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CHAPTER 8

RETAILERS' BUYING: GENERAL ANALYSIS

The purpose of the next two chapters is to select from the infinite number of goals, problems, attitudes, institutions, and management devices that constitute a retail shoe store those that bear most critically on the temporal pattern of the purchase of its stock in trade. Chapter 10 brings together the results of the study of time series just reviewed and of the practices in retail stores that are the subject of this and the following chapter. The discussion proceeds in several steps which it may be useful to disclose at the outset.

In determining what to buy, a retailer must decide not only how much and what he thinks he will sell but also the size of stocks from which customers' selections can profitably be made. We tackle the second problem first and study the role that stocks play in a retail shoe store; we learn that their function is central, and that to discharge it, a fairly precise and strongly enforced stock plan is required. This matter of the clarity and firmness of the objective is critical, especially in determining the timing relations between turns in sales and orders. We then study what the actual stock objective seems to be—Does it fix upon an absolute quantity, or a given average or incremental relation to sales? (We postpone studying what part "speculative" considerations play.) Next, we consider what conditions circumscribe the ability to achieve the objectives. At this point the problems of buying for sales and for desired change in stocks merge into one, and we study typical ordering procedure. In view of the fact that retailers have to place at least a substantial part of their orders before they know what sales will be, errors are bound to occur and we arrive at a notion of what the general pattern of the error tends to be. From this follows the pattern of the unintended change in stock in which the error immediately results.

Because objectives with respect to stock are fairly clearly defined and firmly held, the error is likely to be corrected. In the character of these corrections we find a clue to the lead that seems to be present in orders. When corrective orders are combined with other orders (in what seem like reasonable proportions) to depict total orders under the assumption of stable conditions in the supplying market, we also find that the analysis has provided a clue to the greater subcyclical amplitude of earlier stages relative to retail sales.

In the next chapter we develop another clue to both the earlier turns in orders and the greater subcyclical amplitude of fluctuations. It concerns shifts in buyers' evaluations of future prices and of the ease and speed and certainty of procurement. These shifts in "market prospects" seem to be associated with changes in the amount of goods that merchants choose to have both in stock and on order.

Stock in a Retail Shoe Store

Central to the successful management of any retail store, and especially of a retail shoe store, is a stock composed of the proper selection of merchandise in quantities that are neither too large nor too small. With respect to the selection of the right merchandise, there is little that I can say except that it is probably the subject of most critical concern to the businessman. Likewise of great concern to the retailer is the possession of a quantity of goods sufficient to attract and satisfy customers, but not so large as to require excessive working capital or to incur unnecessary loss through deterioration and obsolescence. It is this quantitative decision that is central to the problem we tackle.

IMPORTANCE OF STOCK CONTROL

To have enough shoes in stock, a retailer must first suit the purse of his customers. The price range he must carry is narrowed by the fact that a store is known as carrying "popular," "medium," or "quality" goods; accordingly, certain people exclude themselves automatically as potential customers. Within the chosen segment a store must stock a number of prices. The institution of price lining (discussed briefly in Chapter 5) simplifies the merchandising problem somewhat; it means that selections of shoes will be offered at each of a number of prices separated from one another by palpable intervals: historical figures over the period we study are $2.98, $3.98, $4.50, $6.50, $8.50, etc.[1] But the problem of suiting the purse remains complex.

[1] The authors of "Establishing and Operating a Retail Shoe Business" (Dept. of Commerce, Bureau of Foreign and Domestic Commerce, Industrial [Small Business] Series 34, 1946, p. 83) advise that the most successful small stores confine their merchandise to a narrow range of prices. Conservative shoes bought for wear ought to be offered at a higher price than style shoes. Pairs of prices suggested are style shoes at

Next, a retailer must offer a selection of types and styles of shoes for most of the price lines stocked. For women's shoes there is the oxford, the low-heeled slipper, the high-heeled slipper, the open toe or open heel or both, the conservative types, and the high-mode types. Most styles need to be carried in several colors and leathers. In the popular-priced field, the number of styles offered in a single store will, other things the same, be far fewer than in a store appealing to wealthier customers, where several hundred style numbers of women's shoes may be carried. But, at best, it is difficult to limit selection for women's shoes to less than several dozen numbers. The problem is, of course, still more complicated for a family shoe store.

All these problems the shoe retailer shares with most other sorts of retail stores, but he has a special problem in the variety of lengths and widths common to the foot of man. The United States Army's schedule of GI service shoes lists 239 combinations of size and width. This is, of course, a singular wealth of selection. Most feet fall in a relatively narrow range of sizes. A survey of several hundred thousand pairs of shoes sold by a group of large shoe factories indicated that about 85 per cent of the sales were in 45 combinations of size and width (about 33 per cent of a manufacturer's full line); moreover, 66 per cent of the sales were in 16 (or about 12 per cent).[2] For the most part, retailers will stock a reasonably full line in 60 or more sizes.[3]

To the four dimensions—price, style, color, and size—in terms of which a retailer must plan his stocks, we may add a fifth—time. Both the volume of sales and the sorts of shoes featured change from one season of the year to the next, and retailers must build their stocks in anticipation of these seasonal requirements. Especially for women's shoes, the short life of a style number—often no more than six weeks—creates serious merchandising problems. Stocks are typically built to a maximum in April and May and again in the fall; they are reduced to a minimum in January and about six months later, in midsummer. At their minimum, they may average three-quarters of their maximum size.

The multidimensional character of a shoe retailer's stocks suggests that they must be large. But it is equally true that they must be small. "It is essential," the prospective shoe retailer is warned, "that you maintain the proper relationship between inventory and sales. If your stock is too low, you lose sales; if too high, you lose profits."[4] They must be small because a retailer makes money by buying and selling merchandise. At any given time, he has a limited amount of capital invested in the business. One important criterion by which bankers, investors, and colleagues evaluate his success is the amount of profit on invested capital. If a shoe retailer makes a 2 per cent profit on sales, and stocks turn twice a year, as they do in many shoe stores, he will make a 6 per cent profit on capital invested in merchandise, assuming a gross margin percentage of 33⅓ per cent (on retail).[5] If they turn five times a year, a figure probably attained by some chain systems, he will make 15 per cent profit on capital invested in merchandise, assuming the same gross margin percentage of 33⅓. Since capital invested in stock in trade constitutes a very substantial portion of the total investment in most retail businesses, the effect on overall return on capital of changes in the rate of turnover is great.

Another reason for the rigid limitation of stocks, particularly of women's shoes, is style obsolescence. The selling life of a high-style shoe is short. The need to prepare ahead for peak-season sales, the uncertainty that a model will be accepted, and the short span of its life even if it proves popular mean that a retailer's stocks can be cluttered with unsalable goods in a twinkling. The pressure to hold stocks of high-style goods at a minimum is apparent in the difference between usual stock-turnover ratios of women's and men's shoes. Because of the greater variety in women's shoe styles, one would suppose that a greater assortment, and therefore a larger stock, would be required per unit of sales in women's shoe departments than in men's. Actually, the figures indicate the reverse: stocks of women's shoes turn more rapidly than those of men's. The reason, in part, may be a tendency for manufacturers of style merchandise to attract customers by supplying rapid factory-to-store deliveries; stores therefore need smaller stocks. For the more staple men's shoes, a low price may be relatively somewhat more attractive than fast deliveries. In part, the faster turnover of women's shoe stocks seems to be a function

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$4.95 and conservative shoes between $6.50 and $6.95, or style shoes at $3.95 and conservative shoes at $5.00. (The study was done by Edwin Hahn in cooperation with J. G. Schnitzer, under the direction of H. B. McCoy.)

[2] *Ibid.*, pp. 85 ff. Although the off-size foot was probably never as well shod (however much abused) as in the United States Army, a large men's shoe factory reports that they sold 129 different combinations of size and width, and a large women's shoe factory gave a comparable figure of 145.

[3] A department store recently advertised a women's oxford in 160 sizes. High-style shoes may be stocked in considerably fewer sizes, especially the open-toed women's shoe, for which 20 sizes provide a passable assortment.

[4] *Ibid.*, p. 68.

[5] Example:

Sales	= $75,000
Profit on sales at 2%	= 1,500
Cost of goods sold (with 33⅓% gross margin)	= 50,000
Cost of average goods in stock (assuming two turns a year)	= 25,000
Profit of $1,500 on $25,000	= 6%

of a larger scale of operations, which permit adequate selections without necessarily causing stocks to be high relative to sales. In any event, the challenge with which proper stock control confronts management is visible in the surprising difference in average turnover achieved in independent and chain shoe stores or in profitable and unprofitable shoe stores.[6]

The burden of all this is simply that the size of stocks must be a matter of central importance to a shoe retailer. Consequently enforcement of stock objectives, whatever they are, must rank high among the many necessarily conflicting objectives that management pursues.

What objectives do shoe retailers actually hold with respect to the size of their stock?

INTENDED SIZE OF STOCK

The proper size of stock depends, in part, on considerations focused on the adequate servicing of sales. But the determination of the best time to buy also influences the size of stock, though the influence may be indirect. The determination is concerned primarily with ascertaining the proper time to agree on a price or to reserve suppliers' capacity, and the direct influence therefore is on stock on hand and on order rather than on stock on hand only. Nevertheless, judgments about the market—often too narrowly called speculative—have a bearing on the intended size of stock on hand as well as on order. The matter is important and requires the full treatment to which the next chapter is devoted. Here we deal primarily with stocks and buying procedures under the assumption of stable market prospects: we abstract from buyers' shifting judgments about the condition of the wholesale shoe markets.

