

This PDF is a selection from an out-of-print volume from the National Bureau of Economic Research

Volume Title: Measurement of Business Inventories

Volume Author/Editor: Murray F. Foss, Gary Fromm, and Irving Rottenberg

Volume Publisher: U.S. Census Bureau

Volume ISBN: 3024029227

Volume URL: <http://www.nber.org/books/foss81-1>

Publication Date: 1981

Chapter Title: Stock-Sales Ratios; Physical Stocks; Market Categories

Chapter Author: Murray F. Foss, Gary Fromm, Irving Rottenberg

Chapter URL: <http://www.nber.org/chapters/c11091>

Chapter pages in book: (p. 142 - 150)

13. STOCK-SALES RATIOS; PHYSICAL STOCKS; MARKET CATEGORIES

This chapter covers a series of topics of concern to analysts of current economic conditions. Although these subjects are not given the same priority as the need for basic improvements in data or manufacturing and trade inventories and the inventory change component of the national accounts, they merit serious attention. Evaluating and forecasting inventory change accurately is extremely difficult, so obtaining a clearer picture of the condition of inventories can be very helpful to economic analysts. This objective can be furthered through development of subsidiary information like stock-sales ratios, selected physical data and more refined market breakdowns.

STOCK-SALES RATIOS

Economists who analyze current economic conditions and make forecasts are frequently asked whether inventories are "too high" or "too low." The answers given, to the extent they affect decisionmaking, may have important implications for the future course of business activity; they may imply large changes in inventory investment in the near future and, because of that, engender large changes in the rate of growth of total output.

Use of equations or models is one approach to judging the adequacy of levels of inventories, but the usual way is to calcu-

late the ratio of inventories to sales and compare the result with some kind of norm. There are several difficulties with this procedure. First, interpreting the ratio is not a simple matter when its numerator and the denominator are not expressed in the same price levels. Second, it is not easy to determine a norm. A norm might be represented by what business considers desirable, but, in the absence of surveys designed to elicit direct information, the desired ratio cannot be observed.

Sometimes a target or desired ratio can be inferred from a model describing inventory behavior, but more often, period by period, actual inventory-sales ratios are compared to calculated long-term averages of the ratio. There are difficulties with this and similar approaches; economists have been known to judge inventories as "not unduly high" just before firms slashed production as a means of decreasing or curbing rises in inventories.

Finally, even within a given industry, a single stock-sales ratio may be too aggregated. In manufacturing, for example, it is often desirable to distinguish between raw materials, work in process, and finished goods since the three types of stocks are subject to different influences and exhibit diverse movements in the short run.

Table 13.1 contains a listing of kinds of inventory-sales ratios now published by BEA and the Bureau of the Census on a seasonally adjusted basis. Note that one of the measures

Table 13.1. STOCK-SALES RATIOS PUBLISHED BY BUREAU OF ECONOMIC ANALYSIS AND CENSUS

Description	Industry	Publication source	Valuation	Frequency
Inventory-final sales	Total and nonfarm business	BEA	1972 dollars	Quarterly
Inventory-final sales	Total and nonfarm business	BEA	Current dollars	Quarterly
Inventory-sales	Manufacturing and trade and 29 breakdowns	BEA	1972 dollars	Quarterly
Inventory-sales	Manufacturing and 16 breakdowns	Census	Book value	Monthly
Inventory-sales	Merchant wholesalers and 13 breakdowns	Census	Book value	Monthly
Inventory-sales	Manufacturing and trade	BEA	Book value	Monthly
Inventory-sales	Manufacturing by stage of fabrication for durables and nondurables	BEA	Book value	Monthly

Source: BEA: *Survey of Current Business*, various issues; Census: monthly reports from these surveys.

published by BEA is the ratio of end-of-quarter inventories in current dollars to final sales for nonfarm business. These inventories are measured in replacement costs at the end of a quarter, which may be quite different from book values and slightly different from the quarterly average prices that BEA uses to value changes in physical inventories in current dollar GNP.

Ratios based on book values are the only ones published on a monthly basis. However, using these book value ratios, published by the Census Bureau in its monthly reports on manufacturing and wholesale trade and by BEA in the statistical pages of the *Survey of Current Business*, yields results that are potentially misleading. It might be argued that stock-sales ratios based on inventory book values are useful so long as the ratio of prices implicit in numerator and denominator is unchanged; there is no basis for such an assumption. Book value figures are reported by firms using a mixture of inventory valuation methods, the significance of which is hard if not impossible to interpret when prices, and valuation methods as well, are changing. The inclusion of LIFO inventories, which are growing in importance, imparts a downward bias to book value figures and ratios based on them. At the end of 1976, the Bureau of the Census estimated the book value of manufacturers' stocks to be \$167 billion. The same stocks valued at end-of-1976 prices were estimated by BEA to be \$206 billion. Some years ago, before the widespread adoption of LIFO, there may have been some justification for the prominence given to inventories measured in book values; this is no longer the case.

