Inventory Recession Ahead?

By Stephen L. Able and Dan M. Bechter

Business sales have grown faster than business inventories during the current expansion. The resulting decline in the inventory-sales ratio has been viewed as evidence that inventories are now under tighter control than during previous expansions. It is also widely believed that this improved inventory control has reduced the chances that cyclical swings in economic activity will be exacerbated by severe fluctuations in inventory investment.

This article shows that a lower risk of a severe inventory recession does not necessarily follow from improved inventory control. A standard model of inventory investment is used to identify two dimensions of better inventory control: lower inventory-to-sales ratios, and faster adjustments to desired stocks of inventories. Empirical support for the hypothesis of improved inventory control is provided by comparing values of these inventory control parameters, estimated for the post-1975 period, to values estimated for an earlier period. The implications of tighter inventory control for the volatility of inventory investment are then explored. A simulation forecast is used to show that, because the two dimensions of tighter inventory control work in opposite directions as far as the size of inventory adjustments are concerned, better inventory management does not necessarily reduce the chances of a sharp inventory recession in the future.

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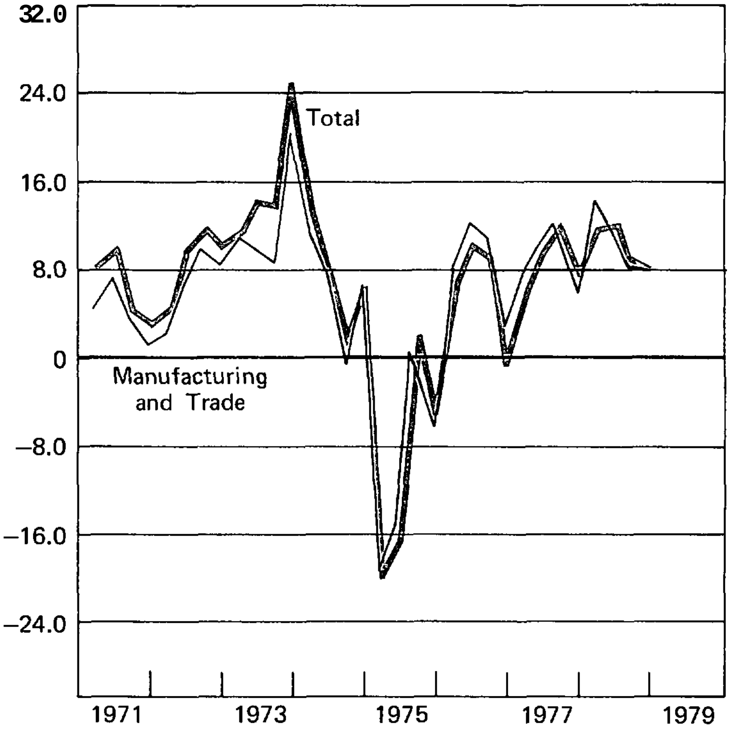
A BRIEF LOOK AT THE BEHAVIOR OF INVENTORY INVESTMENT

The volatility of changes in business inventories has been an important factor in downturns of the economy. When final sales of goods are rising, businesses at all stages of production and distribution usually add to their stocks of inventories, and this accumulation acts to stimulate the economy. But when final sales of goods decline, businesses do not fully replace inventories, allowing them to shrink. As a result, inventory investment switches from being a contributor to being a drag on aggregate demand, further accentuating the size and duration of the fall in output.

The recession of 1974-75 has been considered somewhat atypical, since inventory investment continued positive through all of 1974. However, real inventory investment, although positive, weakened considerably as a source of final demand in 1974, before turning sharply

Chart 1
CHANGES IN BUSINESS INVENTORIES
(In billions of 1972 dollars, at annual rates)



negative in the first half of **1975** (Chart 1).[1]

This article focuses on inventory changes in manufacturing and trade. As Chart 1 shows, changes in manufacturing and trade inventories account for most inventory investment.' Table 1 shows the close association, in both size and volatility, between changes in total business inventories and changes in manufacturing and trade inventories during **1973-75.** Even though inventory investment is very small relative to gross national product, a swing of $26 billion (from +$16 billion to —$10 billion) in total inventory investment from **1973** to **1975,** and of **$23** billion in manufacturing and trade, accounted for almost **80** and **70** per cent,

1 Using its survey data on the book value of business inventories, the U.S. Department of Commerce makes adjustments for price changes and for differences in business accounting methods to arrive at estimates of the quarterly real stock of business inventories measured in constant 1972 dollars. These quarterly series of inventories in constant dollars are available for various industry classifications.