It is difficult to get a clear picture of just how the proper size of stocks is determined by shoe retailers or, more particularly, how the size of stocks is intended to change from time to time. Retailers with whom I have spoken claim that they aim to keep the ratio of sales to stocks about constant from season to season—constant, that is, between successive fall-winter seasons or spring-summer seasons. Of course, when turnover is slow, as it is in a retail shoe store, a change in an annual sales-stock ratio of a few tenths of a point (which may not be considered much of a change in the ratio) will make a substantial difference in the absolute size of stocks, so that the intention "to hold a ratio about constant" may be consistent with sizable changes in stocks. Moreover, if one stops to think of the kind of problem involved in providing for the necessary monthly changes in quantity and kinds of shoes, it is hard to see how, at best, the ratio could be held more than approximately constant.

Retailers claim that they try to anticipate seasonal requirements, and to begin a month when sales are typically high with larger stocks than they would a month of low customer demand. Seasonal indexes suggest that, on the average, this purpose seems broadly achieved. We see, for example, in Table 33 that stocks are built up by the end of one month to meet the expected volume of sales in the next: the size of the seasonal index of stocks at the end of one month is correlated with the seasonal index of sales the next month, as rank standings show. The correlation is high (+.89); but what is far more significant, it is also quite high (+.81) when the *change* in stock between the beginning and end of the preceding month is correlated with the *change* in sales from the preceding to current month. Both correlations are poor when comparisons are made on a current basis (columns 4 and 8). Of course, the suggestion that retailers seem to be successful in relating, on the average, their beginning-of-month stocks to the seasonal variations in sales does not mean that they are successful all of the time. It means, rather, that errors, having no systematic bias, cancel out—both as among retailers and over time. This being so, the seasonal indexes may be interpreted as indicative of intentions.

With this in mind, we glance again at the table to see what it says of the *extent* of the preparations for monthly changes in sales.[7] We see at the foot of col-

[6] The turnover ratio, averaged for the years 1928 through 1941 for shoe departments of department stores, was 2.0 for men's and 2.5 for women's shoe departments (annual issues of the Controllers' Congress of the National Retail Dry Goods Association's *Departmental Merchandising and Operating Results for Department and Specialty Stores*). For eighty-one companies canvassed in a study of the National Shoe Retailers Association in 1936, the ratio to annual sales of the annual average of monthly inventories was 2.2 for men's shoes, 3.3 for women's shoes in profitable shoe stores; for unprofitable companies, the corresponding ratios were 1.6 and 1.9 (*Retail Shoe Stores and Leased Shoe Departments*, National Shoe Retailers Association, 1937, p. 17, an analysis of operating and merchandising experience for 1936). The big difference between the ratios achieved for women's shoes in profitable and unprofitable stores is an eloquent statistic. In 1939, the census tabulations for chain shoe stores show that stock, raised approximately to retail level, turned 3.8 times a year in men's shoe chain stores and 6.0 in women's. The corresponding figures for independent shoe stores were 1.8 and 2.9 for men's and women's shoe stores, respectively. Since these figures are based on year-end inventory records, their level is too high to express average turnover for the year. The relationship among the figures, however, need not be systematically altered.

The sales of men's-shoe chain stores average $42,837 per store in 1939; those of women's-shoe chain stores averaged $75,478. The corresponding figures for independent stores were $12,642 for men's and $36,770 for women's shoe stores (*Census of Business*, Vol. I: *Retail Trade: 1939*, Part I, Table 2A, p. 58; Table 20, p. 179).

[7] The stock index was multiplied by the usual ratio of monthly stocks to sales in order to convert the two indexes to comparable absolute amounts of shoes. Change from month to month in

TABLE 33

Association between Average Seasonal Patterns for Sales and Stocks, Shoe Departments of Department Stores, 1926–1940 [a]

	SALES, INDEX NUMBERS (1)	STOCKS, END OF MONTH, INDEX NUMBERS (2)	STOCKS AT ABSOLUTE LEVEL OF SALES INDEX [b] (3)	RANK STANDING OF SALES MINUS STANDING OF STOCK [c]		CHANGE FROM PREVIOUS MONTH			
				Same Month (4)	*Previous Month* (5)	*Sales* (6)	*Stocks at Comparable Absolute Level* (7)	*Rank Standing of Sales minus Stock* [d] *Same Month* (8)	*Rank Standing of Sales minus Stock* [d] *Previous Month* (9)
January	73.0	85.1	408.5	−3	−1	−93.0	−43.7	+2	0
February	63.9	95.6	458.9	+4	0	−9.1	+50.4	+7.5	−1
March	96.5	102.8	493.4	+2	0	+32.6	+34.5	0	+1.5
April	108.2	105.7	507.4	+1	−1	+11.7	+14.0	−4	+1
May	111.5	109.2	524.2	+2	0	+3.3	+16.8	−1	−2
June	119.1	95.0	456.0	−7	0	+7.6	−68.2	−6	−2
July	72.7	88.7	425.8	−1	+1	−46.4	−30.2	+2	0
August	69.8	99.2	476.2	+4	0	−2.9	+50.4	+6.5	−1
September	116.6	103.3	495.8	−2	−4	+46.8	+19.6	−4	+0.5
October	101.0	107.9	517.9	+4	+2	−15.6	+22.1	+6	+4
November	101.4	112.3	539.0	+5	+3	+0.4	+21.1	+2	+3
December	166.0	94.2	452.2	−9	0	+64.6	−86.8	−11	−4
Average	100	100	480	0	0	27.8 [e]	38.2 [e]	0	0
Coefficient of rank correlation for sales and stocks				+.21	+.89			−.18	+.81

[a] Indexes are weighted averages for seasonal patterns for men's and women's shoe departments of department stores, which were used to construct "Department-Store Shoe Sales," Stock Sample (series 28 in Appendix B) and "Department-Store Shoe Stock" (series 49).

[b] Column 2 multiplied by 4.8, the average ratio of stocks to monthly sales for shoe departments of department stores in 1939, according to information collected by the Controllers' Congress of the National Retail Dry Goods Association.

[c] Each month was assigned a rank position for column 1 and then for column 2. In column 4 the rank figure for column 2 was subtracted from that of column 1 for the same month; in column 5 the stock figure for the previous month (in effect, for the beginning rather than end of the month during which sales are recorded) is compared with current sales.

[d] Same procedure as described in note c, except that columns 6 and 7 were used instead of columns 1 and 2.

[e] Average, ignoring signs.

umns 6 and 7 that the change in stock average is only about a third again as much as the change in sales. In other words, retailers seem to accumulate primarily the seasonal merchandise they expect to sell shortly, not this amount times the usual sales-stock ratio. Consequently, sales-stock ratios vary considerably from month to month; they are high in the months of large sales and low when sales are slack. These observations, based on the statistics, agree with what retailers say and retailing textbooks teach.

The amount of staple, nonseasonal shoes to be carried in stock is, for seasonal shoes, a function of expected sales. The merchandising manuals say that adequate stocks will, on the average, represent a specified multiple of usual weekly sales. Because shoes are not bought by retailers every hour or day, the actual size of stock must vary, and a proper minimum and maximum figure will be set. The minimum figure depends on the cushion thought necessary to meet variations in the sizes and models that customers require and unexpected spurts in sales or delays in delivery, as well as on the usual time required for an order to be delivered. Thus, if for a certain line of shoes a two-week cushion is thought advisable, and it takes three weeks to get delivery, a five-week supply represents the minimum stock; replenishment is called for when stock drops to this figure. The amount ordered depends on the maximum figure, which, in turn, depends on the factors already mentioned plus the frequency with which it is practical to place new orders (or the minimum acceptable size of an order). For a fast-moving staple line, these sizing-up orders may be placed every week or two weeks, thus (continuing with our example) causing maximum stocks to be a six- to seven-week supply.

This procedure yields an implicit stock objective that is somewhere between a fixed absolute amount and a fixed ratio to sales (and is a function also of delivery periods). Which it approaches will depend on how a week's sales are estimated. If a planned and unchanged sales figure is used, planned stocks will tend to be held at a fixed level; if actual sales are the basis of the calculation, planned stock will maintain a more or less fixed ratio to expected sales. In actual practice, the sales figure probably has some stability, but may be altered whenever sales seem to establish themselves at a new level.

These instructions concerning sizing-up orders bear another interesting piece of information. We noted that a reasonable figure for minimum stocks of staple lines

stocks would then be compared with the seasonal changes in sales which the stock change presumably anticipates.

might be a five-week supply and for maximum stocks a seven-week supply, thus suggesting average stocks of about a month and a half's supply. Yet the average amount of stocks actually held are far larger than this —perhaps around three or four months' supply. These apparently inconsistent facts tell us a great deal about the character of retail shoe stocks. The slow average turnover results, in large measure, from the presence in any stock of many models that sell poorly. An actual average turnover figure is almost never a planned turnover for any given group of shoes, since its size is in important part the result of the inevitable occurrence of all sorts of unplanned and undesired divergences between what customers do and what they are expected to do.

To summarize: The intended size of stocks is determined by considering the sorts and sizes of shoes that would constitute a proper basis of customer selection month by month. The number of shoes to be carried for each model is a function of the rate at which it is expected to sell, and consequently total planned stocks must bear a broadly positive relation to expected sales, other things the same. Actually, average or incremental ratios are likely to be used in the course of the planning procedure. But it does not seem realistic to picture retailers as governing their buying, week in, week out, with a view to achieving a stipulated sales-stock ratio in the short run. Both random, and especially seasonal, variation in sales, and consequently in sales-stock ratios, are too great. A more feasible objective is the achievement of a given absolute stock stipulated in terms of each of its component lines, or a beginning-of-month stock that is roughly larger (or smaller) than that of the previous month by the amount that sales are expected to be larger (or smaller). As time proceeds, objectives may be modified on the basis of judgments on whether sales in particular categories are higher or lower than they were expected to be when stocks were planned. But such revision, since it primarily involves unexpected change in particular lines, would tend to steady incremental, rather than average, ratios. Average ratios, on the other hand, are probably used in retrospect—as a check on departmental or store achievement and as a broad test of management efficiency. Thus the rate of turnover must figure in the planning of stocks and in the review of stock performance; it is not likely to be used in correcting the difference between actual and planned stock. For this purpose, it is hard enough to keep track of short-term changes in one variable—stocks—without complicating the problem by their relation to a second variable —sales, particularly since it must be future and expected sales rather than past sales to which stocks ought to be linked.

