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CHAPTER 12

FLUCTUATION IN LEATHER BUYING OF SHOE MANUFACTURERS: HYPOTHESIS AND TEST

We try now to appraise the net influence of the many factors found at work on the temporal patterns of buying and its relation to selling in shoe factories. By comparing these patterns with series representing causal influences, we can gain some general notion of whether the data contradict the explanation. Here, again, it may be that the tests themselves will help to frame more penetrating questions.

A Hypothesis on the Behavior of Leather Stocks

First, which intentions with respect to the stocks can be validated and which of them are likely to be thwarted in the course of unfolding events? The intentions linking the physical volume of buying and that of selling are typically capable of approximate achievement because so substantial a portion of actual orders are on hand before leather must be purchased. Intentions, then, rather than inevitable error, as in the case of the retailer, will be the primary factor determining the patterns of shoe manufacturers' leather stocks. Only in connection with the aspect of buying that depends on guesses about market conditions must disappointment frequently occur, and for this aspect we need not distinguish between thwarted intentions and changed intentions.

To see how much of the behavior of stocks may be explained, we combine the results of our analysis of leather buying under stable market prospects and buying based on shifting market prospects and arrive at a model that we hope to put to an empirical test. Under constant market prospects, leather stocks of leather-goods manufacturers are expected to bear a positive and either slightly leading or synchronous association with leather consumption. Shifting market prospects presumably cause inventories of leather on hand and on order to have a positive association both with the rate of change in expected leather prices and with the assurance with which optimistic or pessimistic expectations are held. The amplitude of fluctuations in stock on hand and on order will tend to approach upper and lower limits dictated by altered risks. Whether operating margins exhibit some association with the process requires investigation.

Evidence Bearing on Each of the Major Variables

Chart 25 shows the estimates of cattle-hide leather stocks held by manufacturers and other time series representing factors that may be partly responsible for the course stocks followed. The data on stocks were computed by estimating the cattle-hide leather used in the production of the month's output of shoes. These figures were subtracted from shipments of cattle-hide leather from tanneries (after deduction of net exports) to obtain the change in cattle-hide inventories of leather-goods manufacturers (leather dealers' inventories are implicitly included), and these hypothetical changes in stocks were linked to a base figure. Estimates of this sort are always highly fallible, since a small percentage error in either of the two flow series [1] can cause large percentage errors in the differences, which in turn are cumulated in stocks proper.

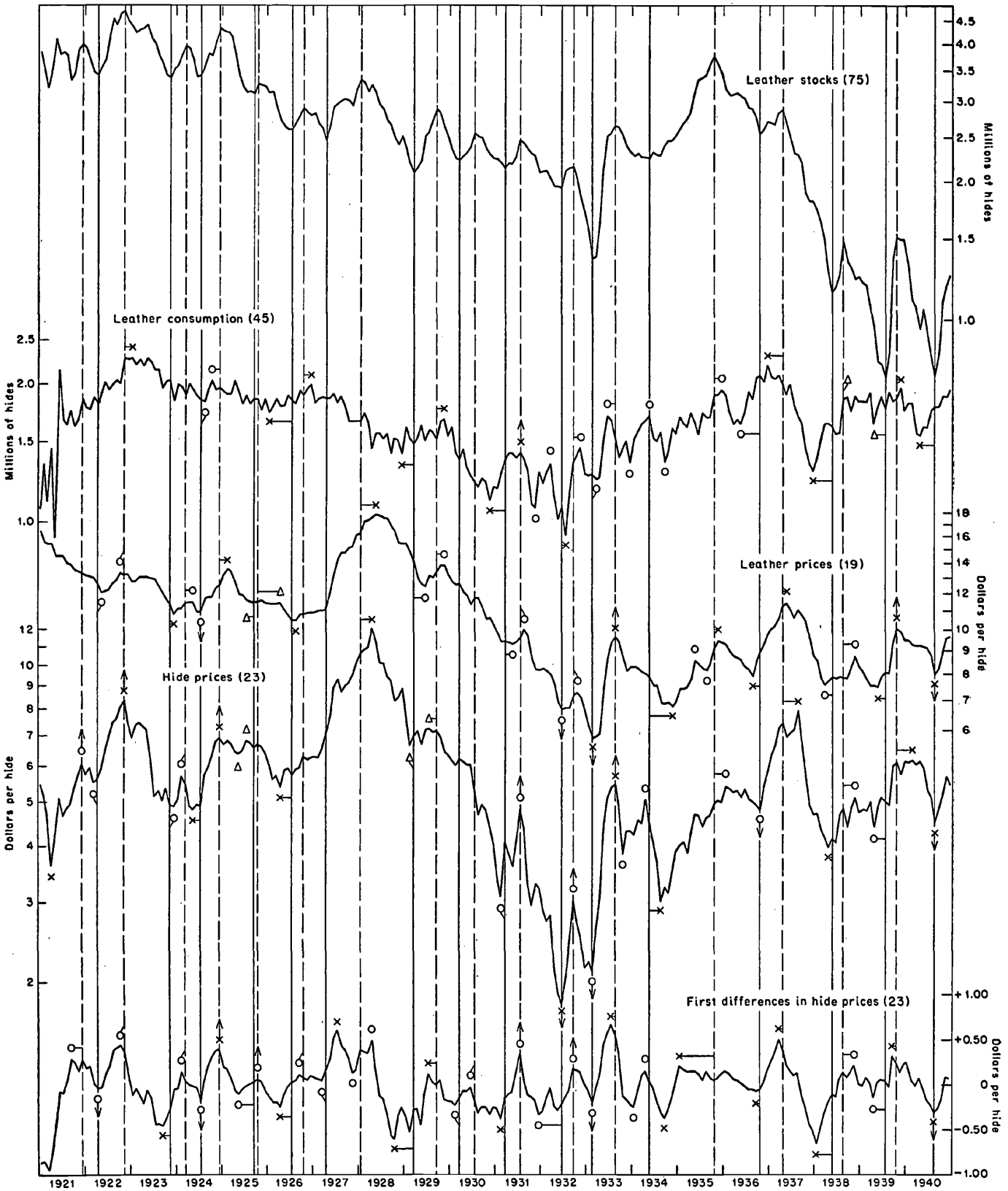
Conceptual as well as statistical difficulties arise in representing the activities to be explained by data on leather stock and its rate of change. First, a minor one: The logic applies to the number of weeks' supply on hand rather than to actual stocks. The precise meaning of the former concept may well vary, but certainly it is not a ratio between stocks at the beginning or end of the week and the week's sales. The sales figure forming the denominator of the ratio is probably more often than not some sort of average for a season or two, or even planned rather than actual sales; consequently, the time patterns of the two concepts, number of weeks' supply on hand and total stocks, are not too different, at least for the short periods involved in subcycles.

The second difficulty is serious. The hypothesis applies to ownership position (leather stocks on hand and on order). The statistical data apply to stock on hand only. They ignore outstanding orders for leather,

[1] One source of error threatens the accuracy of timing comparisons. In estimating leather consumption, a ratio was applied to shoe production that purported to show the changing amount of cattle hide used in a pair of shoes. The ratio has a marked downward trend, 1922–1940, and the presence of the trend is indicated by other information. Its extent may, however, be overestimated. If so, the downward trend in stocks will also be exaggerated. Among other things, this might cause a tendency for peaks in stocks to be marked early and troughs late relative to their true position.

CHART 25

Leather-Goods Manufacturers' Leather Stocks Compared with Selected Series, 1921–1940



First differences are plotted on an arithmetic scale; the other series, on a ratio scale. Specific-subcycle peaks and troughs (broken and solid vertical lines) in *leather stocks* (series 75 in Appendix B) are used as reference frame. For the other series, specific-cycle turns are marked by ×, specific-subcycle turns by O, and retardations by △. When a specific turn is matched with a turn in the reference series, a horizontal line or vertical arrow indicates the association. First differences in hide prices is a five-month moving average of month-to-month change, plotted in the last month.

whether a blanket order or one with type and color specified; this information is essential to an accurate portrayal of shoe manufacturers' market position and of how it changes. But although the level of the market position is not indicated by information on stock on hand only, its change, at least the direction of its change, may be. Market extension or contraction based on changing market prospects may take the form, in part, of spot purchases of leather. Even if it does not, an allowance for a delivery interval may make it possible for data on stock to indicate, though somewhat tardily (especially at peaks), how market positions are changing.

VOLUME OF BUYING

Shoe manufacturers, acting according to their own foreknowledge of production schedules as conveyed through their customers' orders, plan to have leather in the factory in time to prepare it for processing and to complete the shoes at the appointed time. Therefore under constant market prospects, change in leather consumption should be reflected in stock, probably with a short lead. On the average, Table 44 shows about as many leads as lags of consumption relative to stocks. But the average obscures a strong tendency to lead at troughs and lag at peaks.[2] This suggests a link between the size of stocks and orders for shoes: at peaks, when advance positions were extended, orders turned down several months before the change was reflected in production schedules; at troughs, the lag was greatly reduced. Asymmetry is suggested also in the association of wholesale sales of shoes and the consumption of cattle-hide leather, for which only 21 per cent of the months are in unlike phase. But synchronous relationships predominate at troughs (they occur at 7 of the 13 troughs), whereas at peaks wholesale sales lead in 9 out of 13 opportunities.[3] These figures parallel the figures for wholesale sales and shoe production cited earlier. In general, I conclude that the timing association of stocks and output is not contrary to expectations.

However, the two sets of data do not show the strong general similarity that would suggest output was a major determinant of stocks. Beginning around 1926, by which time the excess stock of World War I had been worked off, stocks and output seem to have broadly parallel trends, at least until 1938, when eccentricities appear in the data. Subcycles, however, have a very different course. Differences in amplitude cause the output-stock ratio to be sharply inverse to, and synchronous with, subcycles in stocks. Furthermore, stocks and output move in opposite subcyclical phases 38 per cent of the time between the end of 1921 and 1940.[4]

The underlying influence of output on stock might be clearer in first differences than in the cumulated data. Such an association, after an adjustment for the expected lead of stocks, would permit an intended incremental sales-stock ratio to differ from the average ratio; it is thus a more general case than the previous one. But the two series, shown in Chart 26, exhibit few similarities, and Table 45 confirms the visual impression—38 per cent of the months are in unlike phase.[5]

EXPECTATIONS CONCERNING PRICES

At least one strand of the highly complex web of observations and experiences on which expectations about prices are based must be the relation of current prices to past prices. Past prices and their rates of change are not only specifically watched as harbingers of future prices, but they doubtless also reflect the impact of other sorts of evidence on buyers and sellers—direct experiences of market conditions encountered in the course of a business day. If so, their pattern may be doubly relevant, once for itself and once for a group of other invisible factors that shape judgments about the future, including the future of prices.

Recent rates of change of prices may be as good a measure as we can find of the expected rate of change in prices which will form a basis for the judgment on the amount to be gained from altering the number of weeks' supply of leather, or the supply on hand and on order. The *level* of stock (or its ratio to output) should respond to the *rate of change* in prices insofar as the absolute guess about future prices (rather than the firmness or the dispersion of opinion) is the active agent. Since the synchronous association will presumably be between month-to-month change in prices and stocks proper on hand and on order, change in

[2] The index of consistency with which peaks lag more or lead less than troughs is +79. This asymmetrical timing association also exists between shoe production and stocks; for these two series the consistency index is +74. This suggests that the statistical peculiarities of leather consumption (see the previous note) are not the controlling factor.

[3] The index of consistency for differential peak and trough timing for wholesale sales (pairs) and leather consumption is 40. The average lead of wholesale sales is 1.4 at peaks and 0.5 at troughs.

[4] With an allowance for a one-month lead of consumption, the figure is 37. An allowance for a lead of three months at troughs and none at peaks reduces it to 31.