2 Five-sixths of total inventory investment in the last 20 years has been in manufacturing and trade. Perhaps more important for purposes of this analysis, virtually no volatility in the inventory investment data is sacrificed by concentrating on changes in manufacturing and trade inventories. Between 1959:1 and 1978:4, two measures of the volatility of inventory investment, the mean absolute change and the standard deviation of the change, show the volatility of inventory investment in manufacturing and trade to be equal to that of total inventory investment, and four times the size of the combined volatility of farm and "other nonfarm" inventory investment, the categories of total inventory investment not included in manufacturing and trade.

Table 1
CHANGES IN GNP AND AGGREGATE INVENTORIES
(In billions of 1972 dollars)

	Gross National Product	Change in Business Inventories	Change in Manufacturing and Trade Inventories
1973	$1,235	$+16	$+13
1974	1,218	+ 8	+ 7
1975	1,202	-10	-10

respectively, of the $33-billion decline in gross national product in those two years.

In the study of the statistical variability of a data series, such as inventory investment, one can make a case for disaggregating the data when the components of the aggregated series are not highly correlated with one another. Low correlations imply that the various components have different explanations. The levels of inventory investment in the manufacturing component and in the trade component are only weakly correlated with each other, and changes in these levels show even less correlation. Thus, separate analyses of manufacturing and of trade inventories appear necessary. On the same basis, disaggregating trade into retail and wholesale components, and disaggregating manufacturing into finished and unfinished goods (materials and goods in process), are also justified by low correlations. Charts 2 and 3 show the diverse movements of these components of inventory investment in recent years.[3]

[3] Further disaggregations are possible and were explored, but for the purpose of this study, they were not considered necessary. Reaggregations also come to mind, such as lumping manufacturers' finished goods inventories with the inventories of retailers and wholesalers, on the grounds that trade inventories are also finished goods. But very low correlations between changes in trade inventories and changes in manufacturers' finished goods inventories argue against such a "total finished goods" approach to explaining inventory investment.

The ratio of combined manufacturing and trade inventories to sales declined sharply from **1975** to **1978.** The decline in this inventory-sales ratio lends support to the popular view that inventory control may be tighter now than formerly. When both inventories and sales are adjusted for inflation, however, and when the data are disaggregated along the lines discussed above, it turns out that only in manufacturing has there been a marked drop in the inventory-sales ratio since **1975** (Table 2). Moreover, comparisons with other high-employment years (*e.g.*, **1973)** show that current inventory-sales ratios are not all that low for this stage of a business cycle. Nonetheless, much is heard and read about the "lessons" businesses learned from the recession of **1974-75,** about the improved technology used in inventory management, and about the greater attention being given to tighter control of inventories. Succeeding sections in this article establish a means for testing the hypothesis of improved inventory control and explore the implications of the test results for inventory investment.

A STANDARD MODEL OF INVENTORY INVESTMENT

Most econometric studies of inventory

Table 2
CONSTANT-DOLLAR INVENTORY-SALES RATIOS FOR MANUFACTURING AND TRADE, SEASONALLY ADJUSTED SELECTED YEARS, 1967-78

	Manufacturing and Trade	Manufacturing	Retail Trade	Wholesale Trade
1967	1.61	1.90	1.42	1.20
1970	1.68	2.07	1.39	1.22
1973	1.53	1.78	1.39	1.17
1975	1.67	2.04	1.36	1.33
1978	1.55	1.77	1.39	1.30

behavior employ the partial stock adjustment framework. On the basis of current and expected future economic conditions, businesses are assumed to determine the stock of inventories they would like to hold in each time period. It is further assumed that firms eliminate only a portion of any discrepancy between desired and actual stocks during any period. The partial stock adjustment model is often expressed by the following equation:

(1) $II = s \bullet (KI^* - KI_{-1})$

where

II = Inventory investment during the current period,

KI^* = Desired stock of inventories by the end of the current period,

KI_{-1} = Actual stock of inventories held at the end of the previous period, and

s = The fraction of the discrepancy between desired and actual inventory stocks which may be eliminated in a single period.

This equation states that the amount of inventory investment, II, undertaken during the current period is related to the difference between the desired stock of inventories, KI^*, and the actual stock of inventories on hand, KI_{-1}. The larger the fraction, s, the more

Chart 2
CHANGES IN TRADE INVENTORIES
(In billions of 1972 dollars, at annual rates)

