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CONTENTS

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Eyes Are On Inventories

THE CURRENT downswing in general business has been characterized in responsible quarters as a readjustment of business inventories. Such a characterization is supported by the basic facts, and probably is, or should be, a matter of general agreement, provided it is understood that important factors other than inventories are involved in the process, — both as causes and effects.

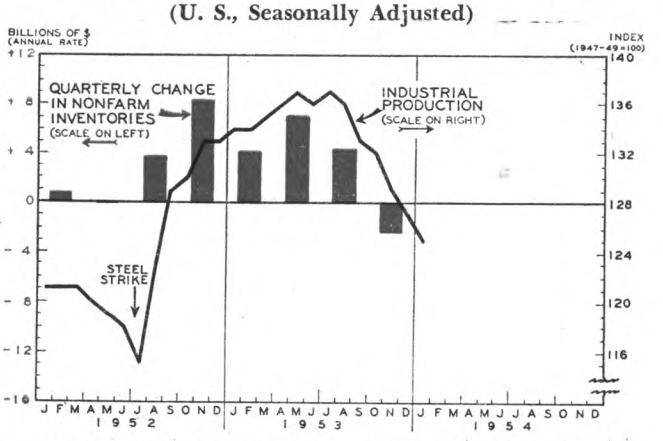
For example, recent moderate reductions in expenditures for national security programs, as well as some moderate slackening in consumer eagerness for the purchase of autos and other durable goods, have played significant roles in bringing the inventory situation into a position that has required correction. At the other end of the scale (on the side of effects) it is clear that the inventory readjustment has necessarily involved some reduction in production and employment.

Eyes are on inventories, — and properly so. The interpretations and charts which follow are designed to give some perspective on the facts of recent inventory change, in relation to the broader aspects of business, and to assist in scorekeeping during the period immediately ahead.

Inventories and Recent Business Changes

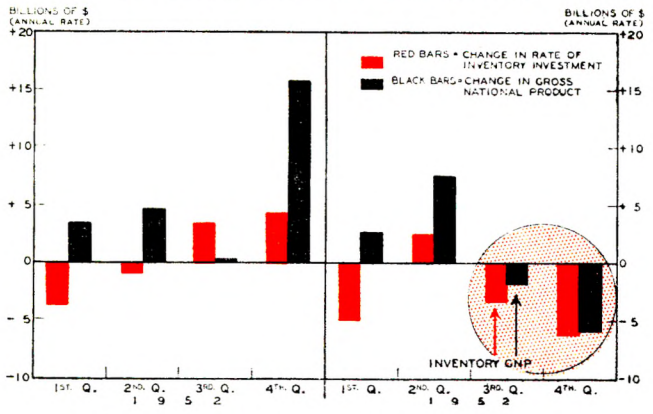
Recent changes in industrial production are closely related to a shift from accumulation to reduction in inventory, as shown by the first accompanying chart. Monthly production for the past two years is shown by the black line, drawn from the Federal Reserve index of the physical volume of industrial production. Quarterly changes in business inventories, exclusive of farm products, are shown by the red

INDUSTRIAL PRODUCTION and CHANGE IN NONFARM BUSINESS INVENTORIES
(U. S., Seasonally Adjusted)



. . . the course of industrial production during the past two years was broadly comparable with the pattern of changes in nonfarm inventories. The parallel was closer in 1953 than in 1952, when the impact of the steel strike obscured the relationship.

IMPACT OF INVENTORY INVESTMENT ON GROSS NATIONAL PRODUCT



. . . during the second half of 1953, quarterly changes in inventory investment, as part of the Gross National Product, paralleled very closely the overall changes in Gross National Product.

bars.[1] The general similarity in pattern is obvious, especially for the course of events during the year immediately past. (During 1952 the complications ensuing from the steel strike upset the timing of the relationships.)

Another way of indicating the connection between recent inventory changes and general business is to look at the quarterly *changes* in Gross National Product, and compare them with the changes in inventory investment, i.e. shifts in the rate of accumulation or reduction from one quarter to the next, recognizing that the latter constitutes only one component of the total change in Gross National Product. This is shown for the past two years in the second of the accompanying charts. It is clear from the chart that *during the third and fourth quarters of 1953* the changes in inventory investment were of magnitudes very close indeed to the overall changes in GNP.