[5] The lead of consumption at troughs relative to peaks found in the cumulated data is not present in the first differences since first differences in stocks lead stocks proper by considerably more at troughs than at peaks (the association of first differences in consumption to consumption proper is substantially similar at peaks and troughs). This might imply, if we persist in assuming that orders for shoes lead leather consumption by more at peaks than troughs, that stocks begin to slacken their rate of rise about when orders cease to rise (and first differences in consumption reach their peak), and that stocks begin to fall at a less rapid rate a few months, on the average, before either orders or consumption turn up, though after their rate of decline has slowed.

TABLE 44

Timing of Subcycles: Leather-Goods Manufacturers' Leather Stocks Compared with Selected Data, 1922–1940

REFERENCE FRAME: MANUFACTURERS' LEATHER STOCKS (32 TURNS) [a]

	ALL TURNS											
	NUMBER OF TURNS [b]					TIMING (*months*) [c]					MONTHS IN UNLIKE PHASE AS % OF ALL MONTHS [d]	
		Matched Turns				*Mean Lead (−) or Lag (+) of:*		*Average Deviation from:*			*Timing That Maximizes Correspondence*	
	All Turns (1)	*Total* (2)	*Leading* (3)	*Lagging* (4)	*Synchronous* (5)	*Central 3 or 4 Turns* (6)	*All Turns* (7)	*Mean of All Turns* (8)	*Mean for Peaks and Troughs* (9)	*Peak and Trough Timing Consistency Index* [e] (10)	*Lead (−) or Lag (+) (months)* (11)	(%) (12)
Leather consumption (45)	26	21	11	9	1	−1.7	−1.2	1.9	1.8	+79	−1	37
Leather prices (19)	27	27	5	16	6	+1.0	+1.0	1.5	1.5	+42	+1	22
Hide prices (23)	30	25	9	6	10	0	+0.1	1.4	1.4	+48	0	25
First differences: [f]												
Hide prices (23)	35	29	20	1	8	0	−1.6	1.6	1.5	+31	−1	26
Manufacturers' leather stocks (74)	31	31	28	0	3	−2.3	−3.3	2.0	1.6	+70	−3	25
Ratio (87) of leather consumption to manufacturers' stocks; matched inversely [g]	32	30	9	11	10	0	+0.4	1.7	1.5	+48	0	22
Margin over leather (LIFO) and labor cost; matched inversely: [g]												
Per pair (10)	24	24	10	12	2	+0.5	+0.1	1.9	1.9	+26	0	25
Aggregate (11)	23	22	7	12	3	+0.7	+0.4	1.6	1.6	+5	+1	24

	PEAKS							TROUGHS						
	NUMBER OF MATCHED PEAKS				TIMING (*months*) [c] *Mean Lead (−) or Lag (+) of:*			NUMBER OF MATCHED TROUGHS				TIMING (*months*) [c] *Mean Lead (−) or Lag (+) of:*		
	Total (13)	*Leading* (14)	*Lagging* (15)	*Synchronous* (16)	*Central 3 or 4 Peaks* (17)	*All Peaks* (18)	*Average Deviation* (19)	*Total* (20)	*Leading* (21)	*Lagging* (22)	*Synchronous* (23)	*Central 3 or 4 Troughs* (24)	*All Troughs* (25)	*Average Deviation* (26)
Leather consumption	11	3	7	1	+1.3	+0.4	1.7	10	8	2	0	−3.5	−2.9	1.9
Leather prices	13	1	10	2	+1.3	+1.7	1.4	14	4	6	4	+0.2	+0.4	1.6
Hide prices	13	2	5	6	0	+1.0	1.8	12	7	1	4	−0.8	−0.9	0.9
First differences:														
Hide prices	14	9	1	4	−1.0	−1.1	1.3	15	11	0	4	−1.3	−2.1	1.7
Manufacturers' leather stocks	15	12	0	3	−2.0	−1.9	1.0	16	16	0	0	−4.0	−4.6	2.2
Ratio of leather consumption to manufacturers' stocks; matched inversely	15	4	9	2	+1.0	+1.1	2.0	15	5	2	8	0	−0.3	1.0
Margin over leather (LIFO) and labor cost; matched inversely:														
Per pair	12	5	7	0	+0.5	+0.2	1.9	12	5	5	2	0	−0.1	1.9
Aggregate	11	3	7	1	+1.0	+0.5	1.5	11	4	5	2	+0.3	+0.3	1.7

[a] Series 75 in Appendix B.

[b] For the rules used in matching subcycle turns, see Appendix A, secs. 10a, b, c, and d. See also Appendix A, sec. I.

[c] See Appendix A, sec. 11.

[d] See Appendix A, sec. 14.

[e] From the timing at each peak is subtracted the timing at the previous and following trough. Each time the sign of the difference accords with that of the difference between the *average* peak and trough timing, +100 is set down; each time it differs, −100; and if it is the same, zero. The ratings are then summed and divided by the number of comparisons (see Appendix A, sec. 11b, ¶4).

[f] The first differences are five-month moving averages of month-to-month change, stated in the last month in the case of hides, centered in the case of manufacturers' leather stocks.

[g] The association is inverse; thus, specific peaks are matched with reference troughs and specific troughs with reference peaks.

TABLE 45

Timing of Subcycles: Leather-Goods Manufacturers' Inventory Investment in Leather Compared with Selected Data, 1922–1940

REFERENCE FRAME: FIRST DIFFERENCES IN MANUFACTURERS' LEATHER STOCKS (31 TURNS) [a]

	ALL TURNS											
	NUMBER OF TURNS [b]					TIMING (*months*) [c]					MONTHS IN UNLIKE PHASE AS % OF ALL MONTHS [d]	
		Matched Turns				Mean Lead (−) or Lag (+) of:		Average Deviation from:			*Timing That Maximizes Correspondence*	
	All Turns (1)	*Total* (2)	*Leading* (3)	*Lagging* (4)	*Synchronous* (5)	*Central 3 or 4 Turns* (6)	*All Turns* (7)	*Mean of All Turns* (8)	*Mean for Peaks and Troughs* (9)	*Peak and Trough Timing Consistency Index* [e] (10)	*Lead (−) or Lag (+) (months)* (11)	(%) (12)
First differences: [f]												
Leather consumption (45)	28	22	9	11	2	+0.7	−0.6	2.5	2.6	+29	0	38
Leather prices (19)	25	24	5	15	4	+1.0	+1.0	1.8	1.7	+35	+1	27
Hide prices (23)	35	31	15	5	11	−0.5	−0.5	1.6	1.6	+53	0	25
Wholesale shoe sales, dollars (34)	31	25	13	7	5	−1.0	−1.0	1.8	1.8	+9	−1	30
Ratio (87) of leather consumption to manufacturers' stocks [g]	32	25	23	2	0	−3.0	−2.7	1.4	1.3	+29	−3	27
Margin over leather (LIFO) and labor cost per pair (10)	24	16	15	0	1	−2.5	−3.6	2.3	2.3	+13	−3	31

	PEAKS							TROUGHS						
	NUMBER OF MATCHED PEAKS				TIMING (*months*) [c] Mean Lead (−) or Lag (+) of:			NUMBER OF MATCHED TROUGHS				TIMING (*months*) [c] Mean Lead (−) or Lag (+) of:		
	Total (13)	*Leading* (14)	*Lagging* (15)	*Synchronous* (16)	*Central 3 or 4 Peaks* (17)	*All Peaks* (18)	*Average Deviation* (19)	*Total* (20)	*Leading* (21)	*Lagging* (22)	*Synchronous* (23)	*Central 3 or 4 Troughs* (24)	*All Troughs* (25)	*Average Deviation* (26)
First differences:														
Leather consumption	11	5	5	1	−0.3	−0.9	2.4	11	4	6	1	+0.7	−0.4	2.8
Leather prices	12	4	5	3	+0.2	−0.1	1.4	12	1	10	1	+1.8	+2.2	2.0
Hide prices	15	10	1	4	−1.0	−1.5	1.4	16	5	4	7	0	+0.4	1.7
Wholesale shoe sales, dollars	12	8	3	1	−1.5	−1.4	2.1	13	5	4	4	0	−0.7	1.5
Ratio of leather consumption to manufacturers' stocks	12	12	0	0	−3.0	−3.0	0.5	13	11	2	0	−2.3	−2.4	2.0
Margin over leather (LIFO) and labor cost per pair	8	8	0	0	−3.0	−3.8	1.7	8	7	0	1	−2.3	−3.5	2.8

[a] Series 74 in Appendix B; turns are marked in centered five-month moving average of month-to-month change.

[b] For the rules used in matching subcycle turns, see Appendix A, secs. 10a, b, c, and d.

[c] See Appendix A, sec. 11.

[d] See Appendix A, sec. 14.

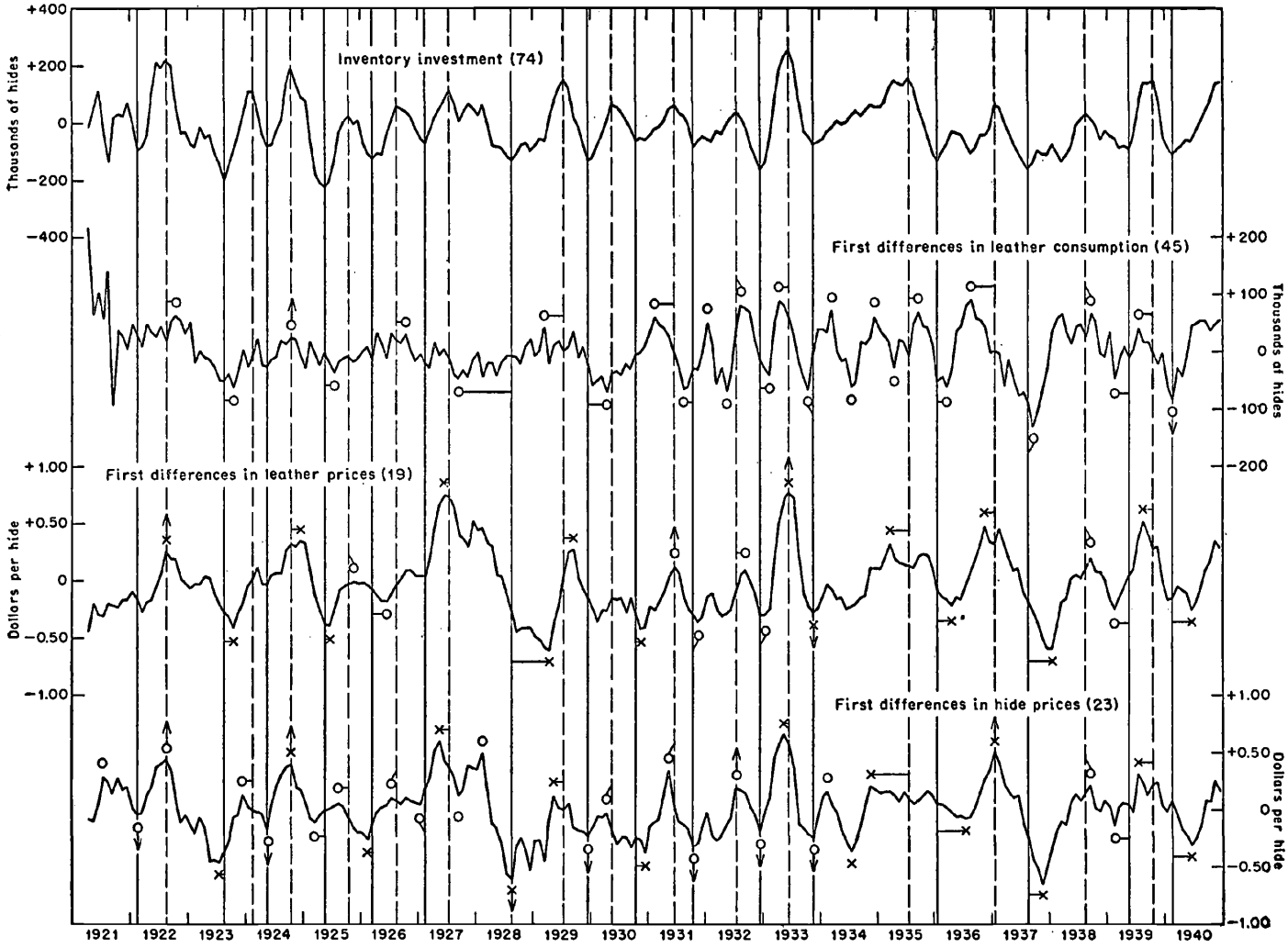
[e] See Table 44, note e, or Appendix A, sec. 11b, ¶4.