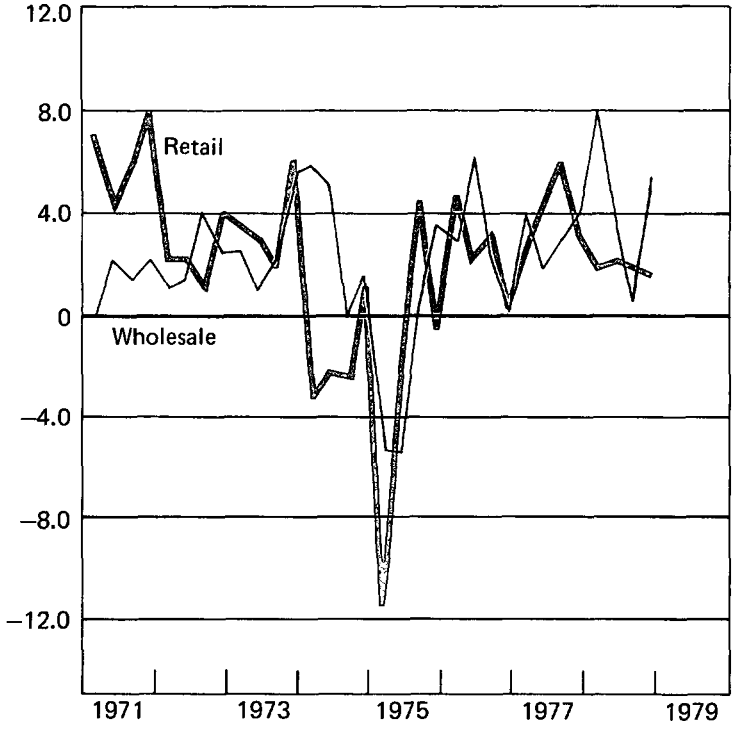
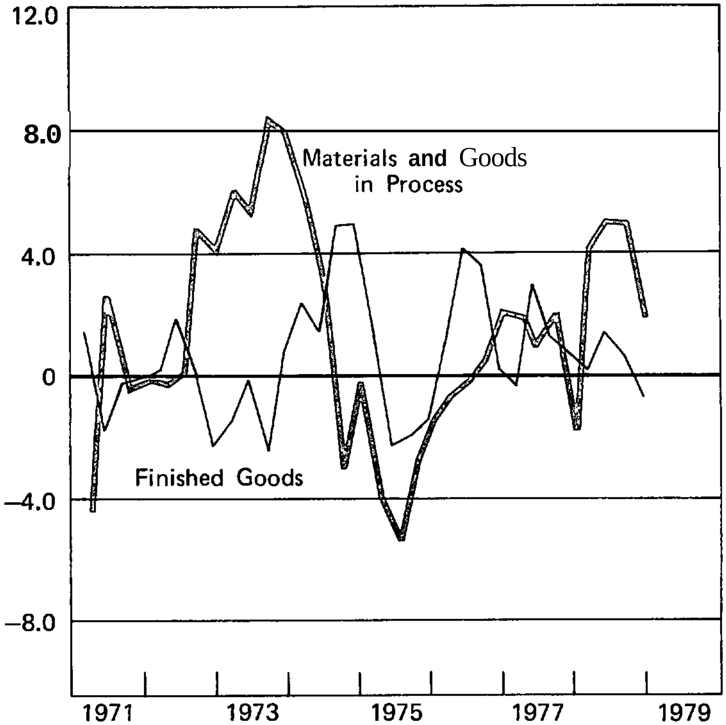


Chart 3
CHANGES IN MANUFACTURERS' INVENTORIES
(In billions of 1972 dollars, at annual rates)



rapidly eliminated is the difference between desired and actual stocks of inventories. Thus, s is also referred to as the speed-of-adjustment parameter in the inventory investment model.

Use of equation 1 for empirical purposes requires specifying the determinants of the desired stock of inventories. Because a number of factors may induce a business enterprise to hold a stock of inventories, a number of variables may be included in an inventory investment equation.

The rationale for holding inventories is that, because the receipt of goods is not likely to be perfectly synchronized with their use and sale, a firm will want to maintain stocks of materials and/or finished goods in order to reduce the likelihood of a disruption in its daily pattern of activity. Also, because production takes time, a manufacturer usually holds a stock of work in progress. The size of the stock of inventories held to satisfy these transactions motives will depend primarily on the firm's anticipated scale of operations, which may be measured by its expected sales. Because expected sales are not observable, actual sales are generally included in an inventory equation instead.'

[4] One justification for the use of actual sales is as follows: At the end of a period, a firm wishes to hold a stock of inventories which equals a proportion, i, of the sales expected during the following period. Thus,

(a) $KI^* = i \bullet S^e_{+1}$

where KI* is the desired inventory stock in the current period and S^e_{+1} represents expected sales in the following period. If naive expectations are assumed, that is if expected sales are assumed equal to current sales,

(b) $S^e_{+1} = S,$

A speculative motive for holding inventories may also exist. If a business enterprise expects the price of its product to rise, it may try to increase its product inventories in the current period in the hope of earning a capital gain upon their sale in the future. If a manufacturer expects the price of its inputs to rise in the future, it may hold additional stocks of materials for the same reason. Thus, the desired stock of inventories might be influenced by the expected rate of inflation.