All this results, as far as I can judge, in a tendency for stocks to move in the same direction as sales but not in the same proportion (if we abstract from buying associated with changes in market prospects). It is more likely that the incremental, rather than the average, ratio will remain approximately constant for intended stocks: stocks may need to be increased by an amount proportional to the *increase* in sales, and analogously when sales decrease.

But whatever the size that shoe retailers wish their stocks to be, two characteristics of the objective appear central to the dynamics of demand transmission: it is reasonably precise and its validation receives high management priority.

Provision for Sales and for Intended Changes in Stocks

What are the circumstances that prescribe the form that the effort to validate the stock objective takes? What is the pattern of ordering that these efforts yield? We cannot distinguish, in practice, between buying to validate stock objectives and to provide for sales. But when stock objectives are reasonably clear, and only then, a conceptual separation is meaningful; then some orders may be thought of as intended to provide for desired change in stock, some to compensate for undesired change, and some to provide for expected sales. But this is an analytic, not an operational, distinction. To study operations, we must include the whole procedure involved in buying merchandise.

RETAILERS' BUYING PROCEDURES [8]

When the new lines are first assembled and shown by shoe manufacturers, usually in November and December or early January for Easter styles, and in May or June for the fall models, retailers place "preseason" advance orders which may cover between 35 and 65 per cent of estimated sales for the next six months. (When and why they move through this range is the subject of the following chapter.) As the season progresses, "secondary" orders are placed for delivery in perhaps two months, more or less. In addition, retailers typically order some goods for "at-once" delivery; and in this case the receipt of the order may be expected within a few weeks or even less, sometimes in a few days if the shoe is carried by the "in-stock" department of a manufacturer or wholesaler,[9] or it may not be

[8] I want to remind the reader that the discussion is confined to the interwar period. During and since World War II there seem to have been changes in some of the quantitative aspects of the procedures, though, as far as I know, their basic character remains essentially the same.

[9] For small shoe retailers who do a large proportion of their business through wholesalers rather than manufacturers, an

expected for six weeks or so if it must be made to order and factories are active. These orders for immediate delivery may take care of unexpected developments, or they may simply be quite routine fill-in orders, or they may represent the slack in the "open-to-buy" [10] position intentionally left to "sweeten stocks" at the latest possible moment.

This is the picture conveyed by retailers and shoe manufacturers. Unfortunately, we cannot view it in statistics on orders, since the only ones available include orders for leather, for which seasonal patterns, though probably not cyclical ones, are notably different from those of orders for shoes. Indirectly, however, it appears in the character of the seasonal pattern of shoe production, which is far less extreme than the pattern of retail sales (the average deviation from 100 each month is ± 9.3 for production and ± 19.5 for sales).[11] Because of the reluctance of most shoe manufacturers to undertake production without a confirmed order, we must rule out the possibility that the seasonal pattern of shoe factories, damped relative to that of retail shoe stores, could be explained entirely by manufacturers' willingness to undertake production in dull months in anticipation of active months to come. Much if not most of this advance production is doubtless set in motion by retailers in the form of the longer-term orders, which makes it possible for manufacturers to smooth their production schedules.

The basic picture, then, is of a battery of orders that converge to supply the desired receipts of a given month. Desired receipts, in turn, consist of merchandise expected to be sold plus the intended increase (or minus the decrease) in stocks. Of course, both desired receipts and desired stock change may shift as the future unfolds.

Management forms and routines are required to achieve the necessary coordination of buying with desired receipts, particularly in a large store. The "merchandise budget" is a means to that end. In it, expected sales and desired change in beginning-of-month stocks are translated via the open-to-buy position into an aggregate value of merchandise that may be bought for delivery each month. The open-to-buy position is: desired receipts for a given month minus those already on hand or contracted for in confirmed orders. As orders are placed, the open-to-buy position is reduced, until the final order for immediate delivery closes it entirely. In this way the aggregate volume of orders (some placed before the season opened, some at various subsequent dates) is controlled so as to equal the desired receipts in the month on which orders converge.

But if orders must be placed several months in advance, it is obvious that a guess must be made as to what sales will be. Indeed, the sales forecast is the foundation of the merchandise budget.

SALES FORECAST

In a large store, forecasting sales and setting up the budget is likely to be a full-dress affair undertaken at least twice a year. I have mentioned these forecasts in connection with the designing of model stocks, but they form the basis of a wide variety of other plans, including the amount of money to be spent on merchandise each month.

In the fall, executives start to compute figures for the period of, perhaps, February to August or January to July; those for the second six-month period are typically undertaken in early spring. The basic starting figure is likely to be the sales for the corresponding period of the previous year or few years.[12] The figures may then be adjusted for the amount by which the store or department has been going ahead or behind. Finally, further corrections may be made on the basis of evaluations of a wide variety of special or general business conditions. In a large store, executives of many subdivisions are asked to submit estimates of what their sales are likely to be. These guesses, often oversanguine, are likely to be pared by the next higher groups to which they are submitted. The sum of the estimates will be scrutinized by top executives studying its component parts, the sales history of the entire company, and business conditions expected to influence sales and prices. The guess concerning the future will be based on a variety of sources: salesmen's reports, trade gossip, and personal contacts with manufacturers or competitors; market services and conferences with trusted advisers. Pet statistical indicators may also be scrutinized. For example, one national organization reported that sales of stores in certain industrial towns show early trends; another company, selling popular-priced men's shoes, found the trend in industrial payrolls (as revealed by a twelve-month moving average) a good prognosticator of its own sales. In small stores in which management techniques are less formalized, the guess about sales for a given month in the future may be little more than the sales of the corresponding month of the previous year, ad-

order placed with the wholesalers will often be delivered in several lots—some very rapidly, and others in a month or more, if the wholesaler has to order the shoes before shipping them.

[10] See third paragraph, below.

[11] These figures are based on indexes for 1926 to 1941. The retail index is a simple average of the index for department stores and for chain shoe stores. The production index is based on total production.

[12] If seasonal patterns are well understood, seasonally adjusted sales for the previous few months may be used to predict seasonally adjusted sales for the next few months.

justed for any known peculiarities of that month and sometimes also by the percentage amount by which sales for the past half year or so have seemed to exceed or fall short of those of the corresponding months of the previous year.

Any forecasts are likely to be in error a good part of the time. Were the forecast a mere guess on the part of each retailer, the error would tend to be randomly distributed, and we could not draw its profile for the group as a whole. But the fundamental characteristic of the procedures just described is that forecasts are not mere guesses but modified projections of past sales. Errors, therefore, will not be haphazard but linked to the pattern of sales and the type of the projection.

As far as I have been able to learn, it is the level of past sales that is projected with, in effect, some sort of seasonal adjustment. I have found no indication that the rates of change are projected over the period of the forecast. (When forecasts based on corresponding months of the previous year are corrected for change between the current month and a year ago, this projects a rate of change only up to the bridgehead of the forecast, not over its span.) Although we cannot rule out the possibility that rates of change are projected in some stores at some time, I think it is uncommon. If, then, the central bias of the forecasts is that they reflect the current level of sales, the central bias of the error of forecast will reflect the rate of change in sales.

UNINTENDED CHANGE IN STOCKS

Orders based on incorrect forecasts of sales will result in receipts of shoes that differ from actual sales plus or minus the change in stock desired at the time the order was placed. (They may even differ still more because of changed expectations and a related change in desired stock.) From what we know about stock objectives, the nature of ordering procedure, and the character of the sales forecast the pattern of unintended change in stocks may be deduced: it will reflect inversely the rate of change in sales over the recent past and perhaps also from one year to the next.

It would be desirable to test this deduction by recourse to statistics, but, of course, we have no time series on unintended change in stocks. But the size of actual stocks should be a function partly of their intended size and partly of the failure to achieve intentions. We noted earlier that stocks are probably intended, season by season, to bear a rough positive relation to the size of sales. Combining the two propositions, we arrive at a hypothesis that may be tested: The size of retailers' shoe stocks will be directly related to sales[13] and inversely related to the change in sales over recent months (and to some extent between corresponding months of the previous year).

The data to which this question can be referred are far from ideal; they are the statistics on shoe inventories of department stores, which are of poorer quality than those on sales.[14] First we correlate sales and stocks in constant prices (series 29 and 50). The straight-line equation develops the parameters, with index numbers used for stocks and sales (1939 = 100):

$$(1) \qquad \text{Stocks} = 34.4 + 0.63 \text{ sales}$$

But stocks are very poorly explained by this formula, as Chart 17 shows.

The difference between the estimated and the actual stocks is shown in Chart 18, as is the rate of change in sales over the previous five months.[15] The association between the error term and the difference series seems quite clear (only 26 per cent of the months are in unlike phase), and indicates the desirability of adding the rate of change as one of the independent variables. This addition develops the following equation:

$$(2) \qquad \text{Stocks} = 12.2 + 0.86 \text{ sales} - 0.53 \text{ sales change}$$

The second set of lines in Chart 17 shows how stock, computed according to this formula, compares with actual stock as recorded by our index. The sales-change variable has the expected negative sign. The regression coefficients for sales and change in sales are, respectively, 17.8 and 10.3 times their standard error of estimate. Estimated stocks show some tendency to lag sales (last line in Chart 17) as they should. Also, the sign and size of the parameters are consistent with a monthly sales-stock ratio that has the general subcyclical characteristics of the actual ratio—positive conformity to sales and a lead.[16] But the coefficient

---

[13] Note that the proposition as I put it does not specify the character of the relation, which could be a constant average or constant incremental ratio, or neither.