[f] The first differences are five-month moving averages of month-to-month change.

[g] If the comparison is made on an inverted basis, twenty-seven turns are matched by our timing rules, and the mean lag is +2.6. But the relation is more irregular as indicated by the average deviation of 2.3 months.

CHART 26

Leather-Goods Manufacturers' Inventory Investment in Leather Compared with Selected Series, 1921–1940



Specific-subcycle peaks and troughs (broken and solid vertical lines) *inventory investment in leather* (in a centered five-month average of month-to-month differences in cattle-hide leather stocks of leather-goods manufacturers, series 74 in Appendix B) are used as reference frame.
For the other series, specific-subcycle turns are marked by O. When a specific turn is matched with a turn in the reference series, a horizontal line or vertical arrow indicates the association.
First differences are centered five-month moving averages of month-to-month change.

prices may be expected to lead stocks on hand by a brief interval.

Prices proper may mirror the gradually cumulating force of optimistic or pessimistic expectation in the market—the firmness with which expectations of rising or falling prices are held and the extent of their dispersion throughout the market. A contrary force may be reflected by the absolute height of the figures: marketeers, familiar with a range within which prices normally fluctuate, may start to expect a fall as the upper boundaries of the range are approached and a rise as prices fall toward levels known to be low in an absolute sense. But absolute lows and highs occur relatively seldom. We can watch for evidence of such behavior, but the primary and systematic association to be expected for prices proper and shoe manufacturers' stocks of leather is probably a direct one reflecting the cumulating sentiments about market prospects. The expected timing association will link current prices with the level of stocks currently (or presently) on hand (and on order). This would mean that prices are associated with stocks on hand either synchronously or with a slight lead.

If the rate of change of prices reflects the size of expected price change, and the price level reflects the cumulation of opinion in the market, and if these

factors are important determinants of buying, then stocks on hand and on order may be expected to exhibit the combined pattern of prices and their first differences (inventory investment the pattern of first and second differences in prices). Stocks on hand only may or may not show this pattern. To say whether they do or not, we turn to the charts and look for a reflection first of prices and then of first differences in prices. While studying each separately, it is well to remember what the logic of the association dictates as the net timing relation between stocks and prices. Stocks should synchronize with or lag slightly *both* prices and their first differences. Since turns in first differences in prices lead prices proper, the influence of the price guess (represented in part by first differences) will cause turns in stocks to be earlier than turns in prices (representing the influence of the cumulation of confidence). The more important the first influence, the nearer stocks will draw toward an average lead of a few months over prices proper, *other things the same.*

But, unfortunately, other things cannot possibly be the same. The causal association between leather prices and stocks of leather held by leather-goods manufacturers can hardly run simply from prices (as a representation of expected prices) to stocks. Efforts of buyers to accumulate stocks must presently influence the course of prices. The extent of the impact on prices or on their rate of change would perhaps be most accurately represented by the rate of change in stocks (more particularly in ownership position). Change in ownership position may lead changes in stocks, especially at peaks, but certainly would not lag. Consequently this line of causal connection seems more consistent with synchronous or even lagging turns in stocks relative to prices (especially at peaks) than with leading ones. Nevertheless the empirical data are hard put to determine which set of impacts they reflect. This difficulty cannot, so far as I know, be abolished. Details of timing comparisons can help a little. Also, it is best to select the price statistics less likely than some alternative to be affected by leather buying and more likely than an alternative to reflect expected prices or the weight of market sentiment. Accordingly, we rely primarily on *hide* prices. Because the price of hides is a highly important element in leather costs (and a change in hide prices a still more important element), it seems reasonable to suppose that expectations about leather prices reflect present hide prices and their expected prices.

Fortunately, the argument does not depend on the ability to distinguish between the causal link that runs in each of the two directions—from stocks to prices and from prices (via expectations) to stocks. Chapter 15 will indicate quite clearly that the first direction of association constitutes one of the strands bearing on prices. The picture may be interpreted in terms of shifting demand schedules for hides caused by changing willingness, all along the line, to hold stocks on hand and on order. This, in connection with an upward-sloping supply schedule for hides, causes changes in market prices. But how do these shifts occur? Obviously, if the desired change in stocks is greater than is necessitated by the physical requirements of customers' orders, it must reflect other considerations, among which are changed market prospects. Though in reviewing the evidence, it is well to try to identify which type of association between stocks and prices seems to be reflected, the effort to distinguish them neither can, nor ought to be, pushed uncomfortably far. If there is any temporal association between the two sets of data, it must, under the conditions existing in the industry, move in *both* directions. Only the relative importance of each requires further investigation.

A general similarity between the course of leather prices and that of leather inventories appears clearly in Chart 25; the same statement (somewhat more clearly in the early years, less in the later years) applies to hide prices. Table 44 gives the timing associations relative to leather stock: an average lag of one month for leather prices and a synchronous relation for hide prices. The table indicates that for hide prices 25 per cent of the months are in unlike phase and for leather prices the corresponding figure (after adjustment for the typical lag of one month) is 22 per cent.

The same set of relationships may be studied in the first difference series of Chart 26 and Table 45. Again there is a small lag for change in leather prices, and this time a small lead for change in hide prices relative to inventory investment, though the per cent of months in unlike phase is somewhat larger than before (27 per cent for leather prices and 25 per cent for hide prices).[6]

[6] Prices, like consumption, tend to lead stocks by more at troughs than peaks. Here, too, the asymmetry is reversed in the first difference series. An explanation for this behavior may be that at troughs, shifts in the weight of opinion in the market are immediately manifest in changes in stocks, since orders can be delivered in a very short time; at peaks, a drop in new orders may take a while to be registered in supplies on hand. However, the rate at which stocks are increasing may fall off after optimistic market sentiment has started to wane, though stocks themselves continue to rise, since of the two factors making for a rise in stock—increasing deliveries of past orders and increasing deliveries of new at-once orders—the second has started to fall. But at troughs the two factors are not differentiated, and thus the impact of the tempo of change on market sentiment and thence on inventory investment is swift.

Viewed as evidence of reverse causal association, that of the impact of stocks on prices, first differences in stocks should be the critical statistic, reflecting changes in buying. On the assumption that changes in ownership position lead change in stock more at peaks than troughs, first differences in prices and prices proper (it is hard to say which would be more appropriate) should lead stocks at peaks and synchronize or lag slightly at

First differences in prices should, according to our hypothesis, have an association with stocks proper (or their ratio to output). The influence would operate through the influence of recent rates of change of prices (and the factors they reflect) on the amount by which prices were expected to rise or fall in the months immediately ahead. Chart 25 and Table 44 suggest the presence of the expected association. The rate of change in hide prices over the five previous months looks similar to end-of-month stocks.[7] The association is interesting in that here the causal relation seems to run from changes in prices through expectations to leather stocks proper. Because of the lead of prices the logic of the reverse causal connection is not appealing.

RISK AND THE LONG-SHORT MARKET RANGE

In addition to the expected change in prices and the firmness with which these expectations are held, shifts in the advance position may be affected by alterations in risk. One type of factor influencing risk may be the number of months' supply already on hand as shown in stock-turnover statistics. The size of gross profits or operating margins may be another.

We learned that leather stocks typically reduce their speed of turnover as they rise and increase it as they fall. The turnover ratio, shown in Chart 27, has an inverse and generally synchronous relation to stocks (see Table 44). When expansions are matched with contractions, and vice versa, the correspondence is quite high (only 22 per cent of months in unlike phase). Turnover and the rate of change in stocks seem to resemble one another on a direct rather than inverse basis, though the peaks in turnover lead with considerable regularity peaks in inventory investment (27 per cent of the months are in unlike phase after allowing for a three-month lead). But the details of the picture suggest that the association is without causal significance.[8]

More interesting than the timing of the output-stock ratio is the range within which it fluctuates. Over the entire period, stocks were almost never so large as to constitute over two and one-third months' output and, except for two months early in 1933 and after 1938 (when the figures seem to have changed abruptly and mysteriously), were they less than about one and one-quarter months' sales. The confinement of stocks to limits consistent with these ratios may have resulted from factors having nothing to do with considerations of turnover per se. But we know that turnover figures are watched. It is possible, and indeed likely, that when stocks on hand reach a figure deemed high, this, together with the on-order position that may accompany it, drops a red signal, or at least a blinking yellow one, in the road of further accretions. Conversely, when stocks get low relative to output, manufacturers are put on their guard against letting them get lower still. Even if over-all ratios are not the explicit guide, the size of the advance position for certain specified sorts of leathers might be. This interpretation seems consistent with what shoe manufacturers say about their leather buying.

It is consistent, too, with the statistics. The first set of horizontal lines toward the center of Chart 27 shows when the ratio of current cattle-hide leather consumption to end-of-month stocks was 0.65 or higher, that is, about six and one-half weeks' supply or less.[9] For the most part, these were periods of declining activity, when leather stock was or recently had been falling. The strongest support for the thesis occurs when high turnover rates appear *before* the upturn in stocks proper. But a synchronous association is also consistent with it, on the assumption that the response was fast and that the on-order position may have given some advance warning. The chart indicates that the ratio reached 0.65 at most of the troughs and a few months before the turn in stocks in all but one instance once the excess of stocks that followed World War I had been worked off.[10] If one defines the period of low

troughs. This is of course what first differences do. Hide prices proper do not accord with the thesis, since they lag by substantial intervals that are virtually the same at peaks and troughs.

[7] It is plotted allowing for a lead of two months. Allowing for a further lead of one month (a total of three months), certainly a reasonable figure in context, 26 per cent are in unlike phase.