A business firm also incurs costs, such as storage, handling, and financing costs, which must be weighed against the benefits from holding inventories. The higher these costs, the greater the willingness of the enterprise to risk disruption in its daily routine, and the less eagerly will the enterprise speculate in inventory stocks. Therefore, the stock of inventories held by a firm is likely to decline as the cost of holding it rises. The most easily identified cost to the firm is that of financing, which may be represented by the rate of interest on business loans used for accumulating inventories.

Despite the theoretical plausibility of including the rate of inflation and the rate of interest as determinants of the desired stock of inventories, previous empirical studies have generally not found these variables to be significant.[5] This study also failed to uncover a significant relationship between the level of inventory investment and rates of inflation and interest. Therefore, the level of sales was treated as the primary determinant of the desired stock of inventories. This relationship may be expressed by the following equation:

$$(2)\quad KI^* = a + i \cdot S$$

where

KI^* = The desired stock of inventories by the end of the current period, and

S = The level of sales during the current period.

The coefficient, a, measures the average impact of all determinants other than sales on the desired stock of inventories. The coefficient, i, measures the size of the change in the desired stock of inventories which arises in response to a one-unit change in the level of sales. Because it measures the incremental relationship between the desired inventory stock and actual sales, i is referred to as the desired ***marginal inventory-sales ratio.***

When the expression for the desired stock of inventories given in **(2)** is substituted for KI* in (1), the following basic equation for inventory investment is obtained:[6]

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equation (a) may be rewritten as

$$(c)\quad KI^* = i \cdot S.$$

Other, more complicated expectations schemes also allow inclusion of actual sales as a determinant of the desired stock of inventories. See, ***e.g.***, Michael C. Lovell, "Manufacturers' Inventories, Sales Expectations, and the Acceleration Principle," ***Econometrica*** **(July 1961)**, pp. 293-314.

[5] For a recent discussion of this topic, see Martin Feldstein and Alan Auerbach, "Inventory Behavior in Durable Goods Manufacturing: The Target Adjustment Model," ***Brookings Papers on Economic Activity, 2***, 1976, pp. 391-93.

[6] It is common practice to add other explanatory variables to the basic model in (3) when estimating inventory investment equations. In this study, some of the estimated inventory equations included the change in sales and the level of unfilled manufacturing orders, as well as sales and lagged inventory stocks. For a fairly exhaustive list of potential explanatory variables for use in inventory equations, see Paul G. Darling and Michael C. Lovell, "Factors Influencing Investment in Inventories," ***The Brookings Quarterly Econometric Model of the United States.*** Duesenberry ***et. al.***, ed., pp. **131-62**.

$$(3)\ II = s \cdot (a + i \cdot S - KI_{-1})$$

$$II = a' + b \cdot S - s \cdot KI_{-1}$$

where

II = Inventory investment in the current period,

S = Sales in the current period,

KI_{-1} = Inventory stocks in the previous period,

a' = $a \cdot s$,

b = $i \cdot s$,

s = The speed of adjustment parameter, and

i = The desired marginal inventory-sales ratio.

By applying ordinary regression techniques to equation (3), estimates of the speed of adjustment and the marginal desired inventory-sales ratio may be obtained. An estimate of the speed of adjustment is obtained directly from the estimated coefficient associated with the lagged inventory stock. An estimate of the marginal inventory-sales ratio may be obtained indirectly from the estimated coefficients associated with current sales and with the lagged inventory stock.[7] Empirical evidence regarding these inventory control parameters is presented in the following section.

7 The estimated value of i is obtained from the regression results associated with (3) by dividing the coefficient on sales, b, by the coefficient on the lagged stock of inventories, s.

ESTIMATES OF THE INVENTORY INVESTMENT MODEL

To test the hypothesis that a shift toward greater inventory control has occurred since the 1974-75 period, inventory investment equations based on the model described above were estimated over two different sample periods. The first period, which was selected to identify the characteristics of inventory behavior prior to 1976, includes approximately nine years of quarterly data beginning in the second quarter of 1967 and ending in the fourth quarter of 1975. The second period covers inventory behavior since the first period and includes three years of quarterly data from the first quarter of 1976 through the fourth quarter of 1978.[8]

Four equations were estimated using data from each of the two sample periods: two for inventory investment by manufacturers (one for materials and work in progress and one for finished goods) and the other two for inventory investment by nonmanufacturers (one for wholesale trade and one for retail trade). The estimated coefficients related to the issue of improved inventory control, namely the