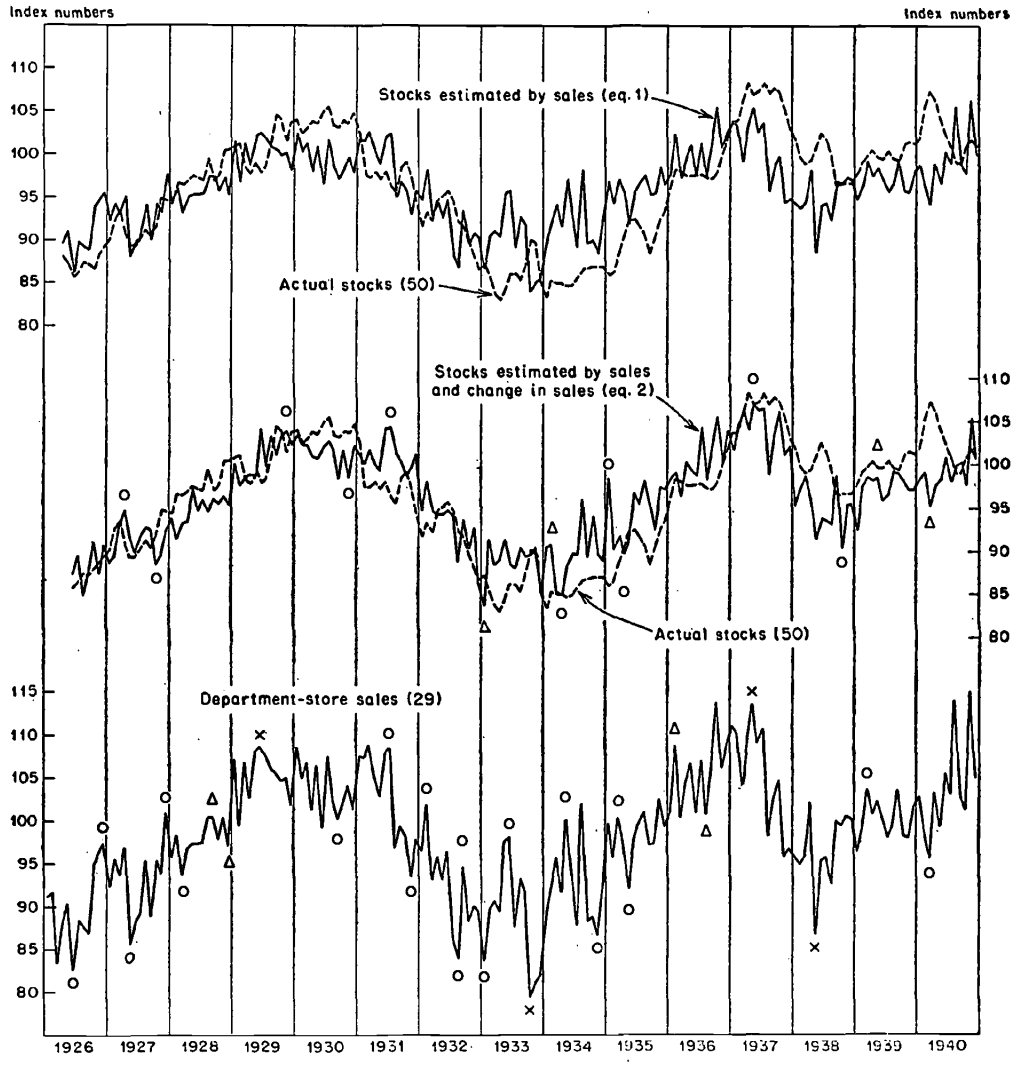
[14] Fewer stores submit information on stock. Also, price change introduces ambiguity in evaluation and hazards for deflation. And there are other problems, too. See Appendix B, series 49.

[15] The sixth previous month is subtracted from the current month. Some other set of differences, such as those discussed in the section "Pattern of the Corrective Order," might have been preferable theoretically, though there is no indication that it would have been in practice. This one was selected at the time the work was done, and the data do not warrant further refinement.

[16] The small value at the intercept and a coefficient of sales of close to 1 would tend to cause the average ratio of intended sales to stocks to be nearly constant though having some positive conformity to sales. Also, when the rate of change in sales is positive and rising, stocks, other things the same, will have a negative influence of increasing size exerted upon them and thus tend to turn over ever more rapidly. Since the positive rate at which sales rise often reaches a maximum several months before the turn, this point would also be that of the highest stock turn, other things the same. These statements may be transposed to apply to contractions.

CHART 17

Shoe Stocks of Department Stores Estimated by Two Equations, 1926–1940



Specific-cycle turns are marked by ×, specific-subcycle turns by O, and retardations by △.
Index numbers (1939 = 100) are for dollar values adjusted for change in shoe prices. Stocks are stated at retail prices.

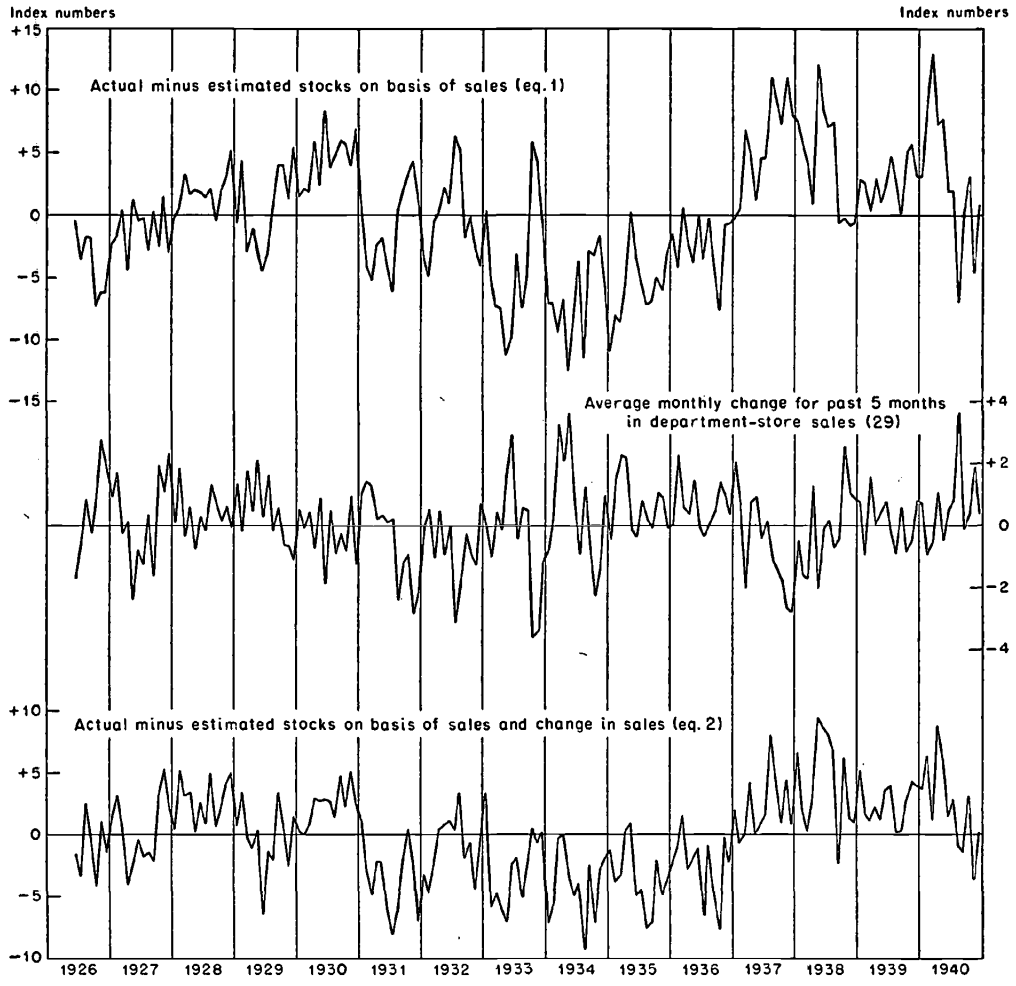
of multiple correlation is .801—not high. The calculation fails in several instances to reproduce the level of the actual stock series correctly and the full extent of its lag relative to sales. In general, the errors of estimate, shown in the last line on Chart 18, are substantial and do not appear randomly distributed. By comparing them with various other time series, I have tried to spot variables whose inclusion might improve the explanation, but the results were negative.[17]

But in spite of the marked deficiencies of the estimates, it may be worthwhile to look for a moment at the implications of the coefficients. I do this more as an exercise than as a sound deduction. For when the inaccuracies in the data are considered in conjunction with the inapplicability of much of probability theory to monthly observations of cumulative data like stocks, estimates of reliability seem of little value. Therefore I use the central values only, as expressed in the coefficients in equation 2, to judge the implication of the

[17] I looked especially to see whether a different system of forecasting sales, and consequently a different pattern of errors, might benefit the calculation, but results were negative. Visual comparison and tests of the number of months in unlike phase suggested that no improvement would result. Another possibility rejected by the data is that the stable sales-stock relationship held not between current stocks and sales, but between current stocks and sales at the earlier date when demand has been forecast and advance orders placed. I looked also for the presence of speculative factors in the unexplained residuals, but here again no systematic picture emerged.

CHART 18

Actual minus Estimated Department-Store Shoe Stocks for Two Regression Equations, 1926–1940



See the text for a description of the estimating equations and the note to Chart 17 for a description of the index numbers.

calculated parameters, could they be accredited. First and foremost, we find the association of stocks with sales positive, and with recent changes in sales negative, and this accords with our analysis of intended and unintended aspects of the control of retailers' shoe stocks. Next, we wish to judge the meaning of the coefficient of sales, which presumably reflects intentions. Implicit in the selection of the straight-line equation is a constant incremental intended sales-stock ratio expressed in the coefficient; but the size of the ratio (the coefficient of sales) is yielded by the line-fitting process. Since both the sales and stock data were index numbers with an average value of 100 for the period, a coefficient of 1 would have meant that the incremental relationship and average relationship were equal. (Had they been equal, the constant term would have been zero.) The fact that the coefficient was only a little less than 1 we interpret as meaning that intended stock change was consistent with an average sales-stock ratio not much lower than the incremental ratio.[18] Further, due to the small constant term, the average ratio was not much lower at low than at high levels of sales.[19] This provides an interesting and not

[18] Remember, however, that the relationship would reflect changes in stocks associated with shifting market prospects, which would tend to amplify the positive association of stocks and sales.