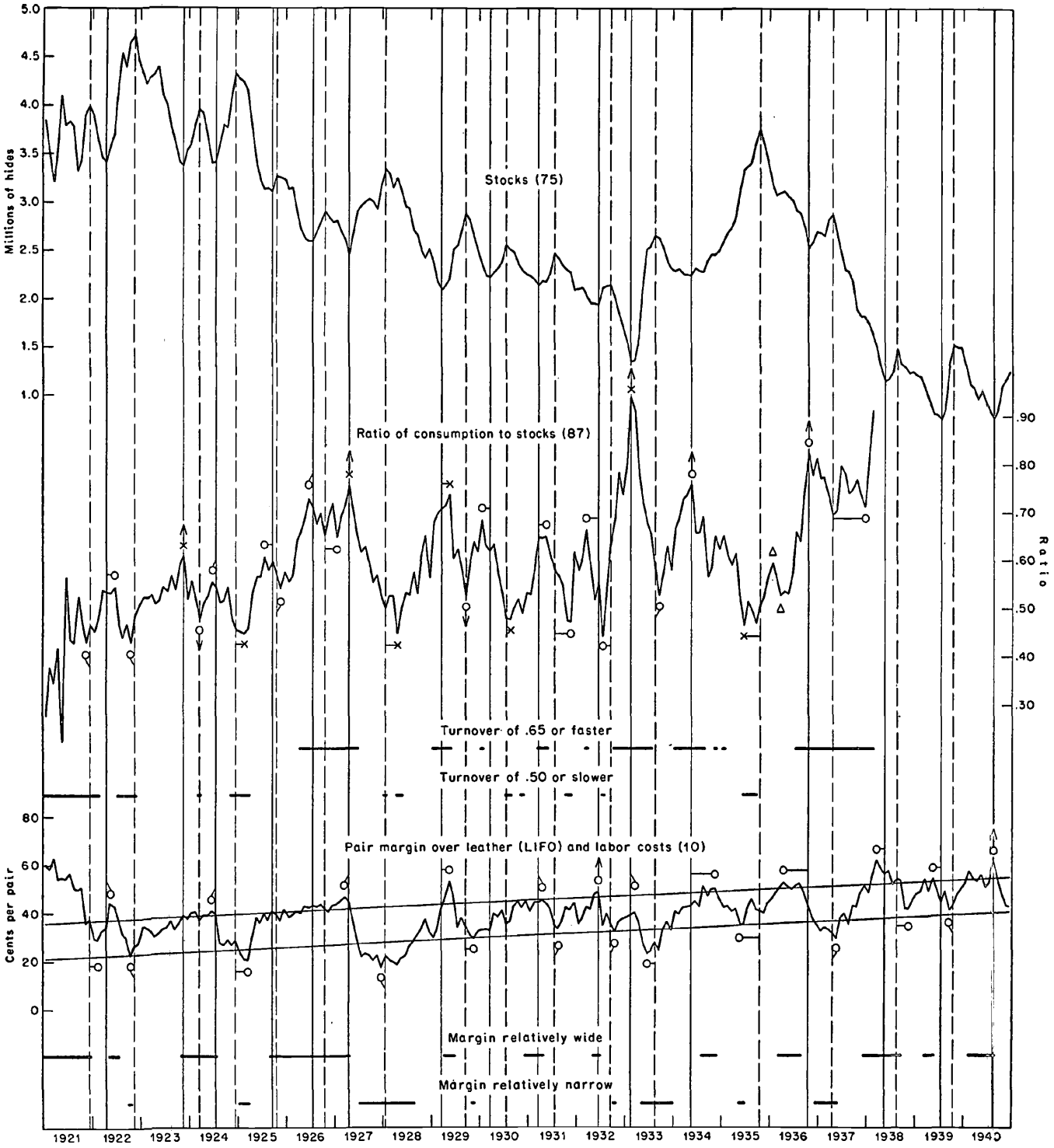
[8] The association might bear on the dynamics of change if the turn in the ratio typically resulted from differential rates of change in a parallel direction of output and stocks. Then we might conclude that it signaled, for example, a less healthy relationship that was prerequisite to a reversal of trends—stocks begin to turn less rapidly, and presently the rate at which inventories are rising slows down. But, actually, the peak in the ratio usually means simply that stocks have turned up. Stocks, that is, which before had been falling at a decreasing rate, now start to rise at an increasing rate. Because this phase of accelerating rise is short (usually only a few months) the trough in first differences follows with some regularity the peak in turnover rates (that is, the trough in stocks proper). The sequence can be rephrased to apply to troughs in turnover. In a sense this is simply an arithmetic corollary of the fact that if peaks in inventory investment are matched with troughs of inventory proper and vice versa, the latter (inventories) lead the former (investment) and by quite regular intervals. This may be an interesting fact, but it does not seem to carry causal implications concerning stock-turnover ratios and inventory investment. In this connection, if the series are matched inversely, peaks (troughs) in turnover lag troughs (peaks) in inventory investment; 34 per cent are in opposite phase after allowing for a three-month lag. But this seems simply a mechanical result of the inverse association to be discussed presently.

[9] The upper and lower limits were selected by a study of the chart. They suffer from all the errors of the data as well as from the cavalier method of choosing them.

[10] Trade reports indicate that by 1926 stocks were no longer considered abnormally high. During this trend to a lower level the band of permissible variation would slope upward and be at

CHART 27

Leather-Goods Manufacturers' Leather Stocks, Their Rate of Turnover, and Margins over Direct Costs, 1921–1940



Specific-subcycle peaks and troughs (broken and solid vertical lines) in *leather stocks* (series 75 in Appendix B) are used as reference frame.
For the other series, specific-cycle turns are marked by X, specific-subcycle turns by O, and retardations by △. When a specific turn is matched with a turn in the reference series, a horizontal line or vertical arrow indicates the association. The relation between the ratio and stock is inverse; specific troughs are matched with reference peaks and specific peaks with reference troughs.
Because of the unaccountably extreme level of the ratio after 1937, the data for 1938–1940 have not been charted. However, turns marked in the series during that period have been included in the calculations exhibited in Table 44. The pair of trend lines drawn have a slope of about 0.8 cents a month.

turnover that may have tended to put an end to further market extension as two months' supply of leather on hand and in process (a ratio of 0.50), the chart shows the association with peaks in stocks; leads and synchronous timing are about evenly divided.

MARGINS

Risk might be judged a function not only of the level of stock turnover already prevailing—the extent to which market positions were now extended or contracted—but also of the leeway between profit and loss, which, in turn, would be positively associated with changes in ownership position. A similar association may attach to margins in their capacity as a source of funds for inventory accumulation: wide margins provide the funds, narrow margins may not only fail to do so but actually make it necessary to liquidate inventories to provide funds for other purposes. Indirectly, wide margins, because of the rosy picture they draw, may also make funds provided by bankers more available, though I have seen no evidence that this is true of short-term fluctuations. Finally margins may influence leather buying through their influence on expectations about leather prices.

To shed light on short waves of inventory accumulation, the figures need to be monthly or at least quarterly. Further, a somewhat different set of figures would be required to reflect alternatively: sources of cash, profitability, expectations. Monthly estimates can be constructed for certain selected costs on the basis of specified assumptions.[11] Leather costs, typically between 35 and 50 per cent of the total, can be estimated on the basis of alternative accounting schemes. Last in, first out (LIFO) accounting implies that the current market price of leather is used in determining costs, and the current price of sole and cattle-hide upper leather was used to compute the cost of the fixed input of the two sorts of leathers.[12] First in, first out (FIFO) accounting is more complicated to reproduce, but an effort to do so was made by using information on leather inventories in conjunction with the price statistics.[13] Labor costs per pair, typically between 20 and 30 per cent of total manufacturing costs, can be estimated by using industry payroll data, though there is a technical difficulty to be circumvented.[14] Overhead costs can be guessed only on the basis of highly formal procedures. Aggregate overhead was assumed to be subject only to trend and to cyclical change associated with changes in salaries; unit overhead was calculated by dividing an estimated total by output.[15]

The three major sorts of costs per pair—leather, labor, and overhead—summed and expressed as a percentage of the average price of cattle-hide leather shoes and subtracted from 100, should presumably give an approximate picture of changing percentage profits per pair ignoring the impact on profits of changing valuation of all sorts. Samples of these calculations summed for twelve months are assembled in Chart 28. The LIFO leather-cost margin assumes that costs were based on the current market price of leather. FIFO assumes that historic costs were used and leather was bought earlier (by the average age of leather inventories) than shoes were sold; the third calculation assumes that leather was bought at the most advantageous time within the previous eight months.

The estimates of profits based on these several assumptions (and ignoring changes in evaluation) may be compared with profits as reported by corporations. The first set of these charted lines are broadly based yet their movement shows no relation to the margins over three types of costs calculated on either a LIFO or a FIFO basis assuming purchases had been made

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a lower level. The same statement applies if beginning rather than end-of-month stocks are used or if we take 0.70 as the danger level (a little over six weeks' supply), except that during the depressed period after 1928, stocks did not fall quite so low.

[11] For sources of this and labor cost estimates, see Chapter 11, note 30. By and large, leather costs are relatively higher and labor costs lower for men's than for women's shoes, and for men's work than for men's dress shoes.

[12] It was assumed that 2.5 square feet of upper and 0.7 square foot of sole leather was used per pair. For details of the computation see Appendix B, series 20.

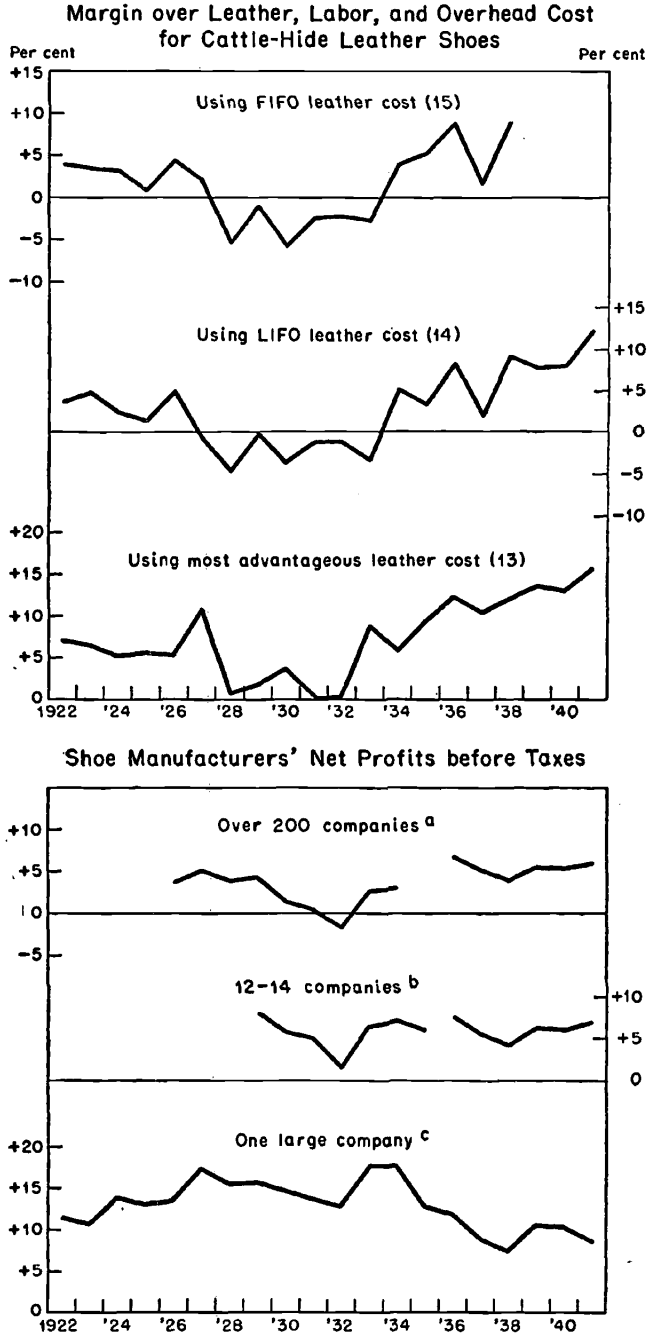
[13] I assumed that half of the total stocks consisted of high-style leathers that would typically be purchased for immediate use and thus were never more than one month old; consequently, leather prices of the previous month represented their cost. The rest of leather stocks may be purchased in advance; I assume that their average age, as actually shown in statistics on stocks, determined how far in advance they were purchased and, consequently, the month in which their cost was set by the then current price of leather.

[14] Cattle-hide leather shoes for which price data are available are staple footwear (these figures are needed to compute margins). To get labor costs per staple shoe, we cannot divide payrolls in the boot and shoe industry by the number of pairs produced, since the high-style women's shoe played a changing part in the total. Instead, we divide payrolls by a specially constructed index of production in which, in effect, other than staple shoes are counted in terms of equivalent staple shoes. For details of the computation see Appendix B, series 5.

[15] The first step was to compute the average for 1922–1940 of the difference between an estimated total factory value of shoe production and total materials and labor costs plus an allowance for profits. This average annual additional cost, in which the overhead type of expense plays an important part, was assumed to be subject to a trend influence computed by fitting a straight-line trend to the annual figures. However, cyclical changes in salaries of clerical and administrative workers would affect aggregate overhead and the figures were adjusted further to allow for these changes. This total was then divided by the dollar value of output each year to get the overhead cost per dollar of sales, or by number of pairs of shoes produced to get overhead costs per pair. For further detail see Appendix B, series 6.