8 Data earlier than 1967 are not available for some of the series. All dollar values were adjusted for inflation (measured in constant 1972 dollars). The choice of sample periods might be criticized on the grounds that the longer, earlier sample period includes periods of both economic expansion and contraction, while the shorter, more recent sample period is one of expansion only. Inferences based on comparisons of inventory control parameters in the two sample periods might therefore seem unjustified. To check for such bias, periods of economic contraction were omitted from the longer sample period, and the equations were reestimated. The estimated values of the inventory control parameters were affected very little. There is no way of knowing whether the inventory control exhibited during the 1976:1-1978:4 expansion will be maintained in the event of a recession. The objective here is not to forecast, but to challenge the conventional view that inventory behavior since 1975 shows a reduced risk of sharp inventory changes in the future.

Table 3
SELECTED ESTIMATION RESULTS FOR THE INVENTORY EQUATIONS

	Marginal Desired Inventory-Sales Ratio		Speed of Adjustment		$\bar{R}^2$	
	1967:2–1975:4	1976:1–1978:4	1967:2–1975:4	1976:1–1978:4	1967:2–1975:4	1976:1–1978:4
Manufacturing: Materials and Work in Progress	.78	.37	.20	.57	.72	.61
Manufacturing: Finished Goods	.22	.26	.11	.57	.15	.57
Retail Trade	1.31	1.60	.52	.32	.47	†
Wholesale Trade	1.60	1.50	.23	.19	.67	†

NOTE: $\bar{R}^2$ is the multiple correlation coefficient adjusted for degrees of freedom.
†The adjusted multiple correlation coefficients for the trade sector fell below 0.

marginal inventory-sales ratio and the speed-of-adjustment parameter, are presented for each of the estimated equations in Table 3, while more complete results are reported in the Appendix.

The results for the trade sector are contrary to the hypothesized improvement in the control of inventories. For both retail and wholesale trade, the marginal inventory-sales ratio is greater in the later period than in the earlier period, and in retail trade, the speed of adjustment to the desired inventory stock is lower in the later period. However, because the trade equations fit the data so poorly over the 1976-78 sample period, it was not believed that a comparison of these results with the earlier periods could be justified.[9] The remaining discussion therefore concentrates on the manufacturing equations.

The estimates in Table 3 suggest that a shift toward greater inventory control by manufacturers has occurred since the end of 1975.[10] For materials and work in progress, the desired inventory-sales ratio is much lower in the later period (0.37) than in the earlier period (0.78). For materials and work in progress and for finished goods, the speed of adjustment is more rapid in the later period (0.57 for both finished goods and work in progress) than in the earlier period (0.11 for finished goods and 0.20 for materials and work in progress).

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[9] The multiple correlation coefficient, R^2, is the basic measure of how well an equation fits the sample data. A value close to 1 implies a very good fit, a value close to 0 a very poor fit. It is common practice to adjust the value of R^2 to take into account the number of explanatory variables included in an equation. If both the sample size and the original multiple correlation coefficient are quite small, it is possible for the adjusted coefficient to become negative. The negative values of $\bar{R}^2$ associated with the trade equations thus imply a very poor fit of the sample data.

[10] The following discussion is based on the face value of the estimated coefficients. Because of the small sample size associated with the 1976-78 period, statistically significant evidence regarding structural shifts in the inventory equations was neither expected nor found. However, in experiments with other sample periods, the inventory-control parameters did remain reasonably stable, suggesting that the dramatic change occurring in these parameters during the 1976-78 period should be viewed as real.

Despite this evidence of improved inventory control, it is not necessarily true that inventory adjustments are now less likely to exacerbate cyclical swings in economic activity. In the short run, the impact on the level of inventory investment of a lower desired inventory-sales ratio and of a more rapid adjustment to the desired stock may be offsetting. While a lower inventory-sales ratio implies that a smaller decline in the level of inventories will be desired in response to a decline in sales, a higher speed of adjustment implies that more of any desired change in inventories may be achieved in a single period. Hence, a decline in sales may initially lead to a greater decumulation of inventory stocks if inventory control has improved.