New BEA Initiatives

In December 1972, BEA began publishing numerous estimates of stocks in current and constant prices.¹ Prior to that time stock estimates were published on an annual basis only, as an element in BEA's program of supplying figures on the nation's tangible wealth. The thrust of the research was to produce wealth data for long-term studies of growth and changes in total factor productivity. Quarterly estimates were not prepared; the data were not published annually on a prompt basis nor were stock-sales ratios computed.

In the summer of 1974, largely as a consequence of dissatisfaction with stock-sales ratios based on book value data, BEA extended its work and began to produce quarterly inventory aggregates in constant prices. This permitted calculation of stock-sales ratios in constant prices.² In this calculation, the sales denominator came from GNP estimates and represented final sales of business in constant prices, that is, it excluded production originating in households, nonprofit institutions, governments and the rest of the world.

In the spring of 1976 the program was extended further. BEA introduced data on sales in constant prices by detailed industries in manufacturing, wholesale and retail trade. In effect, sales figures compiled by the Census Bureau in these

three sectors were deflated.³ These data are now being published on a quarterly basis with breakdowns for about 30 groups. Inventories in current prices also appear regularly in table 16 of the GNP tables, and although stock-sales ratios in current prices are not published, they are available from BEA.

Figure 8 contains a comparison of end-of-quarter ratios in manufacturing based on book values and constant dollars. Peaks and troughs coincide in the two sets but there is a greater upward trend in constant dollar ratios than in book value ratios. A comparison also was made of the third quarter 1976 ratio with a long-term average for the years 1959-69. For all manufacturing, the third quarter 1976 ratio was about average when based on book value data but clearly high when based on constant dollar data. Moreover, a majority of the constant dollar ratios in individual industries tended to be relatively higher than book value ratios when third quarter 1976 was compared with the 1959-69 average. Some summary figures appear in table 13.2.

When data for industries are combined the change in an average ratio may reflect the results of aggregation rather than changes in ratios within individual industries. If there are two industries, each with a different ratio that remains unchanged over time, the overall stock-sales ratio will change if sales of one industry increase more rapidly than those of the other. To overcome this problem BEA publishes a stock-sales ratio with constant sales weights. The two sets tend to be close but are not identical.

Results of Correlations

One way to judge the value of different stock-sales measures is to see how well they forecast the change in manufacturers' inventories. This is not a simple task. A valid forecast of inventory change requires a complete model, but for present purposes of illustration, a simple theory of inventory behavior is used. According to this theory the level of inventories as measured by the stock-sales ratio at the start of a period either accentuates or dampens subsequent inventory change. Hypothetically, when actual stocks are high relative to sales, management takes steps to reduce stocks or to hold them down, either by reducing purchases or production or both; the opposite occurs when stock-sales ratios are relatively low.

What is being tested is the comparative ability of different stock-sales measures to forecast inventory change. The dependent variable is always the percentage change in real manufacturers' stocks over a two-quarter span. Thus the simple model is

$$\frac{I_{t+2} - I_t}{I_t} = f\left(\frac{I_t}{S_t}\right) \quad (1)$$

In equations below, the stock-sales ratio or independent variable is the ratio of inventories at the end of the last actual quarter

¹ Shirley Loftus, "Stocks of Business Inventories in the United States, 1928-1971," *Survey of Current Business*, Vol. 52 (December 1972).

² *Survey of Current Business*, Vol. 54, Part 1 (August 1974), pp. 2-5.

³ Shelby W. Herman, Gerald F. Donahoe and John C. Hinrichs, "Manufacturing and Trade Inventories and Sales in Constant Dollars, 1959 to First Quarter 1976," *Survey of Current Business*, Vol. 56 (May 1976), pp. 11-24.