What this means, statistically, is that all the other components of Gross National Product (such as production for current consumer takings, production for military needs, and for state and local governments, etc.) were relatively stable, or varied in such a manner as to offset each other in their net impact upon Gross National Product. What it means, logically, is that inventory change during the second half of last year probably played a strategic or balancing role in determining the magnitude of the national product. A similar strategic role is probably being played by inventory change at the present moment, although figures for the first quarter of 1954 will not be available for some weeks.

It should be kept in mind that the recent boom was characterized by relative price stability and that there was little or no incentive during the upswing to acquire inventories in anticipation of price advances. This point has been persuasively argued as a reason for confidence at the present time that inventory imbalances may not be too serious.

Inventories Related to Current Sales

At what point inventory levels become too high in relation to concurrent sales is always a difficult question, — usually more amenable to answer in hindsight than at the time the question is most urgently posed. Use of arithmetic ratios between stocks and sales constitutes one somewhat overworked, and often unreliable, approach to an answer. The catch, here, is to determine what ratio between stocks and sales should be considered "normal" or proper. Alternatively, a graphic plotting of inventories alongside the movement of sales serves much the same purpose. Its meaning is, perhaps, easier to grasp than an abstract ratio, but the bothersome question of "normality" persists.

Such a plotting of the movements during recent years of business inventories in relation to business sales (with no adjustment for price changes) is shown in a pair of accompanying charts. One chart deals with manufacturers' inventories and sales, and the other with retailers' inventories and sales.[2] The key to an understanding of such charts lies in a proper appraisal of the starting point, or benchmark, used to indicate the relationship between the two series.

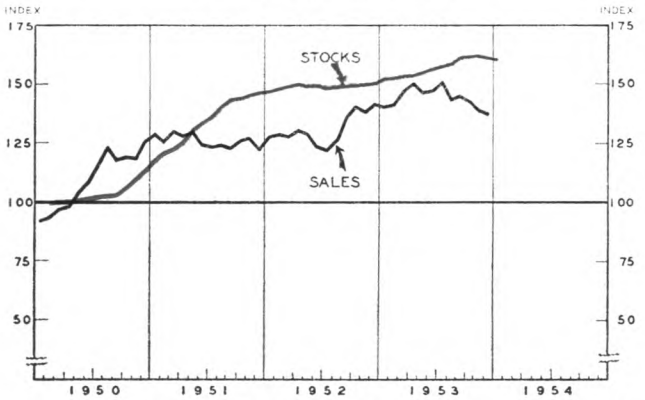
In this case, the first half of 1950 is taken as the starting point, or 100, for both the inventory and sales series. Thus, the charts bring out the fact that inventories have been standing somewhat high in relation to sales, if the first half of 1950 is considered to represent a reasonable relationship.

The first half of 1950 has been chosen as a tentative benchmark here, because it represents a postwar period when the inventory readjustment of 1948-49 had just been completed, and the disturbances due to the Korean War had not yet come into play. Whether this is a fair "normal" by which to judge the current situation is open to debate. But it is highly probable that such a benchmark is a more realistic one than, for example, could be afforded by the use of a year such as 1948 or a year such as

(1) The inventory series here is drawn from "change in nonfarm inventories," a component of the Gross National Product as estimated by the U. S. Department of Commerce. The inventory series reflects the effects of price changes in respect to *current* additions to, or subtractions from, *previous* inventory levels. In this respect it differs conceptually from the production series, which is based strictly on physical volume. But in the two years under consideration, the average movement of prices was so narrow that the two series portrayed in the chart may be regarded as broadly comparable.