An example

A simple example serves to illustrate the combined effect of the two aspects of improved inventory control (see Table 4). To begin with, assume that a business enterprise wishes to maintain an inventory-sales ratio of 2.0 and that sales are projected at 100 units per month. Also assume that the enterprise is currently holding 200 units (200/100 = 2) of inventory, so that the desired and actual stocks of inventories are the same. Finally, assume that the speed of adjustment for the firm is 0.25, so that only one-fourth of any discrepancy which does arise between the desired and actual stock of inventories can be eliminated in a single period. Given this set of assumptions, if sales for some reason were projected to fall to (and to remain at) 96 units per month, the enterprise would wish to reduce its stock of inventories to 192 units in order to maintain its desired inventory-sales ratio (192/96 = 2). Because only a fourth of this discrepancy of 8 units could be eliminated in a single period, inventory investment in the first quarter following the revised sales projection would be negative 2 units (0.25 x 8). In the following periods, inventory investment would be negative 1.5 units (0.25 x 6), negative 1.125 units (0.25 x 4.5), negative 0.87 units (0.25 x 3.375), and so on.

Now assume that a change in inventory management reduces the desired inventory-sales ratio to 1.5, without altering the speed of adjustment. At the initial level of sales, 100 units per month, the firm would wish to hold only 150 units of inventories (150/100 = 1.5), and a reduction in sales to 96 units would reduce the desired stock of inventories by only 6 units (150-144) instead of 8. With the same speed of adjustment as assumed before (0.25), the decline in the stock of inventories in each quarter following the change in the expected level of sales would be less after the change in inventory policy than before. For example, first quarter inventory investment would be negative 1.5 units (0.25 x 6) rather than 2 units as

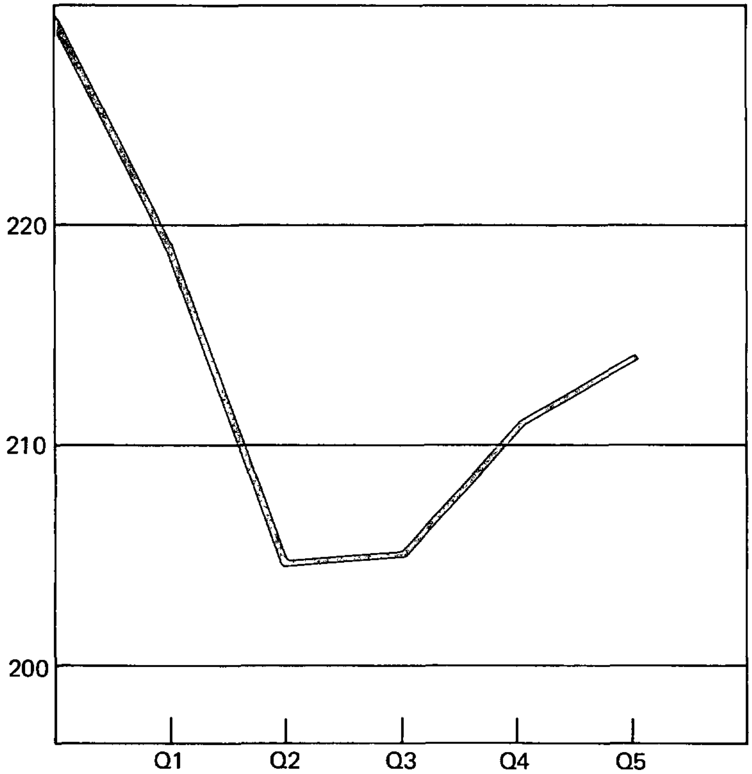
Table 4
IMPACTS OF HYPOTHETICAL CHANGES IN INVENTORY-SALES RATIO AND SPEED OF ADJUSTMENT ON INVENTORY INVESTMENT

	Case 1	Case 2	Case 3
Desired Inventory-Sales Ratio	2.00	1.50	1.50
Speed of Adjustment	0.25	0.25	0.50
Decline in Sales	4	4	4
Decline in Desired Inventory Stock	8	6 .	6
Inventory Investment Following Decline in Sales			
First Quarter	−2.00	−1.50	−3.00
Second Quarter	−1.50	−1.1 3	−1.50
Third Quarter	−1.13	−0.87	−0.75

before. In the second quarter, investment would be negative 1.125 units (0.25 x 4.5) rather than 1.5, in the third quarter 0.87 units (0.25 x 3.375) rather than 1.125, and so on. Because inventory investment would be less negative after the change in policy, it would contribute less to a downturn in economic activity signaled by a decline in sales.

