# CURRENT ISSUES
## IN ECONOMICS AND FINANCE

# Explaining the Gap between New Home Sales and Inventories

*James A. Kahn*

*For much of the last four decades, the stock of unsold new homes has tracked sales very closely. Since 1995, however, inventories have fallen far behind rapidly advancing sales. What accounts for the change? Market trends have both reduced the need for inventories and slowed the response of inventories to shifts in demand. At the same time, the long current expansion has strained the resources of the building industry, creating supply shortages and raising costs.*

A review of recent data from the U.S. housing sector yields a surprising finding: Although sales of new homes have surged over the last five years of the economic expansion, the stock of new homes has not kept pace. The ratio of inventory to sales, which usually rises during an expansion, has dropped to near-unprecedented lows during the current period of prosperity. In the boom years of 1986-89, the ratio followed the customary  pattern, rising from 5.5 to 6.8; by contrast, from 1996 to 1999, the ratio fell from 6.0 to 4.3, and now stands at 4.1.

From one perspective, the gap between new home inventories and sales is reassuring: it suggests that the housing industry may already have prepared for a modest decline in sales and will not require large cutbacks in production if such a decline occurs. From another perspective, however, the gap could raise some concerns. Low inventories could point to a scarcity of building materials or of land suitable for residential development. More generally, a reduced supply of new homes might constrain sales over time. Such developments could put upward pressure on prices in the housing market.

In this edition of *Current Issues*, we investigate the reasons for the decline in new home inventories relative to sales. Chiefly, we are interested in knowing whether the gap stems from "secular"—that is, long-run— changes in the way the housing market operates or from cyclical factors relating to the duration and strength of the current expansion.

Our analysis of the data indicates that long-run market trends and cyclical factors alike have contributed to the low inventory-to-sales ratio. Looking at the market trends, we find that builders are putting up larger and more expensive homes, which require longer construction times. In addition, it appears that an increasing share of homes are sold before construction has begun, and these not-yet-started homes have historically had lower inventory-to-sales ratios. As for cyclical factors, we find evidence that the sustained increase in sales over the last five years of the economic expansion has pushed the industry to a point where costs have increased, profit margins have narrowed, and some materials are in short supply.

## Understanding the Relationship of Inventory and Sales

*Measuring Months' Supply*
In housing industry data, the ratio of inventory to sales is customarily expressed as "months' supply" of new houses.[1] In this article, we calculate months' supply as the stock of new homes at the end of a given quarter divided by the average monthly sales for that quarter.[2] Thus, months' supply is the number of months the stock of new homes would last if sales continued at the rate observed over the quarter.

*Past and Present Patterns*

In recent years, months' supply of single-family homes has declined to unusually low levels, hovering around 4.0 since 1998 (Chart 1). Before 1997, this ratio had not been below 4.8 since 1971. Moreover, only twice since the data became available in the early 1960s had the ratio fallen below 5.0 for at least two consecutive quarters, in 1967 and 1971.

A look at the behavior of inventories and sales over the last four decades suggests that the stock of new homes is no longer responding to changes in sales as it had in the past. Until 1995, inventories tracked sales very closely (Chart 2). To be sure, the response was lagged—inventories typically took about six months to adjust to shifts in sales. Nevertheless, the movements in the two series showed a very clear correspondence during these years. After 1995, however, inventories and sales diverged sharply, with sales climbing dramatically while inventories plunged. Although inventories have recovered modestly in the last two years, they have not begun to close the gap with sales.

The relationship of these movements to the business cycle has also changed. Before 1995, months' supply moved in tandem with the economy, rising during business expansions and falling during contractions. The correspondence with the business cycle stemmed in large part from the lagged relationship between inventory and sales. For example, if sales declined sharply, signaling a future contraction (sales are a leading indicator), inventory continued to increase for one to three quarters because of the flow of homes already in the pipeline. The net result of these changes was that