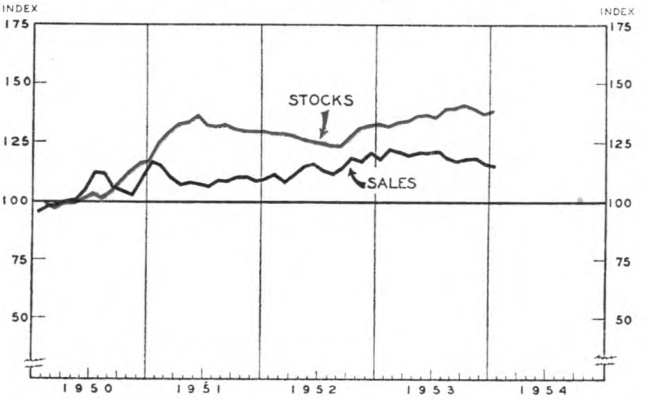
(2) These charts, as well as the subsequent ones, are drawn from the regular Department of Commerce series on book values of business inventories, including manufacturing, wholesale and retail levels. Such data differ somewhat in coverage and concept from the "nonfarm inventories" or "change in inventories" previously mentioned in connection with the first two charts.

MANUFACTURERS' STOCKS AND SALES
(Seasonally Adjusted)
First Half, 1950 = 100



. . . as compared with the position during the first half of 1950, manufacturers' *inventories* climbed quite steadily until mid-1953, partly due to the defense build-up. Sales also rose. A widening gap appeared in the second half of '53, as both series turned downward.

RETAILERS' STOCKS AND SALES
(Seasonally Adjusted)
First Half, 1950 = 100



. . . *retailers' inventories* have risen more than retailers' *sales* since the first half of 1950. In spite of marked readjustment in late '50 and early '52, the "gap" appeared substantial during the second half of '53.

1951. (Using the average of the years 1947-49 as a benchmark, however, would have produced results very close to those shown here; such a period is commonly used as a base period for postwar statistics.)

Granting the use of the first half of 1950 as a benchmark, then, the charts show that both manufacturers' and retailers' inventories since the middle of 1953 have shown a substantial (and in the case of manufacturers' inventories, a widening) gap between inventories and sales, in spite of the fact that the recent inventory trend has been downward. So far as it goes, and granting the assumptions above, this suggests that further inventory readjustment is in prospect.

As between the manufacturers' and the retailers' situations, several differences appear. Except for a brief pause connected with the steel strike of 1952, manufacturers' inventories showed little hesitation in their upward climb from 1950 to mid-53. The requirements of the defense program, and the huge backlog of unfilled orders developed during the period were important in this connection. After September 1953, manufacturers' inventories, especially in the hard goods lines, began to be reduced. However, the simultaneous decline in manufacturers' *sales* has been even more pronounced, thus involving at least a temporary widening of the margin between the two curves.

Retailers' inventories, on the other hand, after a *very* sharp spurt immediately after the outbreak of the Korean War, registered a marked reduction in mid-1951 and early 1952. Such reduction was associated with the temporary lull in civilian buying which followed as an aftermath of the Korean panic buying. Durable consumer goods, as well as apparel and related lines, were concerned in such movements. In the recent phase, retailers' inventories and sales have turned down, without any marked narrowing, as yet, of the gap between the two curves.

Inventories Related to Previous Sales

Inventory fluctuations are usually generated when large numbers of businessmen change their minds about the desirability of holding stocks of goods. Many specific factors influence the inventory decisions of a businessman. Shortages of commodities, price movements, a change in merchandising practice or industry structure, the desire to maintain balanced stocks, and interest rates — all have their effect at various times. However, the one overriding factor, through which most of the other elements are ultimately expressed, is the level of sales.

It seems that businessmen almost invariably gear current inventory investment to the past performance of sales, because generally, for lack of better information, they assume that experience in the immediate past is the best guide in making estimates for the immediate future.

Thus, as can be seen on the final pair of charts, a close statistical relation can be developed between previous sales and inventories during the 1948-49 inventory cycle, and also during the current cycle, if allowance is made for a lag of several months between changes in sales and the resultant adjustments in the level of stocks. The lag allows for the time that must elapse before a shift in sales can impress a businessman enough for him to alter his inventory policy, and to translate his decision *via* orders, delivery, and production into a change in the physical volume of goods on his floor. For convenience, the charts have represented the lag to be five months.