Now assume that the decline in the desired inventory sales ratio from 2 to 1.5 is accompanied by an increase in the speed of adjustment from 0.25 to 0.5. The initial conditions remain the same as in the second example above, with sales equaling 100 units and the desired stock of inventories equaling 150 units. The 6-unit difference between the actual and desired stock of inventories resulting from a decrease in sales to 96 units is also the same as in the second example. However, the resulting pattern of inventory investment is not the same. In the first period, after the decline in sales, inventory investment equals negative 3 units (0.5 x 6) after the shift toward improved control, which is greater than the negative 2 units which occurs before the shift. This larger first-period decumulation of inventories occurs despite the smaller total decumulation of inventories needed to maintain the desired inventory-sales ratio, because the more rapid speed of adjustment causes a greater proportion of the needed decumulation to occur in the first period. While the decumulation in

Chart 4
MANUFACTURING SALES PATTERN ASSUMED FOR USE IN INVENTORY INVESTMENT SIMULATION
(In billions of 1972 dollars)



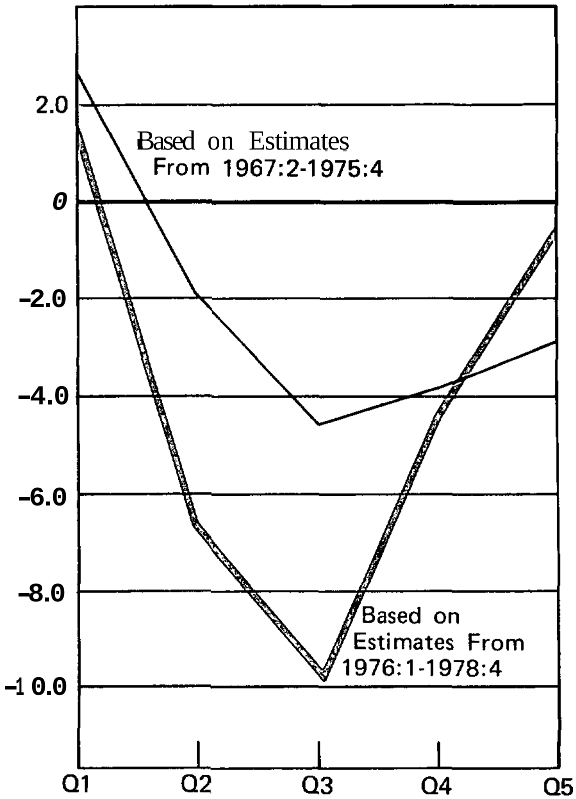
subsequent periods is less than before the shift (see Table 4), the initial impact of the shift to improved control is to make inventory investment more negative than it would have otherwise been, and thus contribute more to the cyclical downturn likely to correspond to the decline in sales.

This example illustrates the conflicting impact of the two aspects of improved inventory control on the size of inventory adjustments made in response to declines in sales. A decrease in the desired inventory-sales ratio implies that a given decline in sales will require a smaller reduction in inventory stocks. An increase in the speed of adjustment, however, implies that a greater proportion of any change in the desired stock of inventories will occur in the periods immediately following a decline in sales. The impact on investment behavior of a shift toward improved inventory control will thus depend upon the magnitude of the shifts in the desired inventory-sales ratio and the speed of adjustment.

A simulation experiment

A simulation experiment was conducted to determine the overall effect on inventory investment of the shift toward improved control implied by the estimates given in Table 3. First, a hypothetical data series for manufacturing sales was constructed, on the basis of an assumed decline and subsequent moderate recovery in the level of sales similar to that which occurred from late 1974 through 1975. The pattern of the assumed data series is shown in Chart 4. Inventory investment in manufacturing was then "forecast" on the basis of this sales pattern with both the 1967:2-1975:4 and 1976:1-1978:4 versions of the estimated model. The simulated path of manufacturing inventory investment resulting from this experiment is presented in Chart 5, while Chart 6 presents the corresponding simulated path for aggregate inventory

Chart 5
SIMULATED INVENTORY INVESTMENT: MANUFACTURING
(In billions of dollars, at annual rates)



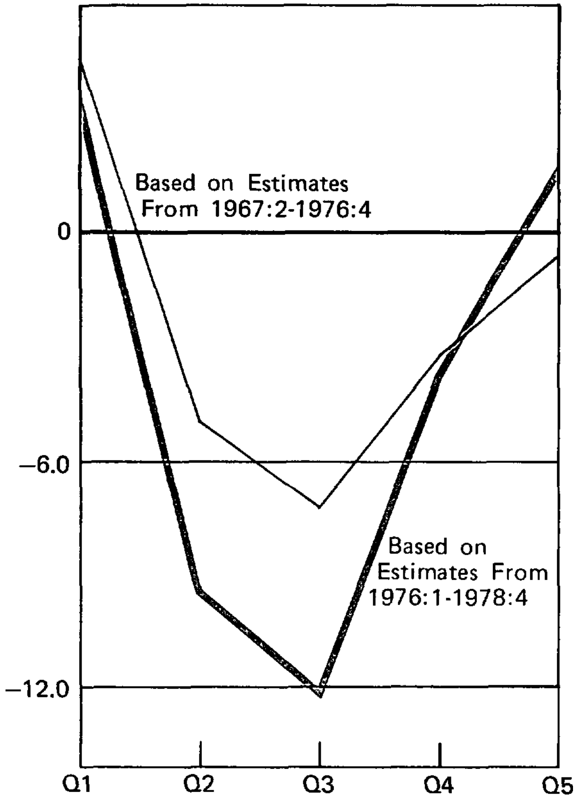
investment (manufacturing plus trade) based upon this same experiment.