**Chart 2**
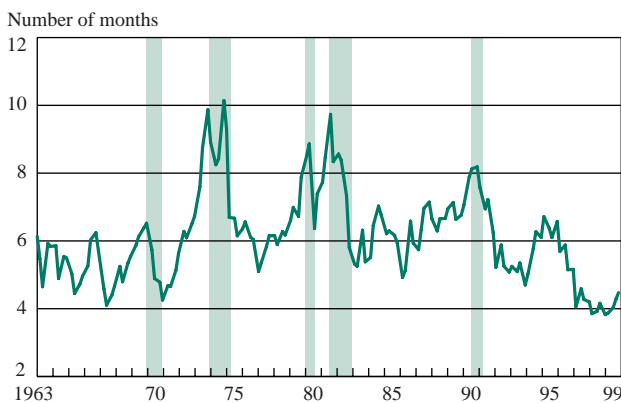**Inventories Usually Follow Sales**
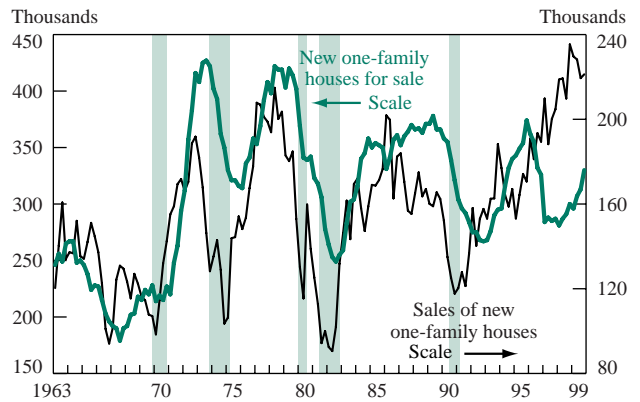


Sources: U.S. Bureau of the Census, Current Construction Reports; author's calculations.

Note: Shaded areas denote periods designated recessions by the National Bureau of Economic Research.

months' supply would reach its peak at about the same time as the economy.

Had previous patterns continued to hold, the present low months' supply would be typical of the early part of an expansion, when sales are growing and the supply response lags behind. Instead, the historic lows we are seeing now have occurred late in a long expansion, well after supply should have caught up with the rising sales.

Some sense of how sharply current developments in the housing sector break with earlier trends can be gained from Chart 3. The chart plots the results of a simple

**Chart 1**
**Months' Supply of New Houses**



Sources: U.S. Bureau of the Census, Current Construction Reports; author's calculations.

Notes: Months' supply is the stock of new homes at the end of a given quarter divided by the average monthly sales for that quarter. Data are seasonally adjusted. Shaded areas denote periods designated recessions by the National Bureau of Economic Research.

**Chart 3**
**The Inventory Gap**
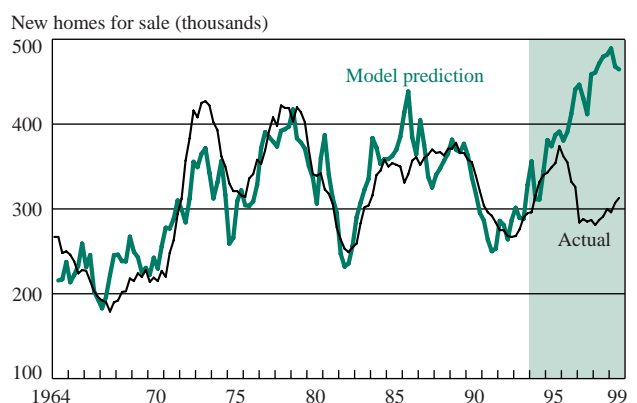


Sources: U.S. Bureau of the Census, Current Construction Reports; author's calculations.

Notes: The chart plots actual inventories against the predictions of a simple forecasting model that uses data on sales, interest rates, new home prices, and construction costs from first-quarter 1964 to fourth-quarter 1993. The shaded area represents out-of-sample forecasting.

forecasting model that uses data on sales, interest rates, new home prices, and construction costs through 1993 to predict the stock of new homes.[3] Although the model forecasts the number of houses for sale quite well through the beginning of 1996, its projections diverge dramatically from the actual series after that point. According to the model, current sales trends would imply a stock for sale of 465,500 units in the third quarter of 1999, compared with the 311,000 that we actually observe. Thus, more than 150,000 homes—or roughly 35 percent of what would have been expected at this point in the cycle—are, so to speak, missing.

To explain this apparent shortfall in new home inventories, we will look at two types of developments: long-term market trends and transitory or cyclical forces. The box below examines, in abstract terms, how market and cyclical forces can affect the behavior of the inventory-to-sales ratio. In the next two sections, we consider more specifically how these forces brought about the low months' supply of new homes during the past five years.