CHART 28

Shoe Manufacturers' Margins and Profits as Percentages of Sales, 1922–1941



a 1926–1934: Compiled net profits before taxes as a percentage of gross sales for manufacturers of boots and slippers, all corporations reporting to the Bureau of Internal Revenue (*Statistics of Income, Source Book*). *1936–1941:* Operating profits as a percentage of net sales of 211 shoe manufacturing companies reporting to the Office of Price Administration (L. D. Howell, *Marketing and Manufacturing Margins for Hides and Skins, Leather and Leather Products*, Bureau of Agricultural Economics, Tech. Bull. 961, July 1948, Table 33, p. 51).

b Net profits before taxes as a percentage of net sales. *1929–1935:* Thirteen companies (*Agricultural Income Inquiry*, Federal Trade Commission, Part III, Supplementary Report, 1937, pp. 24–25). *1936–1941:* Twelve to fourteen companies ("Data on Profits and Operations," *Survey of American Listed Corporations*, Part I, Securities and Exchange Commission, 1936–1948).

c Confidential.

more or less in accordance with sales.[16] But when purchasers of leather are assumed to make the most of opportunities afforded by changing leather prices, the margins as calculated are somewhat more similar to profits as reported by corporations.[17] In 1927 and 1933 particularly, the behavior of "most advantageous leather cost" suggests that the rise in reported profits may have been associated either with early purchases of leather or in some other way with recent appreciation in the value of leather.

In general, it seems evident that the monthly figures that could be computed are not suitable to represent the over-all profitability of shoe manufacturing as reported by corporations. For this there are at least three reasons: changes in input of leather and labor, which are known to play an important part in business tactics, are inaccessible to the calculation, which must presume constant input; the time-pattern of actual buying can not be accurately reproduced, changes in valuation are not included.

But whatever the deficiencies of the figures as an index of profits or sources of funds, they are not without value. They portray the relation between the cost of the major material, leather, and the price of the finished article. Comparisons of this sort are made constantly by people responsible for buying leather, and for producing and selling shoes. It seems almost inevitable that they will influence opinions and actions. Specifically, they may bear on expectations about prices and consequently on buying policy. Just what the form of the influence is likely to be will be better stated after a

[16] Thor Hultgren found a similar absence of direct association between margins over input costs and reported profits in meat packing (see 33rd Annual Report, National Bureau of Economic Research, 1953, p. 32) and for railroading (*American Transportation in Prosperity and Depression*, National Bureau of Economic Research, 1948). See also Alvin H. Hansen, "Prime Costs in the Business Cycle," *Journal of Political Economy*, February 1924, pp. 1–4.

[17] I ask whether the direction of change in profits from year to year for the large sample is the same as that for the constructed margin figures. For the LIFO calculation it was the same 6 times and different 7 times. The score was 5 and 5 for FIFO. For the most advantageous leather costs, direction of change was similar 9 and dissimilar 4 times. If the sharp break in the rate of increase of reported profits 1933 to 1934 is counted as a fall, the score for LIFO is 5 the same and 8 different, and for most advantageous costs 10 the same and 3 different.

I have also made comparisons between leather and labor costs alone and margin over materials and labor cost as reported in the biennial Census of Manufactures. But the census figures trace a gently sloping curve reaching a peak in 1927 and a trough in 1937. Their year-to-year change consequently bears no resemblance at all to either our cost calculations or to profits as reported by corporations.

look at monthly data. The series chosen is the margin over *current* leather costs (LIFO) and estimated labor cost per pair of cattle-hide leather shoes.[18] The figures were plotted in Chart 27.

Margins so defined seem to bear an inverse association to stocks. If peaks are matched with troughs, 25 per cent of months are in opposite phase and there are virtually an even number of leads and lags.[19] Leather prices are far more subcyclically sensitive than shoe prices, and thus have an inverse relation to margins but a positive association to leather stocks of shoe manufacturers. Arithmetically, this causes the inverse association between margins and stocks during short movements. At the level of causal analysis, it is puzzling, and at first seems to suggest that accumulation of stock in trade is unassociated with these margin figures. For, certainly, there is no reason why shoe manufacturers should start to *increase* their stocks the moment margins begin to *fall.* The mere fact that margins fall can hardly portend an immediate rise in leather prices. The inverse association also seems to rule against the possibility that the figures reflect some significant aspect of facilitating finance for inventory accretions. Indeed, were the inverse association all that the figures showed, we would have to conclude that either they hide some relationship that might appear were other factors held constant, or that businessmen simply are not influenced by the difference between buying and selling prices in making their decisions about buying for inventories.[20] Incidentally, the same statement would apply to the relationship between margins and the volume of output or the volume of total leather buying.

But the inverse association is not all that the figures show. Here, as in the case of the sales-stock ratio, the data seem to fluctuate only within a certain range. Indeed, it is quite striking that though leather prices jump all over the lot, margins stay within quite narrow limits most of the time. This is certainly not a result of the ineptitude of the calculations which probably overrather than understate fluctuation since they do not allow for the many adjustments to which input is subject.

Maintenance of margins within tolerable limits may be achieved by charging prices for shoes that keep pace with leather prices. But there is little evidence that this procedure, were it followed, could explain the behavior of margins in the neighborhood of their absolute highs and lows. Shoe prices parallel at least the long swings in leather prices, but this parallelism serves to moderate, not to reverse, the course of margins as they approach their turning points.

I suggest a different explanation. Businessmen know that leather prices rise when the market is tightening and decline when tension is falling off, and that shoe prices are hard to increase and, consequently, should not be lightly decreased. They know too that, though labor cost may be made to compensate partially for increases in leather cost, they cannot do so wholly. The same may be said about other defenses against changing buying prices, such as changes in material input and adjustment of the time when buying is done. This means that margins will tend to move inversely to the short-term state of the market. To prohibit such a movement would involve a different price and sales policy, which would be inadvisable on other grounds. In short, businessmen expect this inverse movement of margins over leather and labor costs to take place and elect to tolerate a certain amount of it rather than to incur the cost of the actions that might prevent it.

However, a time is bound to come when this policy of acquiescence must come to an end as margins drop too low or rise too high. The figures suggest that a band of around twenty cents per pair of shoes marks the typical limits within which this group of expenses other than leather and labor costs plus profits has fluctuated over the years. Though little confidence can be placed in the figure itself (it is certainly too wide relative to total costs since shifts in input are ignored), the data suggest that when fluctuation exceeds usual limits something happens to reverse the course of margins. What may that be?

At an arithmetic level, margins (as calculated) reverse their course because of a change in either shoe prices or leather prices per pair. The highly stable and often lagging shoe prices are not the innovator, and therefore it must be leather prices. At a causal level, the link between margins and leather prices involves the buying policies of shoe manufacturers. Since their sales are not likely to be markedly affected by attention to operating margins (through the prices of shoes), buying for current output is also not likely to be the focus of change. Rather must it be buying for inven-

[18] As far as the short fluctuations are concerned, almost any other set would have told substantially the same story. For a description of the computations see series 10 in Appendix B.

[19] See Table 44. The timing association for aggregate margins is also shown (the charted series multiplied by output in standardized shoes). This series has the advantage of giving the aggregate fund for the industry out of which many expenses of a more or less inflexible sort must be met and thus may reflect an important element in business thinking. Aggregate margins seem to exhibit quite as close an inverse association to stocks as pair margins, 24 per cent are in opposite phase with a month lag. Margins as a per cent of sales have the same over-all timing relationship, though less clearly. Had overhead been included, the picture would have been complicated by a tendency for margins to move in the same direction as output and, therefore, stock during long and strong swings in output; the association during short swings, on the other hand, remains inverse.

[20] It seems proper to assume that the size of shoe manufacturers' stocks of leather may be regarded primarily as voluntary rather than the result of factors that are basically not subject to control.

tories. A shift of the demand schedule for leather, due to a shift in the desire to hold stocks, could cause a shift in the price of leather of a sort to reverse the course of margins.

It seems improbable that this shift in the demand schedule would reflect operating margins, or more particularly, profits, in the role of a source of funds for inventory investment. As margins could be computed, they did not reproduce the course of reported profits; nor did they seem to provide a meaningful measure of a source of funds. Even if they had, before funds grow tight enough to restrict inventory accumulation, they must have been scarce for several months (or ample for several months at troughs) whereas the actual data are not characterized by this sort of pattern.

Rather does it seem probable that the part that margins play in shifting the desire to accumulate stocks, other things the same, operates through a change in expectations about the course of leather prices and perhaps the risk associated with a given course of action. Though unit margins over direct costs are expected to move inversely to output, there are limits beyond which their movement is deemed unhealthy; these limits have some general currency in the trade. One way that margins may be kept within these limits though costs are rising is by appropriate increase in the price charged for shoes. But at times, manufacturers seem to have judged that shoe prices cannot be advanced enough to correct the deficiency without damaging sales. At such times, as margins reach the point where they are considered too narrow and further reduction is thought dangerous, the price of leather approaches, by definition, a level too high for profitable operation. The notion that leather prices are, in this sense, too high raises doubts as to whether they are likely to go much higher. These doubts at least soften the desire to extend the market position farther. In addition, the thought that prices are too high is likely to make buyers resist further increases. Still further resistance may be engendered; for, narrow margins mean that buying based on a wrong guess about prices may now not only reduce profits but imply a more serious risk—that of turning profits into losses. This set of reactions would all tend to make buyers less eager to buy and more finicky about the price they pay. What is more, the influences reinforce one another insofar as the experience and behavior of prospective buyers and sellers at the bargaining table, or during more peripheral contacts, have the power to influence expectations. In consequence, buyers cease to extend their market position and indeed start to contract it, inventories begin to fall as leather prices weaken, and margins cease narrowing and start to widen.

With minor changes, the argument may be reversed to apply to the trough. Also, when margins are wide, shoe manufacturers' expectations about future prices may be buoyed by the thought that leather dealers (whose finished inventories have ceased to rise at their earlier rate) are bound to try to capture some of the wider manufacturing margins by stiffening their price demands. The expectation of a reversal in price trends causes an effort to acquire stocks before the expected rise sets in.

Unfortunately, the argument that I have outlined is not capable of an empirical test. If margins do not transgress the tolerable limits, they can presumably cling close to them for long periods of time without causing a reversal in expectations. At the same time, if *asking* prices involve hypothetical margins that seem dangerously narrow and consequently lead to a downward shift in expectations, buying will falter, leather prices will drop, and actual margins will widen, even though actual (as contrasted with hypothetical) margins have not previously crossed the danger line. All that the figures may show, therefore, will be margins varying within fairly standardized limits and an inverse and largely synchronous association between margins and change in stocks. This is about what the figures do show, and this is all they show. Chart 27 indicates by broken horizontal bars the months when margins were in their higher reaches and therefore may have presaged an upturn in inventories; another set of bars refers to months when margins were low. In neither case does the beginning of these areas, rather than the actual turns in margins, seem to have a systematic association with the turns in inventories. Only if asking prices (rather than actual prices) could be seen could the figures presumably demonstrate how considerations governing margins operate to limit inventory fluctuation.

Importance of Market Prospects

The general tenor of the evidence supplied both by examination of business practice and of time series has emphasized the importance of the impact of fluctuation in market prospects on inventory investment. Insofar as business judgments focused on the proper timing of buying dominate the character of the fluctuations in leather stocks, these fluctuations will be relatively important at times when and for materials where such judgments can be given free rein. One way of evaluating their relative importance would be to note the difference among times and among materials in the relative contribution to fluctuation in leather receipts of changes in leather consumption, on the one hand, and in investment in stocks, on the other hand.