Figure 8. MANUFACTURING STOCK-SALES RATIOS: COMPARISON OF RATIOS BASED ON BOOK VALUES WITH RATIOS BASED ON CONSTANT DOLLARS

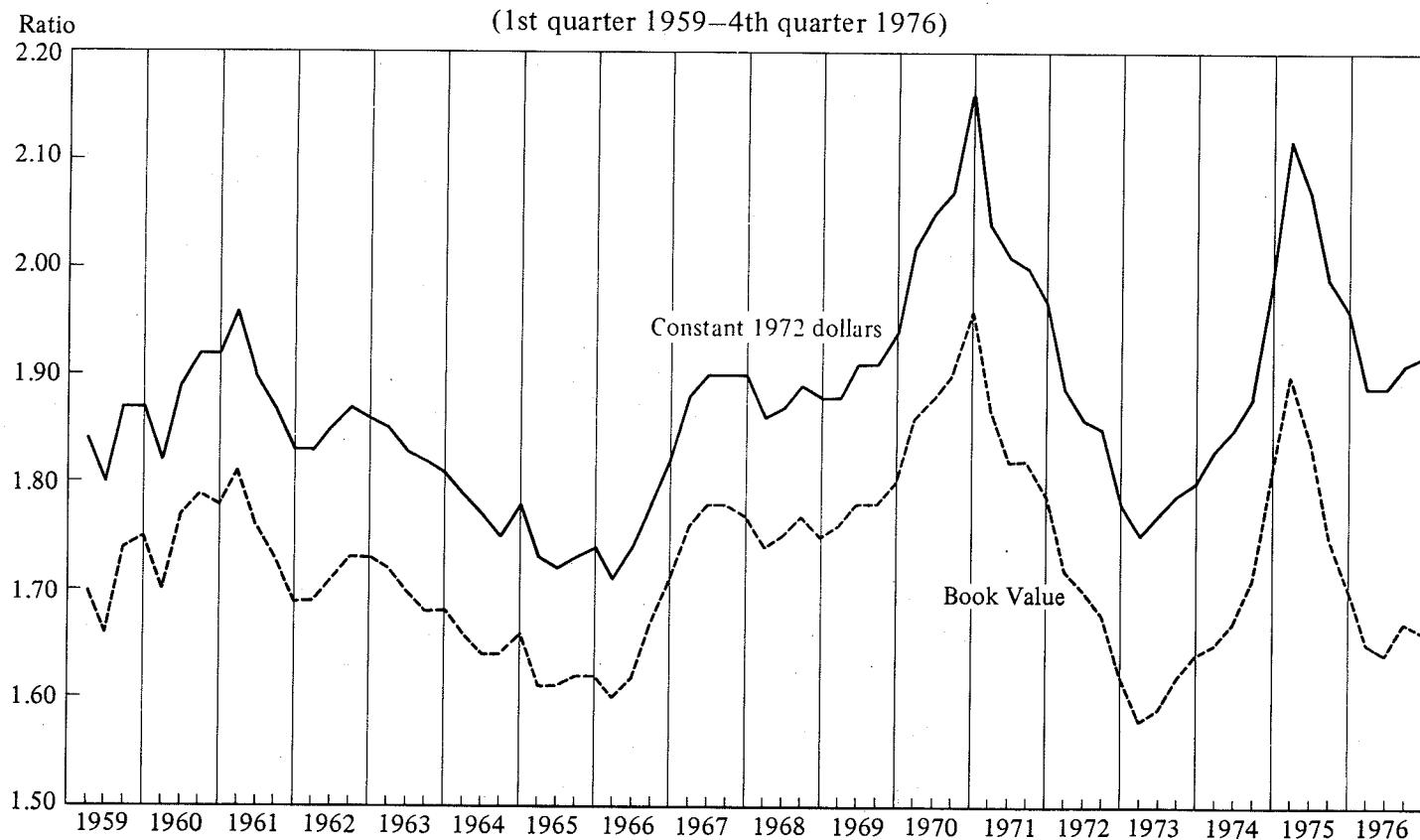


Table 13.2. COMPARISON OF STOCK-SALES RATIOS BASED ON CONSTANT DOLLARS AND BASED ON INVENTORY BOOK VALUES AND CURRENT DOLLAR SALES

Industry	Average of quarterly ratios 1959-69	Third quarter 1976	Difference
Manufacturing and trade:			
Book value.....	1.53	1.55	0.02
Constant.....	1.57	1.70	.13
Manufacturing:			
Book value.....	1.70	1.74	.04
Constant.....	1.83	1.98	.15
Durable:			
Book value.....	1.97	2.18	.21
Constant.....	2.11	2.39	.28
Nondurable:			
Book value.....	1.39	1.28	-.11
Constant.....	1.48	1.50	.02
Wholesale (merchant):			
Book value.....	1.18	1.21	.03
Constant.....	1.18	1.37	.19
Durable:			
Book value.....	1.57	1.69	.12
Constant.....	1.55	1.93	.38
Nondurable:			
Book value.....	.88	.84	-.04
Constant.....	.89	.94	.05
Retail:			
Book value.....	1.43	1.46	.03
Constant.....	1.37	1.47	.10
Durable:			
Book value.....	1.95	2.03	.08
Constant.....	1.93	1.93	0
Nondurable:			
Book value.....	1.18	1.18	0
Constant.....	1.12	1.23	.11

Note: Based on data prior to revisions made by Bureau of Economic Analysis and the Census Bureau in 1977.