### Long-Term Trends in the Market for New Homes

*How New Home Sales Are Changing*
In recent decades, it has become increasingly common for builders to sell a home before construction has actu- ally begun—that is, when only a developed lot is available. This practice gives the buyer the opportunity to customize the new home—that is, to select a particular floor plan or special design features that can be implemented when the house is built. Chart 4 shows that the percentage of overall new home sales represented by the industry's "not started" category has risen steadily over the last twenty-five years, from an average of 19 percent before 1981 to 36 percent averaged over the first three quarters of 1999.[4] During the same period, both homes under construction and completed homes—the industry's other two categories of new homes—have accounted for a diminishing share of sales.[5]

A second notable industry trend is the construction of higher quality homes. Houses today are typically much larger than houses built twenty years ago: average square footage for new single-family homes has risen steadily from 1,700 in 1980 to 2,170 in 1998.[6] In addition, new homes tend to have many more "extras," such as central air conditioning, fireplaces, and two- or three-car garages. As a result of these changes, new houses have become more expensive. The real value of construction put in place relative to the number of houses under construction is 34 percent higher in the 1990s than it was in the 1970s. Also noteworthy is that the average selling price of new homes has drifted

---

### Determinants of Inventory-to-Sales Ratios

Economists have increasingly come to understand that inventories of final goods are held primarily to facilitate—and thereby increase—sales. A producer will accumulate inventory up to the point that the marginal benefit from the increased sales is just offset by the costs of carrying the inventory. For builders, these carrying costs include the interest rate they pay when they establish credit lines with banks to finance land development or home construction. The costs also include the depreciation builders incur on equipment and on the inventory itself.

Calculations of the profitability of sales and the carrying cost of inventories will clearly help to determine a producer's average desired inventory-to-sales ratio. In addition, the ratio will reflect "technological" factors—such as the availability of timely information for use in forecasting future demand— and market-specific considerations that influence the impact of inventories on sales. Builders, for example, will consider the extent to which low supplies of certain categories of new homes result in lost sales.

Variation in inventory-to-sales ratios will also arise from other more transitory or cyclical factors. In general, inven- tory theory* says that inventory-to-sales ratios will decline in response to the following:

- *lower price-cost margins.* Inventories boost sales, but the benefit of such increases to the producer will vary with the markup of price over marginal cost.

- *expectations of declining production costs.* If costs are relatively high now, it is profitable to shift production toward the future, and therefore to reduce current inventories.

- *high real interest rates.* Along with depreciation, the payment of interest rates is the main carrying cost of inventories.

- *unexpectedly high sales.* An unanticipated high vol- ume of sales directly reduces inventories, and its effect will persist to the extent that inventories are slow to adjust.

- *expectations of sales declines.* Current inventories are really targeted at future, rather than current, sales. Producers will therefore draw down inventories in anticipation of a decline in sales.

_____
*See Bils and Kahn (2000) for the theoretical underpinnings of this analysis.

**Chart 4**
**Composition of New Home Sales by Stage of Construction**
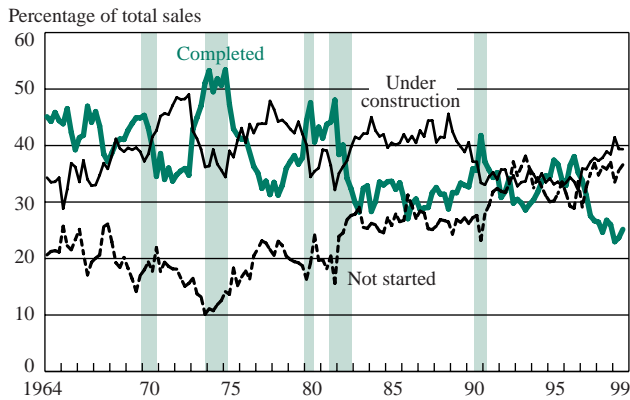
Percentage of total sales



Sources: U.S. Bureau of the Census, Current Construction Reports; author's calculations.

Note: Shaded areas denote periods designated recessions by the National Bureau of Economic Research.

upward relative to a fixed-quality index, providing further evidence that the quality of new homes has risen.

The trend toward bigger and better homes, like the trend toward customization, has been fueled by demographic factors. The peak of the population distribution currently lies in the age range of forty to forty-four, and household heads in this group are more likely to be moving up to larger homes than purchasing the smaller "starter" homes that dominated construction in the 1960s and 1970s. Moreover, income has risen for households headed by men and women in the broad home-buying age range of thirty to forty-nine. Between 1970 and 1990, the number of such households that reported income exceeding $50,000 (in 1990 dollars) rose from 2.77 million to 6.74 million, or from approximately 25 percent to 33 percent of all such households. Thus, more families can now afford large, customized houses.