[19] On the average, shoe stocks of large department stores in 1939, as reported by the Controllers' Congress, were 4.80 times monthly sales. The coefficient of sales in the multiple-regression equation converted to the proper absolute relationship to stocks is 4.13. Ignoring the sales-change term, which would be close to zero for the series as a whole, total stocks would be 4.86 times sales in the month when sales were smallest (October

unreasonable contrast to seasonal patterns in the association of sales and stocks, for which the incremental ratio seemed far larger than the average.[20] Finally, it would be interesting to learn the importance of unintended change in stock (the change in the sales parameter). The calculation suggests that the sales-stock ratio would vary more as a result of unintended than of intended stock change.[21]

I conclude that these data are at least consistent with the thought that unintended inventory change in the stocks of shoe retailers tends to be inversely associated with the rate at which consumer buying is changing, and that the matter is of quantitative importance.

Correction or Prevention of Unintended Change in Stock

If the proper size of stock is clearly defined, and if retailers deem it important to see that stock achieves the correct figure, then unintended change in stock is likely to be prevented or corrected. How?

ADJUSTMENT OF SELLING PRICE

One way to bring the amount of stock in line with a specific objective is to mark down selling prices if stocks are too high and to mark them up if they are too low. Note, however, that I speak here not of the general question of flexibility of prices—the extent to which they are raised or lowered in line with changing costs or consumers' ability to pay, or both—but merely of the use of markdowns or markups as a method for correcting unintended change in inventories.

First, with respect to reduction in selling price: Certainly, seasonal models that have sold badly are closed out in markdown sales when the time for clearance comes around, a time competitors attempt to formalize as much as possible. This is also true of models that are not being reordered, and in which sizes have been decimated. There will be very considerably more of such shoes when there has been an unexpected turn for the worse than at other times. But for shoes that are still considered part of the regular line, frequent stimulation of sales through markdowns is not practical. To change price tags on regular lines is awkward, time-consuming, even embarrassing since suppliers may object. It is, therefore, unsuitable as a means to correct rapidly and frequently for failure to maintain a model stock at the intended level. A glint of evidence on this score, other than what retailers say of their problems and procedures, may be found in figures on markdowns of shoe departments of department stores collected by the Controllers' Congress of the National Retail Dry Goods Association. The average annual figure for these markdowns as a percentage of sales, 1928–1941, varied between about 7.5 (1928) and 12 (1932) per cent of sales.[22] In 1931 the figure was also very high—about 11.5 per cent—yet in the NRDGA *Merchandise Manual* covering 1931, it is said that 95 per cent of the sales forecasts had been too optimistic in that year. Most stores had prophesied an increase in sales whereas sizable decreases were the rule. Obviously, the larger than usual markdowns can have provided only a small part of the correction required to return stocks to the appropriate figure.

Second, with respect to increases in prices: When sales have been unexpectedly good, to raise price tags with some temporary objective in mind would be a most unorthodox retailing procedure. Retail prices are usually set by the application of a given markup to manufacturers' prices. The average markup to be achieved in a given department or for a given class of shoes is fairly well standardized, though it may vary somewhat from model to model. Retailers typically do not even depart from this procedure when, because of an especially advantageous purchase, the application of the usual margin yields lower selling prices than those of most competitors. Certainly it would be most unorthodox to price an article at a figure temporarily higher than the price that would be charged after the temporary dearth of merchandise had righted itself; such a notion would appear comical to most retailers.

In general, then, though revision of selling prices plays some part in reversing undesired change in stock, especially increases, in the short run, its role is a minor one in retail shoe stores. This fact is fundamental. Wherever selling price rather than revision of buying schedules is the primary short-term adjusting mechanism used by the individual company, it is demand which is adjusted to supply rather than, as when buy-

1933) and 4.64 times sales in the month when sales were at their maximum (November 1940). Converted to annual stock-turnover ratios, the figures for low and high months, respectively, are 2.47 and 2.59; and it seems likely that ratios that varied between 2.5 and 2.6 would be regarded as virtually constant by retailers.

[20] See Table 31 and the discussion of it.

[21] Following the line of calculation used in note 19, above, we can hold sales constant at the average for the series. Then at the extreme sales-change figures of +12.62 in March 1934 and −12.58 in August 1933, stocks would range from 4.25 to 5.19 times monthly sales. This gives an annual turnover of 2.82 and 2.31, respectively. If instead of the all-time highs and lows we take the average peak or trough standing for the specific subcycles in sales change, the stock-sales ratio at peaks (sales change averaging +7.80) would be 4.43 and at troughs (sales change averaging −6.49), 4.96; these figures correspond to annual turnover ratios of 2.71 and 2.42. This implies that, according to the equation, the influence of sales change in causing fluctuation in the sales-stock ratio is likely to be greater, especially during the shorter fluctuations, than the influence of sales.

[22] The figures I give are simple averages of median or typical figures for each of five store size-groups of men's and women's shoe departments, weighted 40 and 60, respectively.

ing schedules are changed, supply which is adjusted to demand. Obviously, the effect on suppliers is bound to be quite different.

ADJUSTMENT OF NEW ORDERS

In a retail shoe store, the usual first-line remedy for incorrect forecasts that result in errors in buying is the adjustment of new orders—typically orders for short-term delivery. That adjustments will be made is implicit in all that has been said about the importance of having the proper selection and quantity of shoes on hand. The very structure of orders—the use of a battery that requires advance commitments to provide desired goods for the seasonal peaks but retains some leeway to adjust to unfolding circumstance—attests to its use to prevent, as well as to correct, disadvantageous change in stocks.

The correction may occur as the result of management signals that flash red or green before stocks have had a chance to be affected and thus forestall unintended change in stocks. In large stores, we noted earlier, the semiannual merchandise budget is set up, and the desired receipts of merchandise each month are formulated on the basis of expected sales and desired change in stock. At any given time, buyers are open-to-buy total budgeted receipts minus goods already on order, and they do so in sequential orders of shortening term as the month approaches. But in many stores the open-to-buy position does not stand indefinitely as originally budgeted but is corrected for the difference between planned and actual sales in the previous month and planned and actual beginning-of-month stocks.[23] This formalizes the impact on short-term buying of the difference between plans and actuality. Sometimes the semiannual forecasts themselves may be corrected and with them the initial open-to-buy figure.[24]

In stores where a semiannual estimate of sales is not used as a direct guide to buying, the adjustment can take place without much specific attention as the target date approaches. Thus a retailer places *secondary orders,* say for Easter shoes, in January or February on the basis of a much closer guess of what sales will be than he was able to make when pre-season orders were placed in November or December. The same remark applies in more extreme form when orders for immediate delivery are placed later still. Each successive guess about Easter requirements will probably follow the pattern of the longer guesses, which is likely to be primarily a projection of sales of the recent past. But if earlier orders proved heavy, at-once orders will shrink; if earlier orders proved light, at-once orders will swell.

In stores, large or small, the correction can be based directly on the size of unintended change in stock as revealed by unit stock-control systems or over-all sales-stock ratios. Finally, the clerk-executed fill-in order automatically keeps stocks in line with plans by postponing new orders until stocks have actually reached the planned reorder point.

In one way or another, then, corrections of new orders tend to keep receipts in line with actual sales and thus to keep stocks constant (except for their seasonal patterns). Were stocks intended to vary somewhat with the level of sales, corrections would increase but not change their sign, since desired receipts would include changes in stocks intended to cause stocks to rise or fall with expected sales.

PATTERN OF THE CORRECTIVE ORDER

We have learned that by and large in retail shoe stores, a substantial fraction of the shoes to be sold need to be ordered well ahead of time. Moreover, stock objectives are sufficiently concise and firmly held so that divergence from them tends to be prevented, or corrected after it has occurred. The cascaded character of orders furthers this purpose, which is pursued primarily by adjusting orders rather than selling prices. We have learned further that forecasts of sales tend to have a systematic bias that may be stated in terms of a relationship to sales of the recent past.

These several findings imply that by making more specific assumptions about the actual stock-size objective and the way in which past sales are projected as forecasts of the future, we can construct a model in which errors in buying—and, consequently, their corrections—may be stated in terms of retail sales and their rate of change. I think it will be most useful to confine our model to buying linked not to rigid six-month forecasts embodied in a merchandise budget, but rather to running forecasts and orders. These orders would have a seasonal pattern, both in the aggregate and in their distribution among orders of various terms, but for analytic purposes the seasonal pattern may be ignored. This less formalized procedure forms at least one aspect of the buying in stores that have elaborate semiannual sales and buying budgets, and is the major buying procedure in stores that do not. It is thus probably the prototype, containing the elements of the more formal methods. I start with a set of rigid assumptions (other variants are discussed in passing) and examine their implications. Later we

[23] This is the difference between plans and actual stock at the latest moment possible.

[24] Executives of retail stores have said that such revision may be made within several weeks or several months if the divergence between expectations and actuality cannot be explained in terms of weather, special promotions, etc. When early buying has been based simply on the volume of sales during the same months of the previous year, revisions in the light of current experience are expected.

shall relax some of them to see how the deductions change. The first set of assumptions follows:

1. Stocks are intended to remain at a fixed figure.
2. Past sales are projected horizontally (the level is projected but not a rate of change).
3. The sales of only a single month are projected (a highly rigid assumption).
4. Once an order is placed on the basis of a forecast, no revisions are made until the anticipated month actually comes around.
5. Buyers believe that market prospects are stable. More specifically, the proportion of an expected season's sales for which orders of specified term are originally placed does not change from month to month (the advance order ratio remains invariant).