Source: National Bureau of Economic Research derived from Bureau of Economic Analysis and Census data published in Survey of Current Business. Vol. 56 (December 1976).

divided by average monthly sales during that quarter. The ratios measured in constant (1972) prices are from BEA. Inventories measured in book value terms and divided by current dollar sales are those published by Census. The period covered was 1960 through 1976 and contained 34 observations.

The results, summarized below, are reasonable.⁴ The coefficient on the stock-sales ratio is always negative and in each case is substantially greater than the standard error. In terms of cor-

relation coefficient the fixed-weighted, constant-dollar, stock-sales ratio performs best, although the margin over the mixed weighted ratio is not great.

Equation	Constant Term	Coefficient on Stock-Sales Ratio	r ²
(1) Constant dollar, fixed weights	27.7	-13.9	0.61
Standard errors	(3.7)	(2.0)	—
(2) Constant dollar, mixed weights	27.2	-13.5	0.57
Standard errors	(3.9)	(2.1)	—
(3) Current dollar, mixed weights	26.1	-14.1	0.45
Standard errors	(4.8)	(2.8)	—

Inventory Condition

A quarterly survey, Manufacturers' Inventory and Sales Expectations, formerly conducted by the Commerce Department, has not been discussed in this study because inventory and sales expectations data raise a host of statistical and economic problems that are beyond the scope of this particular investigation.⁵ However, other information collected in the survey—the condition of manufacturers' stocks—has a clear relation to stock-sales ratios.

Firms were asked in the expectations survey: "In relation to total sales and unfilled orders backlog please enter...your company's view of its [end of latest actual quarter] inventory position." Respondents were asked to check one of three columns designated as "low," "about right" and "high." Answers were requested for total inventories, finished goods, and all other inventories.

The reporting unit was the total domestic company. Close to 1,000 firms, primarily the largest manufacturing companies, constituted the reporting panel. The survey was not a probability sample nor did it represent all firms over a certain size. Percentage distributions based on responses, expanded to industry totals and further combined, were published each quarter for all manufacturing, durables and nondurables. This information provided the basis for a diffusion index, although it is important to note that the published proportions reflected inventory weights of firms and industries and were not simply unweighted counts of companies.

The percentage of stocks judged high minus the percentage judged low (referred to as a diffusion index) was compared with the fixed-weighted, constant-dollar, stock-sales ratios for all manufacturing with respect to business cycle turning points designated by the National Bureau of Economic Research. One of the interesting aspects of the diffusion index is its broad

⁵The Manufacturers' Inventory and Sales Expectations survey was conducted quarterly from 1959 through the first quarter of 1976. Results were published 3 months after the close of the quarter. The survey was begun by BEA and taken over by Census in late 1971. First publication by Census, as Series MQ-1, covered the second quarter of 1972.

⁴The equations shown refer to inventory changes over two-quarter spans for even-numbered quarters. The results were very similar for odd-numbered quarters.

range—from a low of 4 percent (third quarter 1959) to a high of 31 percent (fourth quarter 1974). The diffusion index appears to have a clearcut lead with respect to both upturns and downturns in overall business activity as measured. Leads seem to be more clear cut with respect to declines in activity as table 13.3 indicates.

The diffusion index also appears to have signaled an improvement at an earlier date than the fixed-weighted, constant-dollar, stock-sales ratio—by three quarters in 1960, two quarters in 1970 and one quarter in 1974-75. (However, much of this comparative advantage was lost by the late publication schedule of this survey.) Signals of a deterioration came earlier for the diffusion index in 1960 but appear to have been given about simultaneously by the two series in 1969 and 1973.

Recommendations

1. Even though there is a sizable erratic component in monthly inventory change the BEA quarterly series of deflated stock-sales ratios should be published monthly since the underlying book value figures are available monthly. It may well be desirable to present the data only as moving averages. This should be done for both the mixed-weighted and fixed-weighted ratios. BEA began publishing monthly ratios based on deflated data in January 1979.

2. The industry detail of the BEA series should be expanded, especially in wholesale and retail trade, but an expansion in retail trade must await an improvement in the retail inventory survey.