(CONTINUED ON PAGE 7

Measuring 1954 Easter Trade

DURING the weeks immediately preceding Easter Sunday each year, department store sales experience a pronounced pickup from the dull pace characteristic of the winter months. Unlike sales bulges associated with other holidays (most of which fall on or very close to the same date each year) the sales peaks attributable to Easter shopping may occur in almost any week during March or April, depending on the date of Easter in the particular year. This year Easter Sunday falls on April 18—two weeks later than last year. Thus, in interpreting weekly sales reports for March and April this year as compared with the corresponding weeks on last year's calendar, some allowance must be made for the difference in Easter dates as between the two years.

The seasonally adjusted index of weekly department store sales in the Fourth Federal Reserve District, which is published regularly by this bank, is a useful tool for making the required allowance for differences in Easter dates when comparing weekly sales during March and April in one year with performance during the corresponding year-ago weeks. This index has been developed from a special study of the weekly seasonal behavior of department store sales in the Fourth District.

Influence of Easter on Sales

Studies of weekly sales by Fourth District department stores indicate that Easter normally exerts an influence on sales during a period of approximately six weeks. Sales tend to rise noticeably during each of the four weeks immediately preceding Easter, with the over-all rise from the fourth to the final week before Easter Sunday amounting to about 20 percent. A sharp drop in sales usually occurs in the first week after Easter and is followed by a mild recovery in the second post-Easter week. Thereafter, sales continue to follow the usual seasonal swings associated with the time of year.

Such a general pattern of Easter sales can be considered as superimposed, for whatever six-weeks period fits the occurrence of Easter in a particular year, upon the ordinary course of early spring trade. The latter appears to have a generally rising trend, so far as can be ascertained from study of early spring sales isolated from Easter influences. Consequently, the volume of sales at the Easter peak may be expected to be slightly larger when Easter comes relatively late than when it comes early.(1)

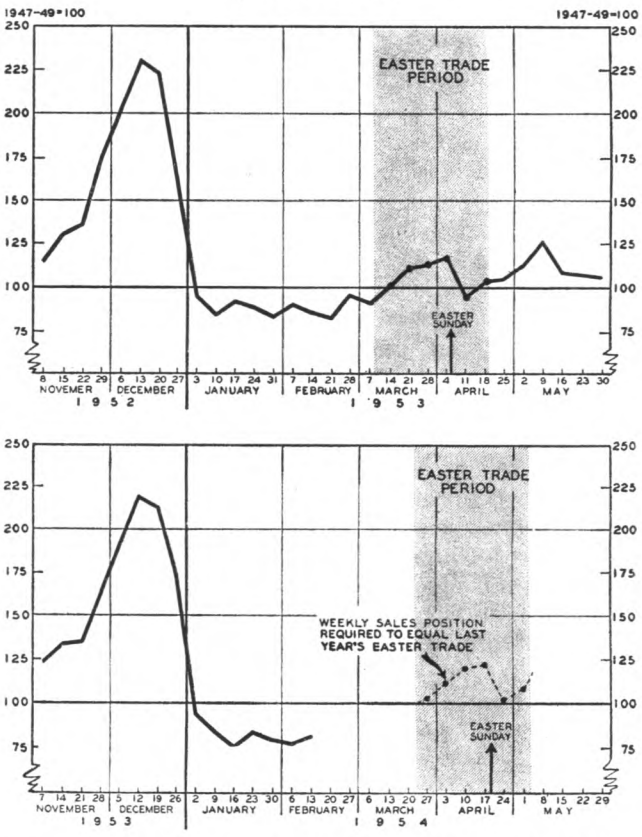
(1) The records of Fourth District department store sales show an important exception to this rule, which, however, is not pertinent to the years 1954 or 1953. A *very* late Easter, like an early Easter, is likely to result in a reduction of the Easter sales bulge as compared with the Easters which fall within the approximate middle of the calendar range.

This year, Easter falls on April 18, a moderately late date. Last year Easter fell on April 5, and was considered a fairly early holiday. As a result of the calendar difference in Easter dates between the two years, a slightly higher level of dollar sales would be required of the coming season if adjusted sales are to match last year's Easter performance.