Orders are placed, say, in December, on the basis of current sales (after an allowance for seasonal patterns), S_{-3}, for expected Easter (in March) sales, S_0. When March comes around, actual sales will have differed from receipts by $S_{-3} - S_0$, and this will be the amount of unintended stock change. Orders to restore stocks to their planned level will be the same, with signs reversed, $S_0 - S_{-3}$.

If, on the other hand, retailers have no clear notion of seasonal patterns, they may use sales of the previous March (S_{-12}) for the forecast, correcting the figure perhaps by the amount by which sales in the current month are running ahead of the corresponding month of the previous year. If comparisons are made on a ratio rather than a difference basis, then $100(S_{-3}/S_{-15}) - 100$ would be the per cent by which sales are going ahead. Forecast sales for March would be $S_{-12}(S_{-3}/S_{-15})$, the error $S_{-12}(S_{-3}/S_{-15}) - S_0$, and orders to correct the errors $S_0 - S_{-12}(S_{-3}/S_{-15})$; this expression may be rewritten $S_0 - S_{-3}(S_{-12}/S_{-15})$ to highlight its relation to the comparable one, in which forecasts are based simply on seasonally adjusted sales in the month when the advance orders are placed. The difference between the two is this: the error now has an inverse relationship to the amount (in ratio form) that sales changed during those months of the previous year which constitute the span of the forecast this year.

What has been said applies to an order three months ahead, but we could simply repeat each statement for orders of shorter term after appropriate alteration of the month when forecasts are made. We assume that retailers will typically make as short a guess as they can and thus, whether formally or informally, revise their sales estimates on the basis of all the available information. Thus it seems reasonable to assume that secondary orders, placed perhaps in January for Easter sales, will use January as the jumping-off spot for the March forecasts. The same may be said for the last-minute orders placed, say, in February. Were we to assume that one-third of expected sales in March are placed at each of the three times (December, January, and February), then the total orders to correct for errors in forecasts would be a simple average of change in sales over the previous three months, two months, and one month, that is:

$$\text{(Ia)} \quad \tfrac{1}{3}(S_0 - S_{-3}) + \tfrac{1}{3}(S_0 - S_{-2}) + \tfrac{1}{3}(S_0 - S_{-1})$$

Had forecasts been based on the corresponding month of the previous year, the formula would be:

$$\text{(Ib)} \quad \tfrac{1}{3}\left(S_0 - S_{-3}\frac{S_{-12}}{S_{-15}}\right) + \tfrac{1}{3}\left(S_0 - S_{-2}\frac{S_{-12}}{S_{-14}}\right) + \tfrac{1}{3}\left(S_0 - S_{-1}\frac{S_{-12}}{S_{-13}}\right)$$

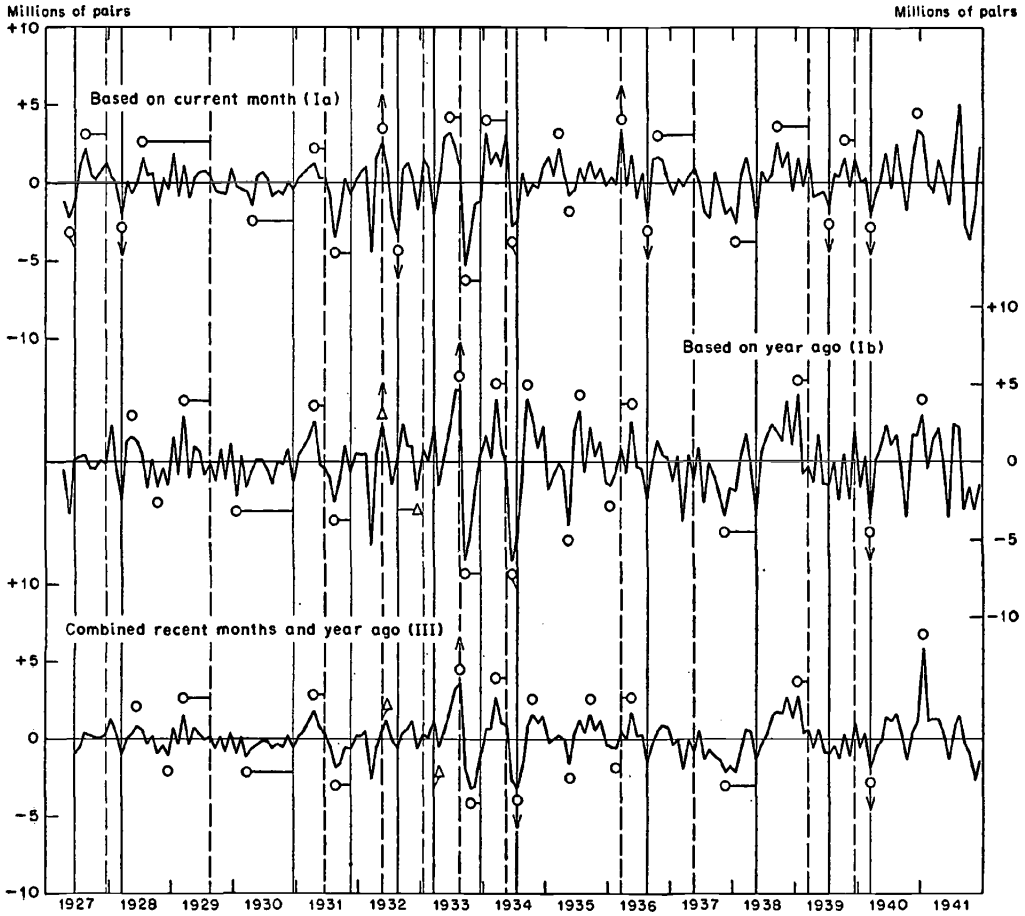
The pattern of corrective orders of this sort depends on the pattern of sales. Toward the close of Chapter 5 we concluded that subcycles in sales may well retard before peaks or troughs are reached (first differences in sales lead sales proper). But we could not be sure; first differences in shoe sales were so erratic that they needed to be smoothed in order to be studied, and the smoothing could produce the observed lead (though there was reason to believe that it did not). But here the smoothing, by aggregating monthly first differences of varying term as they are actually observed, is part and parcel of the process to be described. To see what corrective orders would look like, we simply have to compute them. The calculations are based on our measures of monthly retail shoe sales in pairs (series 33).

Chart 19 shows the result of using formulas Ia and Ib, where their association with retail sales may be judged by reference to the vertical grid. Table 34 measures the association with retail sales and some other activities. Both hypothetical order series tend to lead retail sales, often by considerable intervals. The average timing for matched turns is a lead of around two months. But the conformity is poor, especially for the corrective orders based on the previous year. (Note the small number of matched turns and large percentage of months in opposite phase.) The series have a short average lead (the second and third sections of the table indicate) relative to either wholesale sales or the Associated Industries of Massachusetts (AIM) shoe and leather orders series.

The assumptions underlying these calculations of the error of forecast and consequent correction fail to take account of several aspects of the ordering procedure. We noted earlier that errors of forecast made when long-term orders were placed might be corrected with each order of shorter term rather than

CHART 19

Hypothetical Corrective Orders under Three Assumptions about the Sales Forecast, 1927–1941



Specific-subcycle peaks and troughs (broken and solid vertical lines) in *shoe sales* (series 33 in Appendix B), used as reference frame. For other series, specific-subcycle turns are marked by O and retardations by △. When a specific turn is matched with a turn used as reference turn, a horizontal line or vertical arrow indicates the association.
See the text for a description of Ib and IIa; III is a simple average of equations Ib, IIa, and IIb.

permitted first to result in unintended change in stocks and then corrected, as our model assumes. If this is the case, the importance of cumulated first differences in sales of longer term would be reduced relative to those of shorter term. Corrections in any month would now involve only differences between the current and the previous month, the rest of the error in previous orders still outstanding having been corrected month by month. In consequence, a formula involving piecemeal correction would differ from formula Ia by the omission of the weighted sum of second differences between the previous and each earlier month.[25] Actual procedure would probably usually fall somewhere between the two schemes.

Another clearly unrealistic aspect of the models is the gearing of both anticipations and corrections to a rigid single-month criterion; forecasts are not projections of sales of a single month, but rather of several months of the recent past. Similarly, a decision to correct for differences between receipts and sales is not likely to rest on discrepancies for a single month, but rather on some sort of cumulation of these for several months past. By using three months instead of one in connection, say, with formula Ia, the new picture of orders to correct for incorrect forecasts is, in effect, an average of formula Ia over the past three months. This remark applies only approximately when,

[25] The weights diminish by one with each earlier month and start at a weight of the number of months in the longest order term minus one.

as in Ib, sales of the previous year are the basis of the estimates. These series were constructed.

(IIa)

$$\tfrac{1}{3}(S_{-2} + 2S_{-1} + 3S_0) - \tfrac{1}{3}(S_{-5} + 2S_{-4} + 3S_{-3})$$

(IIb)

$$(S_{-2} + S_{-1} + S_0) - \tfrac{1}{3}\left(S_{-5}\frac{S_{-14}}{S_{-17}} + S_{-4}\frac{S_{-14} + S_{-13}}{S_{-16}} + S_{-3}\frac{S_{-12} + S_{-13} + S_{-14}}{S_{-15}} + S_{-2}\frac{S_{-12} + S_{-13}}{S_{-14}} + S_{-1}\frac{S_{-12}}{S_{-13}}\right)$$

Timing comparisons for the resultant estimates are given in Table 34. The average net lead for both of the two series is a little short of two months—a little weaker than for the previous calculations.