3. The questions formerly asked of firms in the expectations survey regarding the condition of stocks should be shifted by the Census Bureau to a revamped M3 survey and should be obtained on a monthly basis. The questions should also be asked of wholesalers and large retailers monthly. On the basis of experience with the quarterly survey, answers to these questions should provide useful cyclical indicators for a very sensitive economic variable that has tended to lead changes in business activity. In undertaking this work it is important for the Census Bureau to obtain evaluations of inventory condition from authoritative company persons in a position to answer this question.

Wording of the questions should be revised to encourage respondents to take account not merely of sales and unfilled orders but also of outstanding commitments to purchase inventory.

PHYSICAL STOCKS

Moses Abramovitz, in his 1950 study of inventories and business cycles,⁶ made an intensive analysis of manufacturers' inventories that, among other things, utilized available data on inventories measured in physical terms. Abramovitz based his analysis on a limited number of physical series to support conclusions relating to more comprehensive deflated book value

Table 13.3. COMPARISON OF QUARTERLY PEAK AND TROUGHS: INVENTORY DIFFUSION INDEX AND BUSINESS CYCLE

Quarters of lead	Business cycle	Diffusion index
	Trough	Peak
Three.....	1st quarter 1961	2nd quarter 1960
Two.....	4th quarter 1970	2nd quarter 1970
One.....	1st quarter 1975	4th quarter 1974
	Peak	Trough
Three.....	2nd quarter 1960	3rd quarter 1959
Two.....	4th quarter 1969	4th quarter 1968
One.....	4th quarter 1973	1st quarter 1973

Source: National Bureau of Economic Research.

inventory data. Despite the many insights that Abramovitz's analysis yielded, his study did not lead to an increase in the collection of inventory statistics measured in physical terms. Recommendations for increased collection also were made by the Federal Reserve committee in 1955.⁷

Some of the problems with inventory data measured in physical terms are reviewed in this section and a short analysis is presented of selected industrial materials inventories, focusing on their behavior in the first half of the 1970's.

Physical series that are available on a prompt basis can be useful tools for analysts of current economic conditions. One of the best known series of this kind is the set of statistics on retail dealer sales and inventories of domestic-type cars made available by the Motor Vehicle Manufacturers Association of the United States.⁸ For each month, sales figures are published at 10-day intervals and for the month as a whole, while inventory figures are published for the end of the month. Monthly figures are usually available five business days after the close of a month. The monthly data are adjusted for trading days and seasonality by the Bureau of Economic Analysis. The availability of this series has not transformed the task of forecasting automobile sales from something difficult to something easy. But the figures are still very helpful, as attested to by economists and others who pay close attention to automobile sales and production.

The Federal Government collects data on hundreds, if not thousands, of commodities in physical terms. From the perspective of current inventory analysis there are a number of difficulties. First, the main emphasis of most physical series is on production and/or sales or consumption; inventory data are collected much less frequently. Second, monthly series are much less common than annual series. Third, available data are quite limited in their coverage; they are not representative of all stocks. Fourth, existing inventory series have an overweight-

⁶ Moses Abramovitz, *Inventories and Business Cycles*, (New York: National Bureau of Economic Research), 1950.

⁷ Consultant Committee on Inventory Statistics, Federal Reserve Board, *Statistics of Business Inventories* (November 1955), p. 92.

⁸ Monthly data are published in the *Survey of Current Business*.

ing of producers' stocks compared to stocks of industrial consumers. Physical series tend to reflect the desires of particular industry groups and do not for the most part represent unified systematic approaches to data collection.

There are other problems. Some physical series are measured with great precision but are not analyzed with the usual care and attention devoted to series measured in value terms. It is not uncommon to see publication of revised end-of-year inventories for many metals and minerals, but no subsequent adjustments to earlier published preliminary monthly figures to make them comparable to revised end-of-year data. Moreover, basic revisions of data for some important series, including end-of-year inventories, are made very slowly. The Census Bureau instituted a series on steel inventories, receipts and consumption by manufacturers in the early 1960's. Data available from the 1972 Census of Manufactures suggest a major understatement of consumption data, but it is still not known how inventory figures are affected.

Another difficulty with current data in physical volume terms is that they are published with longer lags than book value figures. Monthly book value data published by the Commerce Department are available about 30 to 40 days after periods for which stocks are measured. In contrast, monthly data on physical stocks of major nonferrous metals compiled by the Bureau of Mines are not known until about 60 days after the close of periods for which stocks are measured. Thus it was not until late summer 1974 that analysts could observe in the published figures a small accumulation in copper stocks in the second quarter of 1974.