Standard for Comparing This Year's Easter Sales

The first of the two accompanying sets of charts shows the weekly indexes of Fourth District department store sales

INDEX OF WEEKLY SALES, WITHOUT SEASONAL ADJUSTMENT
Fourth District Department Stores*
(1947-49 = 100)



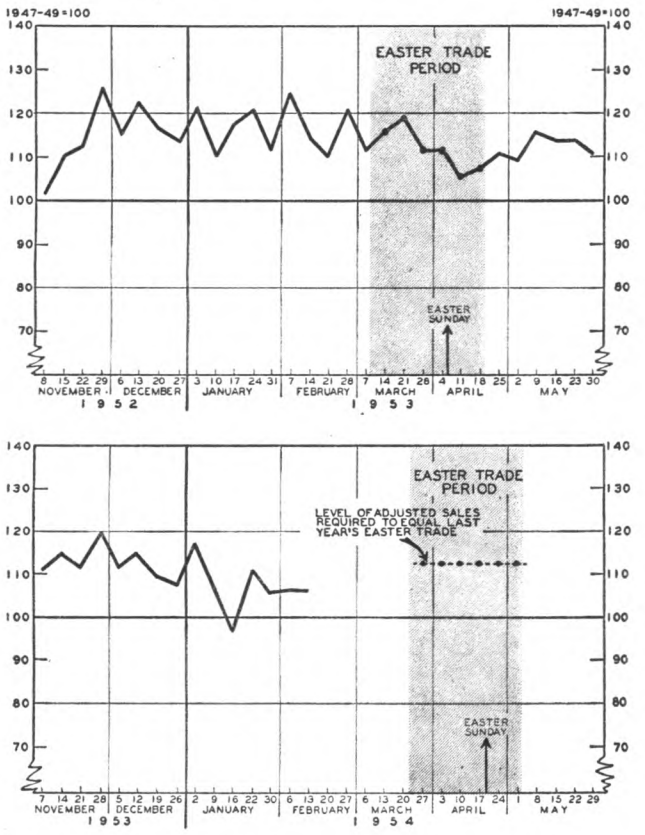
. . . after reaching a peak for the year shortly before Christmas, weekly department store sales fall off rapidly, beginning the new year at a greatly reduced level which holds until the approach of Easter causes a rise in dollar sales. The sales position required this Easter in order to equal last year's Easter total is shown by the broken line on the lower chart.

*Indexes apply to weeks *ended* at designated date.
Note that vertical scale is cut off above zero.

without adjustment for seasonal variation. The line on the *upper* chart indicates the position of unadjusted sales for weeks ended on the dates shown during the period from November 1952 through May 1953. The six-week period during which sales are affected by Easter trade is shaded in red. The solid line on the *lower* chart traces the sales position for weeks ended on the dates shown during the period from November 1953 through February 13, 1954, the latest date for which figures were available at press time. On this chart also, the period affected by Easter trade is shaded in red.

Year-to-year comparisons may be visualized for weekly sales during any week of the past few months by comparing the position of the unadjusted index for the week chosen, as shown on the lower chart, with the position of the unadjusted index for the year-ago week, found on the chart directly above. Thus, during January and early February of this year, sales each week were tending to run somewhat below the year-ago position.

INDEX OF WEEKLY SALES, SEASONALLY ADJUSTED
Fourth District Department Stores*
(1947-49 = 100)



. . . seasonally adjusted department store sales have been running behind last year's level so far this year. If adjusted sales during the coming Easter season are to equal last year's Easter trade, some rise in the current level of sales will be required.

*Indexes apply to weeks *ended* at designated date.
Note that vertical scale is cut off above zero.

By making use of the studies of weekly seasonal variation mentioned earlier, unadjusted indexes have been calculated to represent the level of sales which would be required during each of the six weeks affected by Easter this year if last year's Easter season trade is to be equaled, after allowance for seasonal variations and for the difference in Easter dates. Such indexes, constituting a sort of target, are shown as the broken black line on the lower chart. Last year's Easter sales level has been chosen as a convenient yardstick for measuring sales performance during the coming Easter season especially because of the widespread use of year-to-year percentage changes in evaluating sales during a particular period.