In an effort to consolidate these several pictures of underlying tendency for corrective orders of various shoe retailers, a composite series was constructed and is portrayed in Chart 19. Its formula is numbered III and consists of a simple average of Ib, IIb, and IIa. Double weight is thus given to estimates rooted in the corresponding month of the previous year, because it is my impression that most retailers do not readily make the allowances for usual monthly seasonal patterns necessary to the other type of estimate. Although most of the time there is not too much difference between the estimates resulting from the two methods, the previous-year method will emphasize fluctuation when, as in late 1938, change in the corresponding period of the previous year was strongly in the opposite direction. The contrary is the case, when, as in late 1939, sales had been changing in the same direction in the previous year. Table 34 shows that this presentation of composite corrective orders for the trade as a whole (III) displays, like its components, some tendency to lead turns in retail sales, shoe production, and the reference scheme. For none of these computations is the number of months in unlike phase inter-

TABLE 34

Timing Comparisons: Subcycles in Hypothetical Stable Market Orders Compared with Selected Data, 1927–1940

EQUATION [a]	HYPOTHETICAL ORDER SERIES	NUMBER OF TURNS					TIMING (*months*)			MONTHS IN UNLIKE PHASE AS % OF ALL MONTHS [b] *Timing That Maximizes Correspondence*	
			Matched Turns [c]								
		All Turns (1)	*Total* (2)	*Leading* (3)	*Lagging* (4)	*Synchronous* (5)	*Mean Lead (−) or Lag (+)* (6)	*Average Deviation* (7)	*Mean of Central 3 or 4 Turns* (8)	*Lead (−) or Lag (+) (months)* (9)	(%) (10)
		1. REFERENCE FRAME: RETAIL SALES, PAIRS (23 TURNS) [d]									
	Corrective orders based on sales of:										
Ia	Current month	23	20	13	0	7	−2.9	2.8	−2.3	−2	33
Ib	Year ago	20	14	9	2	3	−2.1	2.7	−1.8	−2	45
IIa	Recent three months	23	21	11	6	4	−1.7	2.6	−0.7	−1	35
IIb	Three months a year ago	20	14	9	3	2	−1.8	2.1	−1.5	−2	44
III	Combined, recent months and year ago	20	14	8	3	3	−1.9	2.2	−1.5	−2 or −1	43
	Total stable-market orders:										
IV	Assuming constant stock objective	22	20	7	3	10	−0.7	1.9	0	0	25
V	Assuming incremental stock-sales ratio of 2	24	19	8	3	8	−1.2	1.8	0	0	30
		2. REFERENCE FRAME: WHOLESALE SALES, PAIRS (21 TURNS) [d]									
	Corrective orders based on sales of:										
Ia	Current month	23	13	7	4	2	−1.2	2.2	−0.7	−1	40
Ib	Year ago	20	15	8	3	4	−1.9	2.5	−0.7	−1	40
III	Combined, recent months and year ago	20	16	8	6	2	−1.3	2.5	−0.5	0	43
	Total stable-market orders:										
IV	Assuming constant stock objective	22	17	6	10	1	+0.5	2.0	+0.8	+1	32
V	Assuming incremental stock-sales ratio of 2	24	16	6	9	1	+0.1	1.9	+0.8	+1	35

(continued on next page)

TABLE 34 (continued)

EQUATION [a]	HYPOTHETICAL ORDER SERIES	NUMBER OF TURNS: All Turns (1)	Matched Turns [c]: Total (2)	Leading (3)	Lagging (4)	Synchronous (5)	TIMING (months): Mean Lead (−) or Lag (+) (6)	Average Deviation (7)	Mean of Central 3 or 4 Turns (8)	MONTHS IN UNLIKE PHASE AS % OF ALL MONTHS [b] Timing That Maximizes Correspondence: Lead (−) or Lag (+) (months) (9)	(%) (10)
	3. REFERENCE FRAME: SHOE AND LEATHER ORDERS (23 TURNS) [d]										
	Corrective orders based on sales of:										
Ia	Current month	23	18	11	6	1	−1.3	2.4	−1.0	−1	39
Ib	Year ago	20	20	13	7	0	−1.9	2.6	−1.8	−2	41
III	Combined, recent months and year ago	20	20	10	8	2	−1.2	2.8	−0.3	0	44
	Total stable-market orders:										
IV	Assuming constant stock objective	22	18	7	8	3	+0.4	2.8	+0.2	0	38
V	Assuming incremental stock-sales ratio of 2	24	22	8	11	3	+0.6	2.7	+0.5	0	40
	4. REFERENCE FRAME: SHOE PRODUCTION, PAIRS (24 TURNS) [d]										
	Corrective orders based on sales of:										
III	Combined, recent months and year ago	20	16	10	5	1	−1.1	2.5	−1.5	−2	41
	Total stable-market orders:										
IV	Assuming constant stock objective	22	19	9	9	1	−0.4	2.0	−0.8	0	30
V	Assuming incremental stock-sales ratio of 2	24	19	10	9	0	−0.5	2.1	−0.3	−1	34
	5. REFERENCE FRAME: SLH-SUBCYCLE REFERENCE CHRONOLOGY (21 TURNS) [d]										
	Corrective orders based on sales of:										
III	Combined, recent months and year ago	20	14	10	3	1	−1.9	2.1	−1.8	−2	44
	Total stable-market orders:										
IV	Assuming constant stock objective	22	18	10	5	3	−1.1	1.8	−0.8	−1	32
V	Assuming incremental stock-sales ratio of 2	24	18	11	4	3	−1.3	1.8	−1.0	−1	35

[a] For an explanation of the equations numbered I and II, see the text of this chapter. Equation III is a simple average of Ib, IIa and IIb. Equation IV is total monthly sales plus III; V is sales plus 3 times III (see also Appendix A, sec. I).

[b] See Appendix A, sec. 14.

[c] See Appendix A, secs. 10a, b, c, and d.

[d] The first four reference frames are series 33, 35, 38, and 40A in Appendix B. For a description of the SLH-subcycle reference-chronology, see Appendix A, sec. 8.

estingly low, nor does the logic suggest that it should be.

This series, too, is certainly a wooden caricature of the central tendency of correction that retailers make in their efforts to enforce their inventory objectives. We have assumed that retailers always make immediate corrections, and often they are doubtless pretty lax about it—lax, perhaps, about correcting for overbuying when they are optimistic and for underbuying when they are pessimistic. We have assumed, further, that corrections are achieved by adjusting orders, and sometimes prices bear at least part of the burden; I would expect this to be true of overbuying, especially, when wholesale prices have fallen. These factors would cause the time pattern generated by the strict assumptions of our model to be biased at certain particular times or to be too sharp to describe even the central tendency of reality, which ought to be represented by a fuzzy band.

The assumption that we made as to the nature of

the forecast is the one I consider most realistic; however, others are permissible and their effect on the model can be analyzed. This could be done, for example, for formal systems of six-month forecasts of the sort that some stores employ. But since merchandise budgets typically introduce schemes for adjusting for the difference between actual and expected sales, this method would principally affect our model in relation to the preseason order.

Forecasts also have been assumed to incorporate a rate of change in sales, as well as their current level.[26] I have found no evidence that this is done except when, as in our model, sales of a previous year are adjusted for recent change. It seems likely that, at most, the actual projection of a rate of change may occur at times when the whole industry is very conscious of strong change in a given direction. Thus, say, in a time of general optimism, the projection of December sales to ascertain Easter requirements, instead of lying along a horizontal line (positing no change) may lie on an upward-tilting line, the slope of which represents the rate of change over recent months. In this case, if the same slope is adhered to until Easter, then the corrections will be larger than those subsumed in our original model when sales have not risen but fallen; they will be of opposite sign when they have risen but by less than the rate assumed; and they will be smaller but of like sign when they have risen by more than the assumed rate. We would simply need to adjust our calculations for given monthly increments of change. If, however, the projected rates of change shift from month to month, depending on actual experience, weighted cumulations of graduated duration of second differences will enter the pattern of correction, but this, I expect, is most unlikely.

Finally, our assumption of the invariant size objective of retailers' stocks was arbitrary. If merchants aim to have stocks change in the same direction as sales, the amplitude of fluctuation of the corrective factor will increase. For then orders based on anticipation of sales must not only provide for sales, but provide also for a parallel increase or decrease in stock. Errors in guessing future sales will be magnified by the errors in guessing the amount by which stocks ought to change; corrections to bring stocks in line with intentions must reverse both errors. The larger the ratio of stocks to sales, or of increments in stocks to increments in sales, the larger the corrections must be, other things the same. Thus if stocks are expected to change as much as sales (an incremental monthly stock-sales ratio of one), the corrective factor as calculated here should be multiplied by two. If a constant ratio of total stocks to monthly sales is intended, the incremental stock-sales ratio will have to be the same as the average one of, say, around three. This would mean that our calculations would have to be multiplied by four.

This matter of amplitude of fluctuation of the corrective order is interesting mainly in connection with the forms in which corrective orders are actually experienced. Conceptually, they may exist in the pure state; actually, they exist in some sort of dilution. The imprint of their characteristic subcyclical amplitude or lead depends on how large a part they play in total orders of the trade as a whole or in orders received by various groups of sellers.

Hypothetical Stable Market Orders

It seems probable that the corrective order plays a far larger part in the sales of some companies or departments than of others. We know that one of the characteristics of the corrective order is its short delivery term and that most shoe wholesalers and the in-stock departments of shoe manufacturers specialize in rapid deliveries. Consequently, for these firms total sales or orders may well be imprinted with the lead of the corrective order. Several shoe manufacturers have said that changes in sales of their in-stock departments presage changes in total demand, and the sales of wholesalers are watched by the trade. Insofar as manufacturers receive these early signals from one another their importance is greater than the proportion they constitute of aggregate orders for shoes. Their role in demand transmission may be further magnified by changes in production schedules and in leather buying based on them.