In principle, there is no reason why physical inventory data cannot be obtained for every physical commodity for which production or shipments data are now reported at the producer level. It is surprising that physical inventories are not collected in certain industries where they should be readily available from records. For example, there is relatively little information on physical stocks of chemicals even though detailed monthly physical production figures for these commodities have been published for many years by the U.S. International Trade Commission. In practice, possibilities for extending physical data are limited, particularly when commodities are complex. Even for some commodities typically measured in physical terms, like "tons of steel," there may be large variations in price and quality. Moreover, commodities can be measured in physical terms only when they are raw materials or finished goods. Ordinarily, there is no simple way to measure goods in process in a manner that would reflect the fabrication performed on the purchased materials unless the inventories of partially fabricated goods are explicitly measured.

Despite such limitations use of the physical inventory data cannot be dismissed completely. After experience with the high and changing rates of inflation of the past few years and onerous problems of interpreting book value data when there are shifts to the LIFO method, the comparative disadvantage of the physical volume approach has diminished. Information now available in physical terms can be used for constructing special indexes. Even though they are not comprehensive, special indexes, such as one for inventories of basic materials, would have provided a useful adjunct for cyclical analysis, especially

over the past few years. Furthermore, knowledge of ratios of stocks to shipments or consumption can be helpful in evaluating the condition of particular stocks at particular levels.

Inventories and Industrial Materials

Early in this project NBER combined several statistical series covering industrial materials measured in physical terms, seasonally adjusted them, and showed stocks in relation to a measure of activity like shipments or consumption. Altogether 41 series were available and they are listed in table 13.4. Usually the period covered is 1967 through the first half of 1975 although several have been in existence for a very long time. The compilation is limited primarily to those industrial commodities for which monthly data were published for an extended period; this meant omitting a few new series and series for which the producing agency revised yearend stocks but not monthly stocks. Individual items are combined into eight subgroups, which in turn are aggregated. Individual commodities are combined on the basis of 1972 average value per unit consumed or average value per unit shipped, as shown in the 1972 Census of Manufactures.

Combined data are shown monthly in figure 9. This particular group of stocks showed an almost unbroken decline from mid-1971 to late 1973. Most of the eight subgroups also declined over this period.

The group of 41 series has an overweighting of producers' finished stocks available for sale. Abramovitz's 1950 study⁹ of earlier data showed that stocks of this type tend to move inversely to activity when an expansion is short or only moderately long. In this respect experience with these stocks in the early 1970's was similar to the very early experience that formed the basis of Abramovitz's analysis. Abramovitz also found that raw materials stocks of domestically produced goods tended to be positively correlated with activity, though they lagged a little around cyclical turns. To the extent that raw material stocks declined while activity was rising in the early 1970's this behavior was atypical.

A somewhat different way of viewing these data is provided in table 13.5, which shows stocks in relation to activity. When possible, raw materials stocks were related to consumption. Finished goods stocks held by producing industries were usually related to producers' shipments but in some cases (textiles and chemicals) the denominator was production. The table shows changes in the ratios from the end of 1971 to the end of 1972 and from the end of 1972 to the end of 1973. A comparison with ratios for December 1968 is also provided, using 1968 as a norm. It is clear from table 13.5 that declining ratios were the rule, especially in 1973, and that at the end of 1973 the ratios in 31 of the 39 series were below those of 1968. This suggests that a condition of depleted stocks led producers and consumers of a wide range of industrial materials to rebuild stocks in late 1973 and early 1974.

⁹ Abramovitz, *op. cit.*, p. 246.

Figure 9. STOCKS OF 41 INDUSTRIAL MATERIALS, JANUARY 1967–JUNE 1975
(Billions of 1972 dollars, seasonally adjusted)