During the week ended April 17 this year, Fourth District department store sales are expected to reach a pre-Easter peak. If sales during this year's Easter season follow the typical pattern outlined above and at the same time equal last year's performance, an unadjusted sales index of 123 (based on 1947-49 average daily sales) should be expected for the peak week, as seen on the accompanying chart. Since sales during the corresponding year-ago week occurred after last year's Easter peak had passed, a year-to-year gain of 17 percent would thus be required to attain an equivalent showing.

On the other hand, sales during the week ended April 3 this year will represent buying before the Easter season is fully under way. In a year-to-year comparison, such sales will be matched against sales during the peak of the Easter season last year (the week ended April 4). Under such circumstances, a year-to-year loss of about 6 percent for the week could be encountered without loss of pace in matching last year's Easter performance. An accompanying table shows the year-to-year percentage changes required during each of the six weeks affected by Easter this year if last year's Easter performance is to be equaled in the aggregate, while the normal pattern of rise and fall is allowed for, in the light of this year's calendar.

Seasonally adjusted indexes of weekly department store sales in the Fourth District are shown on the second pair of accompanying charts. The line on the upper chart traces seasonally adjusted sales by weeks from November 1952 through May 1953, while the solid line on the lower chart shows the adjusted index by weeks from November 1953 through February 13, 1954. The Easter trade season has been shaded red on each chart.

The broken black line running through the shaded portion of the lower chart indicates the level of adjusted sales required during this year's Easter season in order to equal last year's Easter trade. During the six weeks of last year's Easter trade, adjusted

sales averaged 112 percent of 1947-49 average daily sales.

Conclusions In order for this year's Easter trade to equal last year's performance, after all allowances for seasonal fluctuations and differences in Easter dates, some rise in the recent pace of sales would be required. On a seasonally adjusted basis, sales for the first six weeks of 1954 have averaged 107, based on the 1947-49 average of daily sales as 100, and including all the Fourth District department stores which regularly report on a weekly basis. This is appreciably below the average index of 112 required during the forthcoming Easter season to match last year's Easter trade. Thus, department store sales in this District during the Easter season could fail to equal the preceding year's Easter performance by a margin of about 5 percent, and still maintain the present sales level.[2] If, however, adjusted sales during the Easter period fall below the average posted to date in 1954 (and thus fall substantially below last year's Easter trade) the results would offer little encouragement as to the state of trade in this District.

(2) It should be recalled that last year's Easter trade was considered at the time to be only moderately successful. In retrospect it appears to have been rather close to the average for the entire year 1953, on a seasonally adjusted basis, and to have been a shade below the Christmas showing, at least in this District.

A level of adjusted sales during this year's Easter season which equals or even surpasses last year's total could result only from a significant rise in the current pace of sales. Such an event would be a welcome signal in view of recent declines in other phases of business activity.

Whichever direction is taken by the actual course of events, the material submitted above may be of some use in keeping the score.

SALES INCREASES OR DECREASES OVER YEAR-AGO WEEK

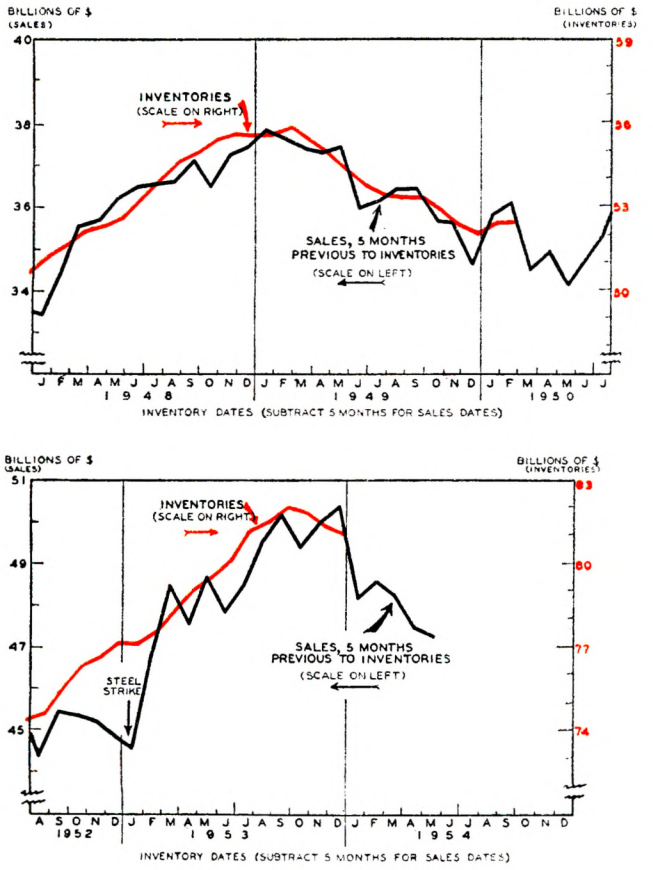
(Fourth District Department Store Sales)