*How Housing Trends Affect the Inventory-to-Sales Ratio*
The growing practice of selling homes before construction has begun has contributed to the decline in the inventory-to-sales ratio through a simple compositional effect. Homes that are not yet started typically have low inventory-to-sales ratios. The reason is that each such home—in essence, a finished lot—is a largely generic product that can be easily replaced by another, enabling builders to limit the numbers they keep in stock. Since this category of new homes now accounts for a much larger proportion of new home sales, its low inventory-to-sales figures are driving the overall ratio down. If we were to adjust the months' supply series to make the composition of new home sales—in terms of stage of construction—more like it was through 1980,[7] the aver-

age months' supply for the first three quarters of 1999 would have been 4.50 rather than 4.06—still low, but not so conspicuously out of line with earlier levels.

The trend toward building larger, higher quality homes has affected the inventory-to-sales ratio through an increase in construction time.[8] Average "time-to-build" for contractor-built single-family homes has risen from about four months in the early 1970s to nearly six months more recently. This increase in construction time appears to have lowered the inventory-to-sales ratio in the new home sector by slowing the response of inventories to cyclical fluctuations in sales.

How would such an effect come about? Longer construction time means that there are always more homes in the pipeline. Thus, when sales turn down, it takes longer for builders to sell off the stock in the pipeline. By the same token, when sales turn up, builders may be less quick to rebuild their inventories, knowing that if sales start to falter, unloading the stock will require more time than in the past.

Evidence that the supply side of the market is, in fact, reacting much more sluggishly to fluctuations in sales is presented in Chart 5. The chart shows the correlation between the stock of new homes and current and previous sales for two different periods: first-quarter 1963 to fourth-quarter 1984 and first-quarter 1985 to third-quarter 1999. In the earlier period, the correlation peaks at three quarters, meaning that inventories are

**Chart 5**
**The Changing Responsiveness of Inventories**
Correlation between the Stock of New Homes and Current and Previous Sales
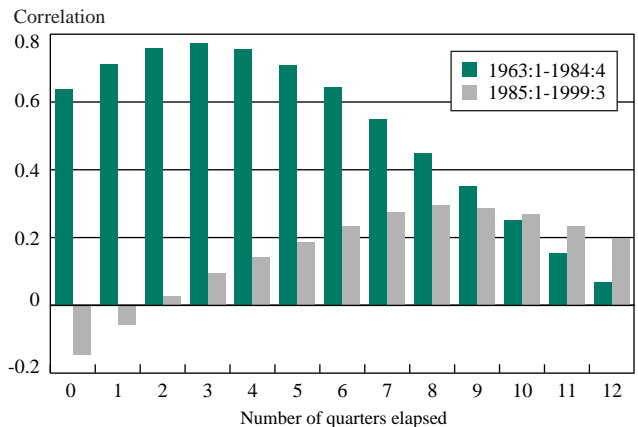


Sources: U.S. Bureau of the Census, Current Construction Reports; author's calculations.

Notes: The horizontal axis gives the number of quarters elapsed between the measurement of sales and the measurement of inventories. For example, the green bar positioned over "2" represents the correlation between inventory at the end of a given quarter and sales from two quarters earlier over the 1963-84 period.

most closely related to sales three quarters earlier.[9] By contrast, in the later period, the correlation starts out in negative territory and only peaks at eight quarters, indicating that inventories are most closely linked to sales a full two years before.

The longer lag between a shift in sales and the inventory response sheds light on the decline in the inventory-to-sales ratio in recent years. The current low ratio may in part reflect a permanent change in the timing of the inventory response to a surge in sales.[10]

### Cyclical Factors

Long-term industry trends have clearly contributed to the low inventory-to-sales ratio observed in recent years, but they cannot fully explain the dramatic drop in months' supply. Short-term fluctuations have also helped to shape the behavior of the inventory-to-sales ratio (see the discussion of cyclical factors in the box). In this connection, we note that while the overall U.S. economy has entered its tenth year of expansion, the housing sector experienced a recession in 1994-95. Indeed, sales fell 21.3 percent in the brief period from the end of 1993 to the beginning of 1995. Thus, for housing, the current expansion is effectively only five—rather than nine—years old. A relatively low inventory-to-sales ratio a few years after a recession is not unprecedented. For example, the ratio bottomed out in 1977 following the 1974-75 recession, and in 1986 following the 1981-82 recession.