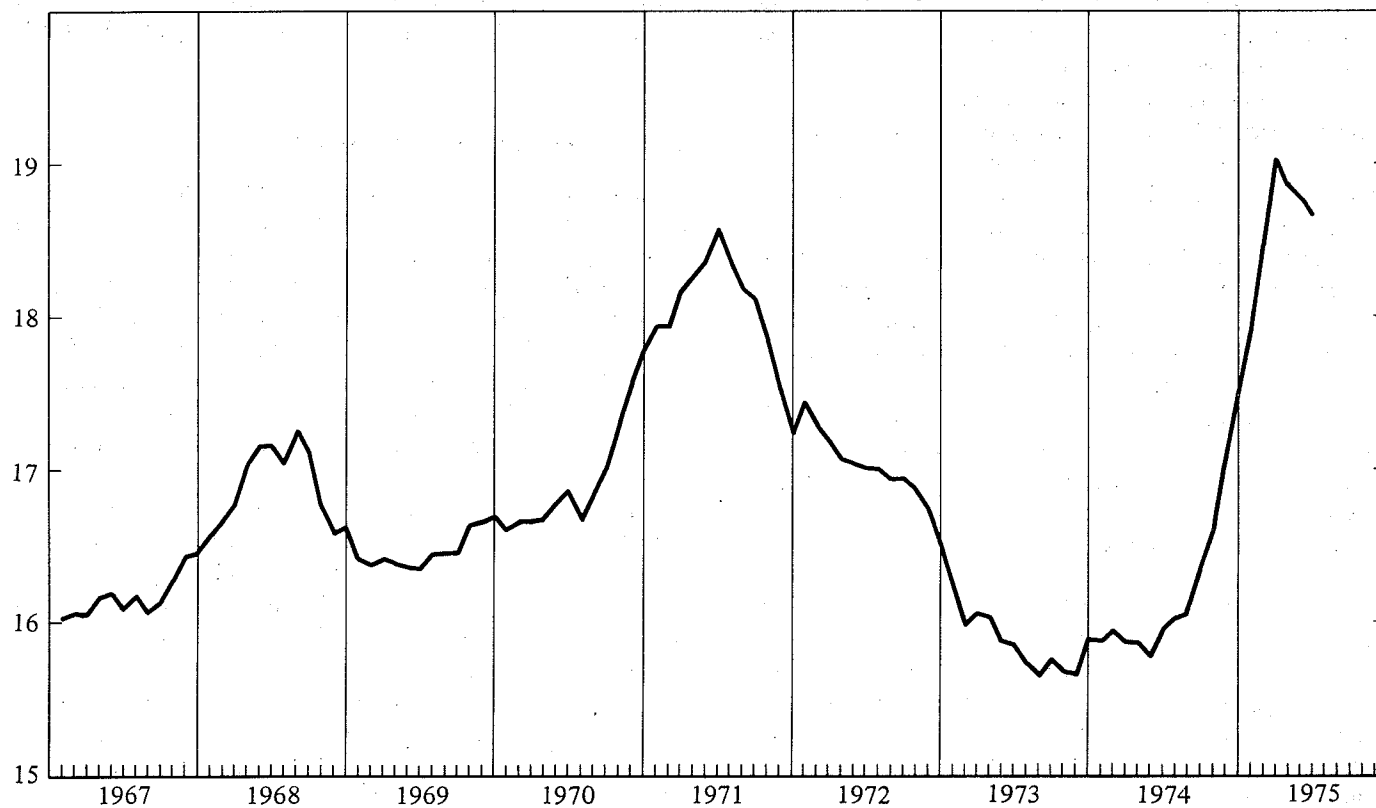


Table 13.4. INDUSTRIAL MATERIALS SERIES WITH PHYSICAL STOCKS AND RELATED DATA

Commodity	Holder
Metals (8)	
Steel mill shapes and forms	Steel mills, steel wholesalers, manufacturing consumers
Iron ore	Mines and blast furnace yards
Pig iron	Producers and consumers
Tin	Private smelters, fabricators and distributors
Zinc	Producers and consumers
Lead	Producers and consumers
Refined copper	Producers and fabricators
Aluminum	Producers
Lumber (2)	Producers
Hardwood	
Softwood	
Textile (7)	
Cotton woven fabric	Fabric producers
Manmade fiber woven fabric	Fabric producers
Noncellulosic yarn	Yarn producers
Noncellulosic staple	Yarn producers
Glass fibre yarn	Yarn producers
Rayon yarn	Yarn producers
Rayon staple	Yarn producers
Paper (2)	
Newsprint	Primarily publishers
Woodpulp	Pulp and paper mills
Petroleum (30)	Refiners and bulk stations
Crude petroleum	
Unfinished oils	
Refined products	
Rubber (2)	All holders
Natural rubber	
Synthetic rubber	
Coal and coke (2)	
Bituminous coal	Manufacturing and mining industries
Coke	Oven-coke plants
Chemicals (15)	Producers
Nitrogen solution	
Phosphoric acid	
Ammonium nitrate	
Ammonium sulfate	
Calcium phosphate dibasic	
Activated carbon	
Sodium metal	
Sodium carbonate	
Sodium chlorate	
Titanium dioxide	
Sulfur	
Ammonia (synthetic anhydrous)	
Phosphoric (elemental)	
Sulfuric acid	
Superphosphate materials	

Note: Figures in parentheses are number of commodity series within each category.

Recommendations

In an economy as complex as the United States, a physical volume approach cannot be used for the comprehensive measurement of inventories. Nevertheless physical data can be useful to economic analysts in limited situations. It is with this in mind that recommendations listed below are offered.