It seems likely that the responsibility of inventory investment for fluctuations in leather receipts may well

be greater in fairly good times than in bad ones. This question is put to the data in Table 46, which is actually the work sheet for our standard average timing comparison. The table gives the dates of each specific-subcycle turn that has been marked in cattle-hide leather receipts and, for each series, the lead or lag at each specific-subcycle turn related to those of receipts by our timing rules. When the crash of 1929 sent industry scuttling to hand-to-mouth buying, we find a one-to-one relation between turns in consumption and turns in receipts, with a predominance of synchronous timing. In the twenties, and after recovery in the thirties, we find more evenly divided responsibility between the two components of receipts, though investment in stocks shows the clearer association as well as a leading one.[21]

[21] The percentage of months in unlike phase with subcycles in receipts of cattle-hide leather of leather-goods manufacturers was as follows:

	Consumption of Leather Matched with a 1-Month Lag	*Change in Stocks Matched with a 1-Month Lead*
January 1930 to December 1932	11.1	27.8
June 1922 to December 1929 and January 1933 to December 1940	24.2	18.3

TABLE 46

Timing of Subcyclical Turns in Selected Series Compared with Turns in Leather-Goods Manufacturers' Leather Receipts, 1921–1940

	NUMBER OF MONTHS' LEAD (—) OR LAG OF SPECIFIC TURNS ASSOCIATED WITH TURNS IN MANUFACTURERS' LEATHER RECEIPTS: [a]											
	P *Nov. 1921*	T *Feb. 1922*	P *July 1922*	T *Dec. 1922*	P *May 1923*	T *Sept. 1923*	P *Feb. 1924*	T *June 1924*	P *Nov. 1924*	T *May 1925*	P *Oct. 1925*	T *Jan. 1926*
Leather consumption (45)	i.d.	i.d.			—4			+2	—1			0
First differences: [b]												
Manufacturers' leather stocks (74)	i.d.	0	+1			—1	0	—1	—1	0	0	+2
Total leather stocks (71); matched inversely [c]	—3	—2	+1			0			—2	0		
Wholesale shoe sales (35)	—5	—2		o				0	+1			+3
Shoe and leather orders (38)												

	NUMBER OF MONTHS' LEAD (—) OR LAG OF SPECIFIC TURNS ASSOCIATED WITH TURNS IN MANUFACTURERS' LEATHER RECEIPTS: [a]											
	P *Sept. 1926*	T *Apr. 1927*	P *June 1927*	T *Sept. 1928*	P *June 1929*	T *Nov. 1930*	P *July 1931*	T *Oct. 1931*	P *Feb. 1932*	T *May 1932*	P *Sept. 1932*	T *Feb. 1933*
Leather consumption	+3			+3	+5	0	0	+1	+1	+2	+2	+1
First differences: [b]												
Manufacturers' leather stocks	—1	—2	+1	—1	+1	oo —1	—1	0			—2	—2
Total leather stocks; matched inversely [c]	—1 o	o		—3	0	—3	—6	0	—1	+2	+3	0
Wholesale shoe sales	+3			+3	0	0	—3	0	0	0	0	0
Shoe and leather orders		i.d.	0 o		oo —1	+1	0	0	+1			0

	NUMBER OF MONTHS' LEAD (—) OR LAG OF SPECIFIC TURNS ASSOCIATED WITH TURNS IN MANUFACTURERS' LEATHER RECEIPTS: [a]											
	P *June 1933*	T *Dec. 1933*	P *May 1934*	T *July 1934*	P *Oct. 1935*	T *May 1936*	P *Dec. 1936*	T *Oct. 1937*	P *Aug. 1938*	T *Apr. 1939*	P *Sept. 1939*	T *Apr. 1940*
Leather consumption	0	0	0	+2	+2	0	0	+2	+1	0	+2	0
First differences: [b]												
Manufacturers' leather stocks	0	—1			—3	—4	+1	—2	0	+1	+1	—2
Total leather stocks; matched inversely [c]	0			+1	—4	—1	—1	0	0	—3	—1	+3
Wholesale shoe sales	—1	0	—3	0	—5	—4	+3	+2	+4	0	—1	0
Shoe and leather orders	+1	—2 oo	o		oo —1	—2	+1	0	+1	0	0	+4

P = peak, T = trough in manufacturers' leather receipts (89) used as reference frame.

o = a specific turn that could not be related under the timing rules (see Appendix A, secs. 10a, b, c, and d).

i.d. = insufficient data.

Unmatched reference turns are shown as a blank.

[a] Series 89 in Appendix B, see also Appendix A, sec. I.

[b] First differences are centered five-month moving averages of month-to-month change.

[c] When the association is inverse, specific peaks are matched with reference troughs and specific troughs with reference peaks.

The distinction based on timing comparisons may be tested by amplitude comparisons. Table 41 (in Chapter 11) led to the conclusion that the aggregate subcyclical amplitude of leather receipts, 1921–1940, was, at an arithmetic level, due 40 per cent to fluctuations in consumption and 60 per cent to fluctuations in inventory investment. In the period of the long depression—from the peak in receipts, June 1929, to the trough in February 1933, consumption contributed 68 per cent and inventory investment 32 per cent of the total fluctuation in receipts. For the rest of the period the figures were reversed—34 and 66.

Instead of making a distinction on the basis of different times, it can be made on the basis of various sorts of leather. Sole leather is a relatively safe property; a given grade of sole can be used on a wide variety of individual shoes; and, consequently, there is little risk of being unable to use it eventually. Information on consumption and inventories of sole leather, as distinct from cattle-hide upper leather, is lacking. However, data are available on receipts of the two sorts of leather by leather-goods manufacturers. Comparing receipts of each sort first with inventory investment and then with consumption of both sorts, we find that inventory investment appears to play a more important part in the determination of the pattern of receipts of sole leather than of upper leather, and the reverse is true of consumption. For sole leather, receipts and inventory investment are in unlike subcyclical phase (allowing for the typical lead of one month) only 15 per cent of the time. For upper leather, the figure (synchronous timing) is 28 per cent. Comparing consumption and inventory investment, we find the corresponding figures 30 per cent for sole and 22 per cent for upper leather.[22] Clearly, then, the staple sole leather, the most eligible sort in which to vary the advance position in accordance with market prospects, is more than other leathers responsible for short-term fluctuations in receipts. These figures seem to lend support to the notion that market considerations are highly important determinants of inventory investment in leather.[23]

[22] When compared with inventory investment, receipts of sole leather have 30 matching turns, 2 unmatched, and inventory investment no unmatched ones. The corresponding figures for upper leather are 27, 4, and 4. When compared with leather consumption, receipts of sole leather have 22 matching turns, 10 unmatched, and consumption 4 unmatched ones. The corresponding figures for upper leather are 26, 6, 0.

[23] Part of the difference between the behavior of stocks of sole and upper leather may result from the fact that extension or contraction of the commitment position is more likely in the latter than in the former to take the form of variation in stocks on order (rather than on hand). Insofar as the ownership position in upper leather consists of unspecified blanket orders, virtually everything that has been said of sole leather stocks would be applicable.

Multivariate Analysis

All of these efforts to observe in gross investment or receipts the influence of the several causal factors thought to be involved are, of course, a roundabout and crude way to test the theory. The theory states that many factors are involved. Could each be perfectly represented by a time series, it is altogether possible that no one of them would have a visually obvious association with the dependent variable, although each had a perfect relation, *ceteris paribus*. The situation calls for multivariate analysis. Taking inventories as the variable to be explained, I tried a straight-line multiple-correlation scheme for the monthly data in which the several independent variables were represented as best we could.[24] It was a total failure. Though the multiple-correlation coefficient was reasonably high (.81) estimated inventories of leather showed only a chance smattering of the minor waves displayed by actual stocks. The respectable over-all correlation resulted primarily from the ability to "explain" the broad sweep of the data. Annual figures would have appeared to be quite adequately represented, but monthly figures showed up the deficiencies

[24] Cattle-hide leather stocks was the dependent variable. The figure, say, for the end of January, was "explained" by domestic consumption of leather during February, the price of cattle-hide leather during January, and the five-month average of month-to-month change in cattle-hide prices for September to January (average change in hide prices proper, August to January). The calculation covered the period January 1922 to December 1937, after which the stock figures plunged downward in what seemed to be a curious fashion. For the total period the extreme range of the consumption parameter explained 71 per cent of the extreme range in stocks, and the corresponding figures for the other independent variables were: leather prices, 25 per cent; change in hide prices, 7 per cent. But these figures are unstable. When the period is broken in two parts at the beginning of 1932, the figures for the three variables for the first period were 59, 8, and 17 per cent; and for the second period, 54, 8, and 8 per cent. The correlation coefficients for the two periods were .88 and .65, respectively.

If trend is added as an additional variable the percentage extreme contribution of each variable to the explanation of the extreme variation in stocks switches again:

Period	*Consumption*	*Leather Price*	*Change in Hide Price*	*Trend*
Full period	59	8	1	27
First half	12	11	22	74
Second half	59	15	7	33

The introduction of additional variables (first differences in consumption and one representing the limits approached by margins were added) serve primarily to cause peculiar shifts in the other variables.

All in all, the computations—because they were done by machine they were more various than they otherwise could have been—demonstrate primarily how the wealth of information (monthly rather than annual data, two time periods instead of one, the use of additional variables) can serve to demonstrate that a calculation is a failure which might otherwise (had it been done with annual data for the full period only) have been considered a success.

of the calculation. Actually, there is every reason to expect that the several factors bearing on fluctuations in stocks will contribute to long- and to short-term change in different proportions. The whole set of factors associated with market expectations, for example, are basically very short-run considerations. At the other extreme, most American businesses have tried to get along with smaller inventories as modern management techniques have developed and taken hold, and yet this movement is not well represented by a straight-line trend.

These findings and reflections suggest a technique that concentrates more particularly on the short movements. Consequently, the variables in the first set of computations were differenced.[25] Table 47 lists the variables and describes the results of fitting a straight-line equation to the data. Apparently all of the variables have the appropriate sign, but the contribution of second differences in hide prices (representing the specific guess about changes in prices) is not reliably indicated by the computation and is, in any event, negligible. If it is left out, the other two variables (representing sales and the cumulative force of market optimism or pessimism) contribute about equally to changes in stocks, and each is clearly statistically significant. The coefficient of multiple correlation, although low, is significant at the 1 per cent probability level.

If the computed values are charted and compared with the actual ones (see Chart 29), an interesting result appears. The combined influence of the two variables (the β-coefficients show X_1 and X_2 contribute about equally) reproduces most of the ups and downs in inventory investment, but the movements are severely muted in the computed series. To bring out the similarity in the movements, I have smoothed both actual and computed inventory investment by a five-month moving average and plotted the computed figures on a scale that doubles their amplitude. Except between 1934 and 1936 when drought slaughter overhung the market, the computation certainly succeeds in reproducing most of the fluctuations, and virtually only those, that actually occurred in inventory investment. Nevertheless, the extent of the movement is very poorly reproduced. Study of Chart 29 suggests at least one reason for the underestimation of amplitude. The month-to-month movement of first differences in prices and consumption is exceedingly choppy. For the monthly ups and downs, in contrast to their five-month averages, there seems little relation between independent and dependent variables. This suggests that correlation ought to be improved if some of this saw-tooth pattern is eliminated by using a longer period. Accordingly, I used quarterly data; the correlation coefficient was .66 (for the monthly data it was .46). Incidentally, quarterly figures assigned hide prices a more important part than did the monthly calculations. The β coefficients were .28 and .58 for consumption and hide prices (for the monthly data they were .32 and .35).