1954 Week Ending:	Required to Equal Last Year's Easter Trade
March 27	−10%
April 3	− 6%
10	+26%
17	+17%
24	− 3%
May 1	− 3%

EYES ARE ON INVENTORIES

(CONTINUED FROM PAGE 3)

BUSINESS INVENTORIES and SALES
(Seasonally Adjusted)



. . . if levels of business inventories are compared with levels of business sales of *five months previous,* a close correspondence of movement is apparent. In the current cycle, this would indicate that further inventory reduction is likely for some months ahead.

The months plotted on the horizontal scale of this pair of charts pertain to inventories. In picturing the lag of inventory changes behind changes in sales, the sales curve has been plotted five months ahead of its real position, so that to read correctly the sales positions on the horizontal scale, five months must always be subtracted from the month appearing on the scale. Thus, the last sales figure plotted on the bottom chart is for December 1953. This is read by subtracting five months from May, 1954, which is the apparent position on the scale.

The pattern of inventory and sales movements quite recently has in many ways paralleled that of 1948-49, when the nation experienced what has been generally designated as an "inventory recession." To facilitate comparison of these inventory cycles the charts have been drawn to coordinate the two cyclical patterns rather than calendar periods.

In each case the addition to stocks during the thirteen-month build-up period shown on the chart totaled approximately ten percent. The slightly steeper appearance of the 1952-53 curves can be explained partly by the fact that larger aggregates of dollars are involved in the more recent cycle. Because of price changes in the interval between the two cycles, and also because the whole economy has grown in real terms since 1948-49, direct comparison of the dollar values of inventories and sales on the two charts would not be meaningful.

Since the Department of Commerce data upon which the two charts are based are expressed in terms of current prices, not all of the movement depicted within each chart can be assumed to be representative of physical changes in stocks and shipments. The general price level during 1952-53 was more stable than during 1948-49, but the difference was not large enough to preclude broad comparability of the two charts.

Some slight differences in emphasis can be discerned if a more detailed examination of the two cycles is undertaken. The inventory-sales fluctuations of 1948-49 were largely confined to manufacturing, while consumer demand and retail stocks held relatively steady. The 1953-54 cycle appears to be a broader movement distributed more widely among manufacturers, wholesalers, and retailers, with particular emphasis on durable goods. This is not only a reflection of the defense program, but also of the boom in civilian durables that dominated the first half of 1953.

But whether durables or nondurables are leading the cycle, the basic relationship between inventories and sales seems to persist. The fact that sales movements have been observed to lead changes in inventory levels in the past suggests the likelihood that a similar relationship may continue in the future. On the basis of such analysis, the continued weakness evidenced by business sales during recent months might well indicate a period of inventory liquidation extending up to or beyond mid-year of 1954.

Progress Through Chemistry

by **CLYDE WILLIAMS,** ***President and Director, Battelle Memorial Institute***

Many factors contribute to our national prosperity. However, faith in the destiny of an expanding economy is the intangible factor which gives meaning to all the others. Our forefathers expressed that faith through the conquest of new lands. During the last century, that faith found expression through the development of machines which have made possible one-time undreamed-of increases in the nation's productivity. More recently, that faith has been entering a new phase, based on the premise that research can create new wealth.

Among others, the chemical industry has been doing an outstanding job of putting into practice this new expression of an old faith. Chemists have found (1) that suitable replacements for existing products can be developed from new sources of abundant raw materials, and (2) that new materials can be synthesized to fill special needs for which no previous products were entirely satisfactory.