Existing Series

1. Monthly physical inventories series should be benchmarked much more promptly than has been the practice to date. When new benchmark data become available, preliminary monthly series should be revised as is the custom with inventory series expressed in book values.

2. Sampling schemes used should be reviewed (for monthly series) and probability surveys should be adopted.

3. Monthly series should be seasonally adjusted and seasonal adjustments should be revised at frequent intervals.

4. Monthly data should be shown relative to shipments or consumption, which should also be seasonally adjusted.

New Series

5. The Census Bureau should seriously consider developing new physical quantity inventory series. Chemicals and building materials seem to be obvious candidates in this regard.

6. Data should be collected not only on finished stocks held by producers but also on those same stocks held as materials by manufacturing consumers. This is the case with most primary metals series now in existence.

Table 13.5. CHANGES IN RATIOS OF STOCKS TO CONSUMPTION OR SALES

(Number of series)			
Material and number of series	Dec. 1971- Dec. 1972	Dec. 1972- Dec. 1973	Dec. 1968- Dec. 1973
Metals (8).....	+3 -5	0 -8	+1 -7
Lumber (2).....	0 -2	+1 -1	0 -2
Textiles (7).....	+3 -4	0 -7	+1 -6
Pulp and paper (2).	0 -2	+1 -1	0 -2
Petroleum (1) (includes 3 series)..	0 -1	+1 0	0 -1
Rubber (2).....	0 -2	+2 0	+1 -1
Coal and coke (2)..	+1 -1	0 -2	0 -2
Chemicals (15).....	+8 -7 0	+5 -10 0	+3 -10 2
Total.....	39 +15 -24 0	39 +10 -29 0	39 +6 -31 2

Source: National Bureau of Economic Research.

7. The Census Bureau should initiate the publication of a seasonally adjusted monthly measure of stocks of industrial materials using data already published by the Bureau itself as well as data published elsewhere (for example, the Bureau of Mines). A companion measure should cover consumption of these materials so that a monthly stock-consumption ratio can be constructed. Timeliness is important for such an undertaking.

Analytically useful breakdowns of inventory data should include holdings by producers and holdings by industrial consumers, and breakdowns between materials and finished goods (closely related to the preceding). The availability of several series would permit calculation of diffusion indexes, which might be useful as cyclical indicators and for the study of inventory behavior over the business cycle.

MARKET CATEGORIES

In 1963, following recommendations made by the consultant committee to the Federal Reserve,¹⁰ the Bureau of the Census introduced market groupings into the M3 manufacturing series. Since that time, however, there have been no major new initiatives in this area. There still is a need for new analytic breakdowns in this field. The breakdowns now being published appear below.

- Home goods and apparel
- Consumer staples
- Equipment and defense products
- Automotive equipment
- Construction materials and supplies
- Other materials and supplies and intermediate products
- Supplementary series
- Household durables

Capital goods industries

Nondefense

Defense

1. The number of market categories now shown in the M3 survey should be extended. Two examples where finer detail would be helpful are "other materials and supplies and intermediate products" and "nondefense capital goods." The improved divisional reporting system recommended in this study should foster more detailed breakdowns.

2. Inventories now being published in terms of book values in the M3 series should be calculated in constant-dollars. Shipments should also be deflated to make calculations of constant-dollar, stock-sales ratios by market category possible.

3. Inventories of the same goods, wherever held, should be combined and, where possible, should be shown in relation to final sales. That is, it should be possible to combine the same goods held by retailers, by wholesalers and (as finished goods) by manufacturers. For consumer goods this will require further breakdowns of stocks held by general merchandise stores as recommended in chapter 3. Despite the difficulties that were noted in chapters 4 and 9 concerning deflation of manufacturers' inventories by stage of fabrication, inventories and sales by market categories should be deflated also.

4. Even when it is not possible to combine manufacturers' finished stocks with those of wholesalers and retailers it frequently is useful to combine similar stocks held by wholesalers and retailers, notably in the case of consumer goods.

5. A breakdown of inventories by stage of fabrication in manufacturing also will permit a breakdown of inventories by stage of processing. With this kind of breakdown inventories can be classified into raw materials and finished goods with respect to the economy as a whole.¹¹

¹¹Joel Popkin, "An Integrated Model and Intermediate Demand by Stage of Process," in American Economic Association, *Papers and Proceedings of the Eighty-ninth Annual Meeting, 1976* (*American Economic Review*, Vol. 67, No. 1, Feb. 1977) pp. 141-147.

¹⁰Consultant Committee on Inventory Statistics, *op. cit.*, p. 51.