I find both the success and failure of these calculations extremely interesting and am loath to leave them

TABLE 47

Inventory Investment of Leather-Goods Manufacturers in Finished Leather Estimated on the Basis of Three and Two Variables, Monthly, 1922–1937

VARIABLES	EXAMPLE OF MONTHS THAT ARE MATCHED:	UNITS
X_0 = first differences in manufacturers' leather stocks (74)	Change during January	Millions of equivalent hides
X_1 = first differences in leather consumption (45)	Change from January to February	Millions of equivalent hides
X_2 = first differences in hide prices (23)	Change from November to December	Dollars
X_3 = second differences in hide prices (23)	Change in first differences (X_2) October through December	Dollars

	THREE-VARIABLE REGRESSION	TWO-VARIABLE REGRESSION
Regression equation	$X_0 = -.009 + .452X_1 + .094X_2 + .067X_3$	$X_0 = -.010 + .465X_1 + .113X_3$
Standard errors of regression coefficients	.093 .029 .063	.093 .021
β-coefficients [a]	+.31 +.29 +.09	+.32 +.35
Standard error of estimate	.13	.13
Multiple correlation coefficient	.47	.46

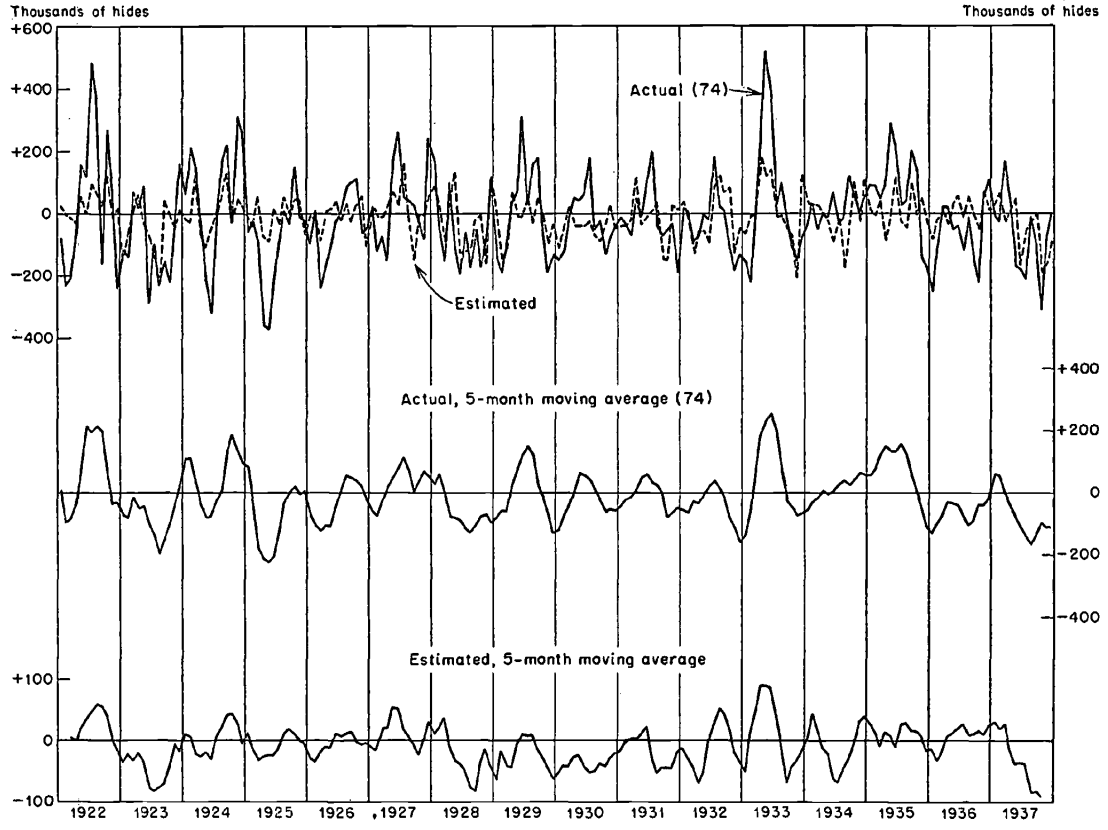
[a] β-coefficients give the proportion of the standard deviation of shoe sales that is "explained" by the standard deviation times the regression coefficient of each independent variable; thus:

$$\beta_{12\cdot34} = b_{12\cdot34}\frac{\sigma_2}{\sigma_1};\ \beta_{13\cdot24} = b_{13\cdot24}\frac{\sigma_3}{\sigma_1},\ \text{etc.}$$

[25] Hide prices, appearing in these calculations as first differences in hide prices, were substituted for leather prices and centered one month earlier.

CHART 29

Leather Inventory Investment of Leather-Goods Manufacturers Estimated on the Basis of Three Variables, 1922–1937



See text and Table 47 for explanation of the data. The moving averages are of month-to-month change and are centered.

without further probing. However, the abundance of choice as to the next step makes it advisable to do so.[26]

[26] Four lines of attack or a combination of them suggest themselves. First, since it is true that the long- and short-range changes in inventories may well be the result of different factors or at least of factors operating in different proportions, there might be something to be said for making the explanation in two steps—first for the level of stocks and then for departures from the general level. Second, there are reasons to experiment with a different function. We did try one calculation for quarterly data using link relatives rather than monthly first differences. This is simply a mathematical conversion of the straight-line function fitted to the data proper. But the results were inconclusive. The correlation coefficient was now a little higher than when first differences were used—.713 rather than .664—and the two variables contributed about the same proportion of the explanation—β coefficients were .28 for consumption and .61 for hide prices. Differences in the price ratios, the equivalent of second differences for the other computation, added nothing to the explanation. A third line of attack would be to alter the variables and perhaps their timing too. Finally, an equation system rather than a single equation is certainly indicated (see the explanation of hide prices in terms of leather receipts of leather-goods manufacturers and a stock-location ratio), though it is hard to say how it can be realistically achieved. One last caution: the stock series is itself a derived series.

Concerning the Independent Contribution of Shoe Manufacturing to Fluctuation

In general, the data just reviewed lend some support and further specificity to the hypothesis under examination. But they are also compatible with other explanations. Because the logic of the inventory investment process applies far more clearly to inventories on hand *and on order* than to the former alone, the correct statistical data (on orders for shoes rather than on shoe production, and on orders for leather rather than on leather receipts) could easily differ from those I was forced to use. Were the difference extreme, it could explain in whole or part the patterns of inventory investment that have been observed.

Assume, for example, that shoe manufacturers place orders for all leather when, and only when, they write orders for shoes, and that leather is received within a week or two of the order date. Shoes are produced, however, in accordance with stipulated delivery dates, and these fluctuate far less than orders (being linked

as nearly as possible to the pattern of consumer buying as retailers foresee it). In this event, inventory investment of shoe manufacturers will have considerable subcyclical variation and will probably show the tendency to lead output as well as many of the other observed characteristics. Shifts in market prospects may still be primarily responsible for behavior, but in this case it would be the views of retailers and wholesalers rather than those of manufacturers of shoes that are reflected in the fluctuations of manufacturers' stocks. Is it possible to say whether this explanation, or one that attributes inventory fluctuation largely to decisions of the manufacturers, is the correct one?

On the basis of what executives say about procedures, there is every reason to believe that *both* explanations contribute. The description in the previous paragraph is not entirely unrealistic; still, shoe manufacturers' statements about their leather buying indicate that they do not simply pass on their customers' orders to tanners after converting them to leather requirements. Even were they to keep the monetary investment in goods constant as their customers increased their advanced orders, leather buying would experience relative expansion. A given number of dollars released from investment in finished or partly finished goods and invested in raw materials (which represent only a fraction of the cost of the finished article) increases the number of items owned by the manufacturer; the number of weeks' supply of shoes released would be balanced by perhaps twice as many weeks' supply of leather acquired. It is desirable to know whether there is a tendency for this total commitment position to remain constant, with the resultant whip to leather buying, or whether buying fluctuates still more through explicit additional extension or contraction of the ownership position in leather.

Turning again to the time series, we search for specific evidence on the contribution of shoe manufacturers themselves to buying waves. Information on inventory investment might conceivably be helpful if there were reason to believe that the timing of fluctuations might be different if it resulted from the decisions of distributors, on the one hand, or shoe manufacturers, on the other. But this is not the expectation that these studies foster. Judgments about the future of prices and stringencies in procurement are likely to be based on the same criteria at whatever vertical level they are made. Buying reflecting shifting market prospects will consequently not presumably be systematically earlier or later at one stage than another (though receipts, of course, might be).

Ideally, the second hypothesis—the notion that shoe producers add to, rather than merely transmit, the fluctuations in distributors' orders—needs to be tested with information on orders for shoes and for leather and by their comparison with shoe production and leather receipts. But the order data are lacking. Deflated wholesale sales, having some of the characteristics of orders for shoes, have an average subcyclical amplitude, 1922 to 1940, of 2.60 per cent of their average standing per month; the corresponding figure for leather receipts is 3.84. Were wholesale sales a true order series—and needless to say it is very far from that—these statistics would suggest that manufacturers do augment fluctuations as well as transmit them. The data on shoe and leather orders combined have still further shortcomings for this purpose.[27] Timing comparisons between receipts and the stand-ins for orders show an average synchronous association that is quite close, as the summary figures in Table 48 show; (the details are given in Table 46). The similarity in timing attests to elements of homogeneity in market prospects for retailers and shoe manufacturers, rather than indicating which of the two initiate fluctuation in leather receipts.[28]

Another method of testing the impact of price expectations on receipts (or orders) was developed in Chapter 9. There, data on shoe production were used to inform about shoe ordering on the assumption that habits of the trade are such that in some months (stipulated on the basis of a knowledge of buying procedure) larger than usual production meant larger than usual advance orders, whereas the reverse was necessarily true of the rest of the months. Although discussions with shoe manufacturers and tanners did not indicate that parallel assumptions would be valid at this stage, it nevertheless seemed worthwhile to test the proposition for leather receipts (the total, and upper and sole leather separately) and for upper-leather production. For each activity, taking one month at a time, the ratios to the surrounding twelve months were correlated with recent changes in hide prices (as an indication of the temper of market prospects). Results were either negative or ambiguous. The statistics, in

[27] The per month subcyclical amplitude for shoe and leather orders is 4.68 per cent of the average value. Since orders seem frequently to be reported in dollars rather than in physical volume, this figure is substantially high to be compared with the one for receipts expressed in equivalent hides of leather—3.84. An allowance for conversion to physical volume would probably reverse the direction of the difference in amplitude between orders and receipts. In addition, an allowance also needs to be made, but cannot be, for the fact that the leather-order component of the shoe-and-leather-order series might have a higher subcyclical amplitude than the shoe-order component.

[28] Strong similarity between the market profile and manufacturers' leather stocks or their rates of change may at least be consistent with the thought (though with other hypotheses, too) that the latter were significantly conditioned by distributors' shoe, rather than by manufacturers' leather, buying. But though comparisons show no systematic differences, they also show a negligible correlation.

TABLE 48

Timing of Subcycles: Leather-Goods Manufacturers' Receipts of Leather Compared with Selected Data, 1921–1940

REFERENCE FRAME: MANUFACTURERS' LEATHER RECEIPTS (36 TURNS) [a]

	ALL TURNS										
	NUMBER OF TURNS [b]					TIMING (*months*) [c]					MONTHS IN UNLIKE PHASE AS % OF ALL MONTHS [d]
		Matched Turns				*Mean Lead (—) or Lag (+) of:*		*Average Deviation from:*		*Peak and Trough Timing Consistency Index* [e]	*Timing That Maximizes Correspondence*
	All Turns (1)	*Total* (2)	*Leading* (3)	*Lagging* (4)	*Synchronous* (5)	*Central 3 or 4 Turns* (6)	*All Turns* (7)	*Mean of All Turns* (8)	*Mean for Peaks and Troughs* (9)	(10)	*Lead (—) or Lag (+) (months)* (11)	(%) (12)
Leather consumption (45)	26	26	2	13	11	+0.5	+0.8	1.2	1.2	[g]	+1	22
First differences: [f]												
Manufacturers' leather stocks (74)	31	29	15	7	7	—0.7	—0.6	1.1	1.0	+32	—1	21
All leather stocks (71) [h]	28	26	13	5	8	—0.5	—0.8	1.5	1.6	+16	—1	26
Wholesale shoe sales, pairs (35)	28	27	8	7	12	0	—0.2	1.7	1.7	[g]	0	28
Shoe and leather orders (38)	24	17	4	6	7	0	+0.2	0.9 [i]	0.9 [i]	[g]	0	20 [i]

	PEAKS							TROUGHS						
	NUMBER OF MATCHED PEAKS				TIMING (*months*) [c] *Mean Lead (—) or Lag (+) of:*			NUMBER OF MATCHED TROUGHS				TIMING (*months*) [c] *Mean Lead (—) or Lag (+) of:*		
	Total (13)	*Leading* (14)	*Lagging* (15)	*Synchronous* (16)	*Central 3 or 4 Peaks* (17)	*All Peaks* (18)	*Average Deviation* (19)	*Total* (20)	*Leading* (21)	*Lagging* (22)	*Synchronous* (23)	*Central 3 or 4 Troughs* (24)	*All Troughs* (25)	*Average Deviation* (26)
Leather consumption	13	2	7	4	+0.7	+0.8	1.6	13	0	6	7	+0.3	+0.8	0.9
First differences:														
Manufacturers' leather stocks	14	5	5	4	0	—0.2	1.0	15	10	2	3	—1.0	—0.9	1.0
All leather stocks	13	8	2	3	—1.0	—1.2	1.6	13	5	3	5	0	—0.5	1.5
Wholesale shoe sales, pairs	13	6	4	3	—0.3	—0.5	2.3	14	2	3	9	0	+0.1	1.1
Shoe and leather orders	9	2	4	3	+0.3	+0.2	0.7	8	2	2	4	0	+0.1	1.2

[a] Series 89 in Appendix B.