As a result of these discoveries and their application to the raw material and product needs of the economy, the chemical industry has experienced phenomenal growth. During the past 30 years, the increase in its volume of production has been three times as great as total industrial production. At the present time, sales of chemicals and allied products make up nearly 10 per cent of all sales of manufactured products. Sales volume has grown from $4.8 billion in 1940 to an estimated $20 billion in 1953.

The chemical industry has catalyzed its own growth and national progress through creative service to other industries. By developing adhesives that are water-repellant, heat-resistant, and rot proof, for example, chemists opened the way for the plywood industry to extend its markets to numerous outdoor uses such as in aircraft and boats. Defoliant chemicals, by causing plants to drop their leaves before picking time, have speeded up the hand-picking of cotton as much as 100 per cent. They have made more feasible the widespread use of the mechanical cotton picker. Since World War I, constant advances in petroleum refining processes have brought us a gasoline which gives about 50 per cent more mileage, and which effectively reduces knock in engine operation. Such advances have not only resulted in more economical car operation and longer engine life; they have also contributed to more efficient use of our vital petroleum resources.

The phenomenal growth of the chemical industry is reflected most sharply in the consumption of chemicals made from petroleum which reached an estimated 29 billion pounds in 1953, more than 7 times the 1940 volume. Industries using petrochemicals include those making synthetic rubber, antifreeze and antiknock fluids, synthetic fibers, plastics, agricultural chemicals, surface coatings, explosives, synthetic detergents, and drugs.* In each case, productive efforts have been concentrated on the fulfillment of special needs for which no previous products were entirely satisfactory. The extent to which the nation has been accepting these efforts is borne out by the record.

We are no longer dependent solely on imports of natural rubber. The country now has the capacity to produce about one million long tons of synthetic rubber which is as good or better than natural rubber in most of its uses.

Similarly successful have been the chemically-made fibers like nylon, Orlon, Dynel, Acrilan, and rayon. In the past 15 years, these fibers have accounted for most of the 1.7 billion-pound increase in consumption of all fibers. The chemical fibers have found ever-expanding markets, for example, in making apparel, bedding, upholstery, carpets, tires, electrical insulation, and industrial hose and belting.

Although synthetic detergents are relative newcomers, their sale passed that of soap in both tonnage and dollar volume during the past year. Over a thousand different brands of synthetic detergents have been developed and more no doubt are in the offing. Wherever there is a surface to be cleaned or washed, there is an existing or potential market for new uses.

The production of plastics in 1953 reached an estimated record high of 3 billion pounds, or about 15 times the prewar volume. However, no let-up in long-range expansion of markets is seen. The increasing importance of plastics as engineering materials bears close watching. Sales of plastic pipe, for example, have soared from $500 thousand to $15 million in the last 5 years. Initial uses have been industrial, including some three-inch diameter pipe in oil well casings. Water pipe also is expected to be an important outlet.

Interest is growing in plastics reinforced with glass-fiber. They have numerous existing or potential markets, ranging from fishing rods to large tanks for shipping and storage of corrosive chemicals, boats up to 40 feet in length, and automobile bodies.

The story behind the versatility of the chemical industry in serving the American economy is largely one of endless ingenuity of chemists in developing new products. Product versatility, in turn, has largely been made possible by the development of better instruments to analyze and control the processing of chemicals and by the continuing search for cheap, abundant supplies of raw materials. Before 1930, many of the present important chemicals derived from petroleum were derived from coal or agricultural products. In 1952, sales of petrochemicals amounted to $2.7 billion, or about half of the total sales for all intermediate chemicals.

Within about a generation, the chemical industry has become one of America's production giants whose markets embrace the entire economic structure. With its progress already keyed to the creation of new wealth, the chemical industry will exert an increasingly important influence on the nation's prosperity.

Editor's Note—While the views expressed on this page are not necessarily those of this bank, the *Monthly Business Review* is pleased to make this space available for the discussion of significant developments in industrial research.

* Previous articles in this series have discussed agricultural chemicals (July, 1953); synthetic detergents (April, 1952); and plastics, (November, 1951).