The results suggest that the increased speed of adjustment dominates the reduction in the desired inventory-sales ratio during and shortly following periods of declining sales. Rather than reducing the contribution of inventory adjustments to cyclical downturns, the shift toward greater inventory control implied by the estimated model would appear to have increased this contribution.

CONCLUSION

This study of inventory behavior provides

Chart 6
SIMULATED INVENTORY INVESTMENT: MANUFACTURING AND TRADE
(In billions of 1972 dollars, at annual rates)



empirical support for the popular notion that manufacturers are controlling their inventories more closely than before, even though the post-1975 period is too short to provide definitive statistical evidence of such control. It does not necessarily follow, however, that the chances of large inventory swings have been reduced. While lower inventory-sales ratios, taken alone, do suggest smaller required adjustments in inventories, the ratio of inventories to sales is only one of two important inventory-control parameters. The other parameter is the speed with which businesses make desired adjustments to inventories. The faster this speed of adjustment, the greater the initial change in business inventories. Since the two inventory-control parameters work in opposite directions, the implication of improved inventory control for the business cycle becomes an empirical question. In terms of the overall impact on the size of inventory adjustments, the estimates derived for this study suggests that an increase in the speed of adjustment has occurred which more than offsets the reduction in the inventory-sales ratio. The findings reported in this article therefore do not support the notion that the potential contribution of inventory investment to a cyclical downswing has lessened since 1975 because of improvements in inventory control.

Appendix

Table A.1
SUMMARY OF ESTIMATION RESULTS FOR THE INVENTORY INVESTMENT EQUATIONS
(Sample Period: 1967:2-1975:4)

Inventory Investment in	Estimated Coefficients: Constant	Sales	Change in Sales	Unfilled Orders	Lagged Stock	Implied Marginal Desired Inventory-Sales Ratio	$\bar{R}^2$	S.E	D W.
Manufacturing:									
Materials and	1.36	.159	—	.047	–.204	.78	.720	.506	2.20
Work in Progress	(.9)	(5.6)	—	(3.8)	(-8.6)				
Manufacturing	2.72	.024	–.037	—	–.110	.22	.150	.358	1.84"
Finished Goods	(1.5)	(.9)	(-2.3)						
Distributive Trades:	1.95	.687	–.204	—	–.524	1.31	.474	.628	1.90
Retail	(1.9)	(5.2)	(–2.4)		(-5.4)				
Distributive Trades:	–.14	.366	—	—	–.233	1.60	.668	.347	2.30
Wholesale	(.3)	(8.2)			(–8.2)				

NOTE $\bar{R}^2$ equals multiple correlation coefficient corrected for degrees of freedom. SE equals standard error of estimate. DW equals Durbin-Watson statistic.
'The equation for manufacturers' finished goods was estimated with a correction for first order serial correlat~onThe Durbin-Watson statistic for the original equation was 1 38 and the estimation coefficient of serial correlation equal to .497

Table A.2
SUMMARY OF ESTIMATION RESULTS FOR THE INVENTORY INVESTMENT EQUATIONS
(Sample Period: 1976:1-1978:4)

Inventory Investment in	Estimated Coefficients: Constant	=	Change in Sales	Unfilled Orders	Lagged Stock	Implied Marginal Desired Inventory-Sales Ratio	$\bar{R}^2$	S E	D W
Manufacturing'									
Materials and	25.92	2.11	—	.073	–.567	0.37	.614	.387	2.06'
Work in Progress	(1.8)	(2.7)		(1.9)	(-7.0)				
Manufacturing:	13.74	.148	.094	—	–.568	0.26	.566	.259	2.22
Finished Goods	(4.0)	(2.0)	(-2.0)		(-3.0)				
Distributive Trades:	-2.35	.508	103	—	–.323	1.57	t	.381	1.73
Retail	(–.5)	(1.3)	(–1.0)		(-1.4)				
Distributive Trades:	.99	.290	—	—	–.189	1.53	†	.597	2.14
Wholesale	(.3)	(.5)			(– 5)				

'The equation for manufacturers' materials and work in progress was estimated with a correction for first order serial correlat~on.The original Durbin-Watson statistic was 2.62 and the estimated serial correlat~on coefficient was – 3647
†The adjusted R^2's for equations in the trade sector were negative.