[b] For the rules used in matching subcycle turns, see Appendix A, secs. 10a, b, c, and d; see also Appendix A, sec. I.

[c] See Appendix A, sec. 11.

[d] See Appendix A, sec. 14.

[e] From the timing at each peak is subtracted the timing at the previous and following trough. Each time the sign of the difference accords with that of the difference between the *average* peak and trough timing, +100 is set down; each time it differs, —100; and if it is the same, zero. The ratings are then summed and divided by the number of comparisons (see Appendix A, sec. 11b, ¶4).

[f] The first differences are centered five-month moving averages of month-to-month change.

[g] Not computed, because peak and trough timing differences were obviously insignificant.

[h] The association is inverse; thus, specific peaks are matched with reference troughs, and specific troughs with reference peaks.

[i] Comparisons are bettered relative to those for the other series by the fact that shoe and leather orders are first available in 1927. If the percentage of months in unlike subcyclical phase are computed for the same period—1927–1940—for consumption and wholesale sales, the figures are 14 and 19, respectively.

accord with what people had said, failed to suggest the presence of seasonal buying patterns that were sufficiently sharp, sufficiently reflected in patterns of leather production or receipts, or sufficiently differentiated from those of distributors, to make it possible to distinguish between leather buying of manufacturers that did and did not reflect the buying of their customers.[29]

[29] The ratios for, say, upper-leather production for April to the surrounding twelve months each year were ranked. The change in hide prices from December through March for each year were ranked. Correlation coefficients for the two pairs of rank standings each year were computed. The procedure was duplicated for each month and repeated with the data for receipts substituted for upper leather production.

A general correlation of hide prices and output is indicated by the fact that the coefficients of rank correlation for virtually all months are positive. The same may be said if we study the association of leather receipts and change in hide prices, or of receipts of upper and sole leather separately. For upper leather production or receipts the correlation for some months seems

All in all, we simply do not have the statistical data that might help to answer whether part or all of the fluctuations in manufacturers' stocks may directly reflect buying movements for shoes rather than partly reflect independent movements in the buying of leather. However, what we have learned of shoe manufacturers' buying problems and procedures strongly suggest, and the statistics do not deny, that whatever the volatility of shoe buying, leather buying adds to, as well as passes along, these fluctuations as they impinge on the operation of tanners.

Conclusions

As demand moves backward through the stage where the finished shoe is produced, there is, as at the marketing stage, a magnification as well as an acceleration of fluctuations, especially of the shorter fluctuations, in consumer buying. The movement of cattle-hide leather into shoe manufacturers' establishments broadly parallels the output of shoes. Though there has been a downward trend in the leather used per pair of shoes, the major cycles in the consumption of cattle-hide leather, finished leather goods, and receipts of cattle-hide leather by shoe manufacturers are closely parallel, though their leather stocks, too, rose when production rose and fell when it fell. Corresponding minor as well as major movements appear in input and output, but in this case we find a clear tendency for amplitude to be greater at the earlier stage and for turns to precede turns in shoe output; stocks of leather, raw and in process, strongly reflect these differential rates of input and output.

Thus, though the large majority of receipts of leather depends on requirements for the current output of finished leather goods, at least half of the subcyclical variability in receipts of leather is associated with fluctuations in leather stocks (unprocessed and in-process) rather than directly with fluctuations in finished output. The fluctuations in stocks are, in absolute terms, little greater for heavy swings in output than for the shorter, often lighter, swings. Stocks rise and fall, on the average, synchronously with subcycles in production; first differences in stocks lead the turns in trade.

I have tried to study how this pattern comes about, for it has important implications for the dynamics of business fluctuation. Its explanation involves the whole range of practices bearing on the association between buying and selling; no more limited study is useful. Businessmen have a great deal to contribute concerning what these practices are. But when one undertakes further specification and test of the hypotheses with the aid of time series, a dilemma appears. Theoretically, we require information on selling, buying, and ownership position; actually we possess statistics on output, receipts, and stocks of leather on hand. Fortunately the two sets of information are not without some relationship to one another, both logically and temporally. By exploiting this relation, it seems possible to make some progress. The behavior of the time series at our command add specificity to the hypothesis and appear consistent with it, though not uniquely so.

By and large, the earlier turns and a good part of the amplitude of inventory investment, especially of the shorter movements, seem to be associated with shifting prospects as to prices and other conditions in leather markets rather than with the physical requirements of producing a changing number of shoes. Certainly more leather is suspended in the receiving and production process when sales are high than when they are low, but neither total stocks nor increments and decrements need to be proportional to the level or rate of change in output. The ability to speed up the movement of materials through the factory and into the factory, on the basis of foreknowledge of requirements, means that the connection between the level of output and the size of stocks can be quite loose if operating efficiency is the only consideration. Further, shoe manufacturers' descriptions of their procedures do not reveal the same sort of carefully constructed inventory objectives for leather as apply

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clearly better than for others: June is universally high, and March and April (for which the shifting date of Easter introduces complications) is typically very low, and there are months of high correlation around the turn of the year. For sole-leather deliveries (no computations were made for sole-leather production since this seemed the least likely place to find seasonal patterns dependent on the patterns of buying) there seems little difference among months, suggesting the absence of seasonal patterns for advance buying as contrasted with other buying.

About all these figures seem to show is that for upper leathers there may well be certain months in which optimistic price expectation fosters more buying than in other months, and this may simply reflect patterns in shoe ordering. Only if the months of high correlation between expectations and, hypothetically, orders for leather preceded those for shoes, or showed a clearly stronger positive correlation, might the information be interpreted as bearing witness to independent action on the part of shoe manufacturers. But the figures do not show such differences. For the most part, the shoe and leather orders are price-sensitive in the same months or at least not in significantly different months. Neither the average positive correlation nor the coefficients for the months in which correlation tends to be highest are more clearly marked in the leather than in the shoe data. These negative results carry no positive message. They could indicate any one of several things, and there is no way of knowing which. They could, for example, mean, first, that leather buying simply follows the patterns of shoe buying; second, that though leather buying has patterns of its own, other factors hide it; or third, that the analysis is irrelevant because the conditions necessary to it—a strong uniform seasonal convention as to when advance orders are placed and incentive to smooth seasonal patterns in output by producing or shipping in slack times if orders are on hand—are not fulfilled.

to retailers' model stocks of shoes. Ambiguous, loosely held intentions mean that the term unintended change in stocks is an anomaly. Consequently, the stock-objective accelerating mechanism described earlier is not likely to operate here. Indeed, since it derives primarily from the inability to validate intentions, it would not be present for a second reason: a large amount of sales of shoes are made several months ahead of when they must be delivered, and in time to permit leather to be acquired specially for the purpose. As a result, shoe manufacturers do not have to make the errors in gauging leather buying that the retailer (who ships the same day he receives the order from his customer, but often buys several months ahead) must make.

But the successful operation of a shoe factory does seem to imply that a larger proportion of expected or actual leather requirements be bought sooner sometimes than other times. To some extent this is merely a reflection of parallel shifts in the shoe buying of retailers or wholesalers. But it seems inevitable that shoe manufacturers add to the fluctuation in meeting the exigencies of their own business problems. The resulting increase and decrease in leather stock on hand and on order is visible, too, in stock on hand only. We have tried to examine the variables affecting the process.

They can be discussed at many levels, and this is one reason why they are so difficult to discuss at all. At the level closest to actual buying, the changes in prospects concerning the speed with which deliveries can be relied upon, concerning adequacy of selections, concerning future prices are, for the shoe manufacturer as for the retailer, the primary considerations (though price expectations may play a more important part in connection with the buying of leather than of shoes).

For each of these problems, especially problems involving buying prices, actual expectations—in the sense of some sort of probability distribution—is only part of the picture, for the assurance with which expectations are held (the level, as well as the shape, of the distribution) and the risk attached to action on the basis of a given expectation, held with a given degree of assurance, are very important, too. Any effort to separate the three elements—expected prices, certainty, and risk—is fraught with peril. The necessarily crude evidence that we have been able to examine seems to insist on the importance of the less obvious second and third elements. We see a close temporal association between leather stocks and the factor that seems to represent the snowballing of market sentiment. We see also reflections of the temporal patterns in risk, and its effect on investment, in the limits within which the output-stock ratio seems to fluctuate.

Dropping to the next level of analysis—the factors that determine expectations, risk, and assurance—complications multiply. We have not tried to catalogue systematically the factors on which expectations about prices rest, though we shall try to summarize observations appearing here and elsewhere in Chapter 15. In general, two major classes of factors have come to the fore—those that intensify change in a given direction and those that tend to limit and reverse change.

In the first group belongs the tendency for men to act at first warily and to gain confidence only slowly. The process is intensified by the fact that man is a social animal and gains confidence in his thinking when others think similarly and act accordingly. What others do, as well as think, adds to the cumulative process in other ways: it can change the situation with which each man must deal. Thus for any one man, the incentive to buy ahead is stronger, *ceteris paribus,* when enough competitors are buying ahead so that costs for a substantial segment of the industry, and therefore prices, are predicated on early buying. Another important cumulative factor is the tendency for expectations to result in actions that tend to validate expectations: the expectation that prices will rise augments buying; this raises prices. The circle of cause and effect harasses empirical study, since the change in hide prices that might be a guide to, and reflection of, expectations could likewise be significantly shaped by the shift in inventory position that these expectations touch off.

But our studies hint that there may well be a disciplined dialectic to these short swings that give them a true capacity to reverse themselves. We seem to find factors—on the basis of what logic suggests, businessmen say, and the statistics at least pass as credible—that cause both extension and contraction of market position eventually to push against increasing resistance. For the shoe manufacturer, the size of stocks provides one such limit; though it may be less sharp than for the retailer, it seems likely that the trade holds certain notions concerning the maximum number of weeks' supply of various sorts of leathers that may properly be held on hand and on order under optimistic and under pessimistic market prospects. It seems probable, too, that these limits, however elastic they may be, are revealed in the ceiling and floor to output-stock ratios that we saw in the figures. Another factor tending toward reversal may well operate through its impact on expectations about prices—the limits that businessmen impose on the tolerable inverse movement of unit margins which results of necessity from inflexible selling prices and flexible buying

prices. Finally, the tendency that we have observed again and again for acceleration to cease several months before the absolute turns—acceleration in prices and orders, which could in the latter case carry implications concerning unfilled orders, too—may also have some impact on business thinking.

All in all, the poking and puttering in the variety of information that could be assembled dimly outlines a process of great subtlety and even beauty. Built out of the intimate details of business practice—the picture differs significantly for shoe retailer, wholesaler, and manufacturer—it has nevertheless the deliberate outlines of an apparatus that has the power to intensify and yet eventually to reverse the course of change. In the tanning industry to which we now turn, there appears yet another variation on this theme.