Nevertheless, the proportion that corrective orders constitute of the industry-wide total of all orders for shoes is also important, and it will be heavily influenced by what the stock size objective actually is. The character of the relationship has been discussed; how it may operate is illustrated by two hypothetical total stable market orders series calculated on the basis of two alternative assumptions as to distributors' size objectives concerning stock. The first, IV, assumes that stocks are intended to remain invariant (an incremental stock-sales ratio of zero), and the second, V, that the incremental stock-sales ratio is two—consider-

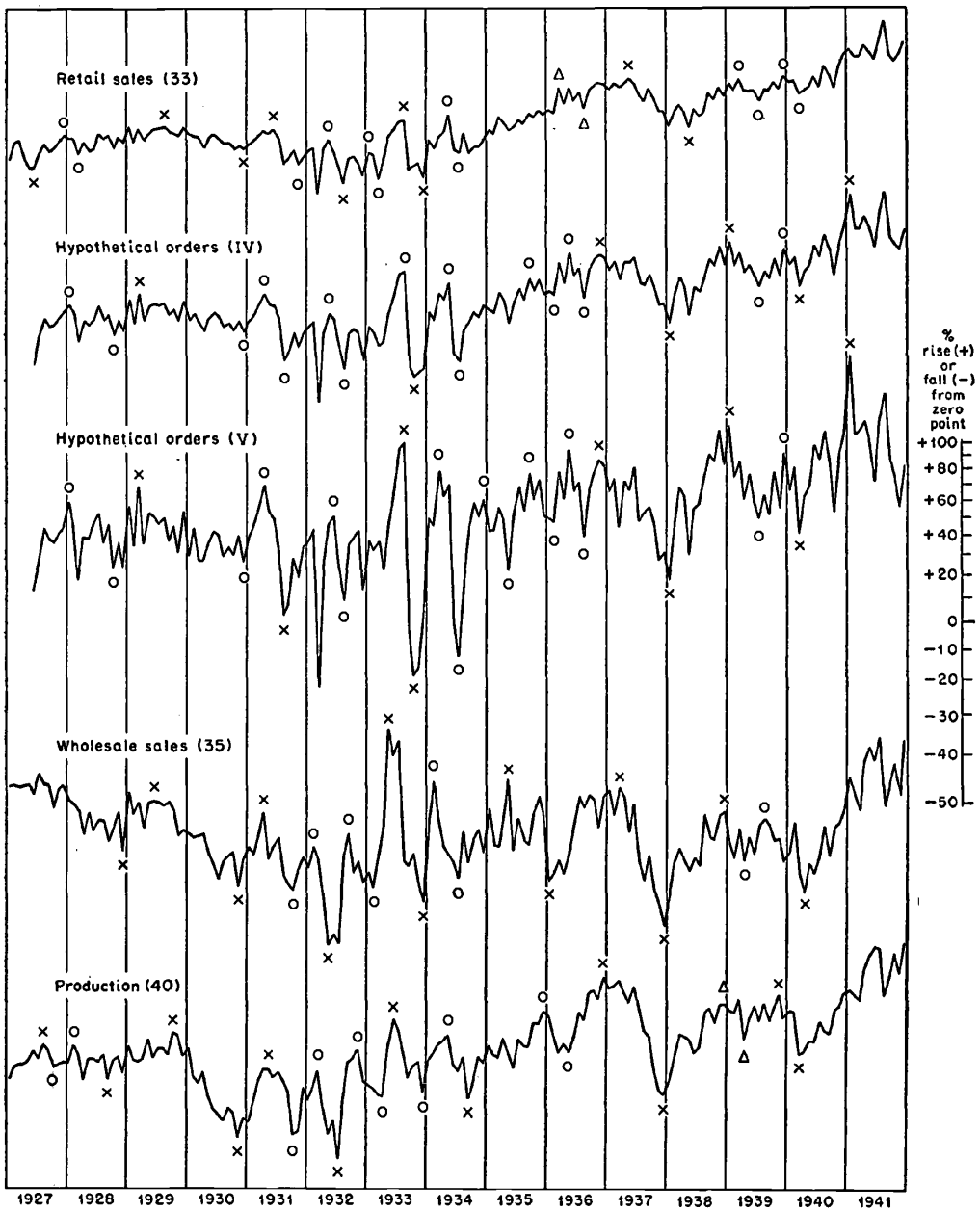
[26] Lloyd Metzler uses a factor of this sort in his "coefficient of expectations" in "Factors Governing the Length of Inventory Cycles," *Review of Economic Statistics*, February 1947. It also enters as a possible factor in construction cycles in the discussion by Arthur F. Burns, "Long Cycles in Residential Construction" in *Economic Essays in Honor of Wesley Clair Mitchell*, Columbia University Press, 1935, p. 88, reprinted in Burns, *The Frontiers of Economic Knowledge*, Princeton University Press for National Bureau of Economic Research, 1954.

ably lower than would be necessary to keep the average stock-sales ratio constant. Regular orders—those aiming to provide for expected sales and desired change in stocks—are assumed to be identical to current sales at the time they are placed. Consequently, the best estimate of corrective orders (formula III) is added to current sales for the first estimate (IV) and the same series is multiplied by three for the second one (V). The data are exhibited in Chart 20 along with several series with which it may be interesting to compare them.

The chart shows how the relatively temperate activ-

CHART 20

Hypothetical Total Stable Market Orders under Two Assumptions about Future Sales Compared with Retailers' Sales and Buying, Pairs, 1927–1941



Specific-cycle turns are marked by ×, specific-subcycle turns by O, and retardations by △.
Hypothetical orders IV assumes a constant stock-sales ratio: sales plus corrective orders III. Hypothetical orders V assumes a stock-sales ratio of 2: sales plus 3 times corrective orders III.

ity of retail sales can, by the judicious pursuit of sensible and conservative business policy, acquire the excited look of an order series. In addition to this greater subcyclical amplitude, the constructs appear to have a slight tendency to lead sales. Both the chart and Table 34 show that the hypothetical order series often turn at the same time as retail sales; however they lead over twice as often as they lag. The leads are clear, Chart 20 indicates (with the exception of one turn for series IV), at all four of the major turns.

The hypothetical series project (under stable market conditions) the implications of objectives and procedures of retailers' purchasing which we believe to be typical. One would wish to test this construction with the aid of some independent set of observations. But not only do we have no information about retailers' ordering under stable market conditions; we have no reliable information about ordering at all. Nevertheless, realizing both the conceptual and statistical improprieties, it is interesting to compare the two series of hypothetical stable market orders with the two stand-ins for orders that have been used before.

We have already noted how Chart 20 indicates that the arithmetic transpositions of retail sales implied by the calculations have carried the construct in the direction of the independent statistics of orders. Table 34 shows that both hypothetical order series are approximately synchronous, on the average, with wholesale sales and with shoe and leather orders. However, the percentage of months in different phase is not small. But from Chart 20, one gains the impression that the measures miss quite a bit of the resemblances between the construct and wholesale sales or even the AIM shoe and leather orders.

The usual measures of subcyclical and selected cycle amplitudes are given in Table 35. They may help to indicate which of the two series embodies the most realistic assumption about the stock objective, since the character of the assumption has a strong influence on the amplitude of fluctuation of the series. We see there what the charts have already taught: both of the hypothetical order series have a notably higher amplitude than retail sales. Wholesale sales, on the other hand, the only data that can be used as an independent representation of orders in this context,[27] fall between the two series. Because the inclusion of shifts in market position would add still further to the subcyclical amplitude of shoe orders, I read these figures as suggesting that the incremental stock-sales ratio of two is high; a ratio of one seems more realistic. This is the ratio suggested by the seasonal figures. It would yield a subcyclical amplitude for hypothetical orders falling between the two as computed; it would be greater than for retail sales (and greater by a larger amount per month for subcycles than for major cycles), less than for wholesale sales, and about the same as for shoe production (for which some smoothing of the pattern of ordering is always achieved).

TABLE 35

Amplitude of Fluctuation in Shoe Retailers' Hypothetical Stable Market Orders and in Related Activities, 1926–1940

SHOE SERIES IN PAIRS	SPECIFIC AMPLITUDE PER MONTH [a]		
	Subcycles	*Selected Cycles* [b]	*Ratio of Cycle to Subcycle*
Orders assuming constant stock objective (IV)	2.07	1.11	0.53
Orders assuming an incremental stock-sales ratio of two (V)	4.29	1.70	0.40
Retail sales (33)	1.28	0.64	0.50
Wholesale sales (35)	3.75	1.48	0.39
Production (39)	2.69	1.33	0.49

[a] Each fall from peak to trough is added to each rise from trough to peak, the sum for all phases is divided by the number of months covered, and expressed as a percentage of the average value of the series (see Appendix A, sec. 16). The period covered is never longer than January 1926 to December 1940, but may be shorter, depending on when the initial trough and terminal peak is selected.

[b] Amplitudes for specific cycles that are defined by those specific-*cycle* turns associated with SLH-*cycle* reference turns. An incomplete initial expansion and a terminal one are included; for these phases, the bounding initial and terminal turns, respectively, are selected as that specific-*subcycle* trough not earlier than January 1926 or peak not later than December 1940 that maximizes the total amplitude of each of these two incomplete cycle phases.

The average amplitudes for all fluctuations hide an interesting fact: The relationship between our hypothetical stable market order series and wholesale sales is different for various movements common to both series. The eye can pick up some of these differences in Chart 20. Note, for example, the steeper fall in wholesale sales in late 1929 and 1930, or the sharper rise as 1936 ran its course, or the heavier drop toward the close of the following year. To explain these episodes, we must abandon the assumption of stable market conditions and learn how shifting market prospects affect buying.

[27] Shoe and leather orders are disqualified because the amplitude of fluctuation for leather buying may be quite a bit larger than for shoe buying and also because some of the figures are reported in dollars rather than pairs, which likewise would overstate the amplitude.