In addition, the large decline in sales associated with the recession most likely left builders unprepared for the surge in sales that followed. After the sharp drop in 1993-95, sales climbed 53 percent over the next four years. As noted in the box, an unexpected jump in sales tends to lower inventory-to-sales ratios by reducing inventories directly. Although in the last two years, inventories have risen fairly steadily, particularly in the category of houses not yet started, the net percentage increase in new homes for sale has been less than the percentage increase in sales.

Another cyclical factor that may have contributed to the decline in the inventory-to-sales ratio is the increase in construction costs relative to the selling prices of new homes. Adopting the assumption that builders incur costs for two quarters and receive the price for the house that obtains in the second quarter, we can construct an index to measure changes in cost relative to selling price.[11] We find that over 1995-99, the index rose roughly 2 percent above its average value in the early 1990s. The higher relative cost—and the consequent reduction in builders' profit margins—tend to undercut the benefit of holding inventories and hence lower the desired inventory-to-sales ratio (see box).

Along with overall construction costs, prices of key inputs such as lumber and gypsum are up substantially relative to new house prices since 1991.[12] Temporarily high costs provide an incentive for builders to shift production toward the future—a strategy that leads to lower current inventories.

A final factor that may have contributed to the decline in inventories is the existence of shortages in building materials. In some cases, these shortages appear to be related to rationing and delivery lags on the part of suppliers.[13] Since a scarcity of materials contributes directly to construction delays, this development may help explain why construction times have lengthened even after we allow for the upward trend in time-to-build.

### Conclusion

The recent decline in the months' supply of new homes appears to stem from a combination of secular and cyclical forces. Certainly, there have been significant changes in the way the housing industry operates: more homes are sold before construction begins, construction times have increased, and builders are less quick to respond to fluctuations in sales. But at the same time, shortages in building materials, increased construction costs, and reduced profit margins indicate that the ongoing surge in sales during the current expansion may be testing the industry's limits.

What does our analysis suggest about the future course of the new home sector? Given that demand is likely to remain robust, we would expect continuing strength in housing starts and sales. Growth might proceed at a more moderate pace, however, as selling prices rise in response to cost increases and as the recent round of rate increases takes its toll on this interest-sensitive sector. Still, the current low inventory levels offer some assurance that the sector could weather a slowdown in sales without the dramatic decline in construction activity that has characterized past downturns.

### Notes

1. We use the terms "inventory-to-sales ratio" and "months' supply" interchangeably in our analysis.

2. Most of the housing data are available on a monthly basis. We base the figures and statistics in this article on quarterly data because month-to-month fluctuations in the data are sharp and tend to obscure the overall picture.

3. The forecast equation is

$$\begin{aligned}
LOG(FT) = {} & 0.170 + 0.310 \times LOG(SSA) + 0.599 \times LOG(SSA(\text{-}1)) \\
& + 0.006 \times FTB3 + 0.045 \times FTB3(\text{-}1) - 2.204 \\
& \times LOG(HPDEX) - 2.724 \times LOG(HPDEX(\text{-}1)) \\
& + 3.877 \times LOG(CCIHF) + 1.208 \times LOG(CCIHF(\text{-}1)),
\end{aligned}$$

where FT is the stock of homes for sale, SSA is seasonally adjusted sales, FTB3 is the three-month Treasury bill rate, HPDEX is the price index for new homes, and CCIHF is the fixed-weight construction cost index. A (-1) indicates a one-quarter lag.

4.  Note that these figures do not include owner-built homes, which have shown little trend one way or the other.

5.  A unique feature of the data on new homes is the breakdown of statistics by stage of construction. The overall inventory and sales data add together 1) houses not yet started, 2) houses under construction, and 3) completed houses.

   Although the data on new homes are generally available monthly from 1963 on, the data on houses for sale by stage of construction have a gap from July 1967 through October 1970. Still, one can estimate the stage-of-construction data with a high degree of accuracy from other available data (total houses for sale, sales by stage of construction, starts, seasonal factors, and a time trend). Therefore, rather than disregard the period from 1963 to 1970, this analysis makes use of the interpolated data to cover this gap.

6.  See U.S. Bureau of the Census (1982-99), Table 22.

7.  Inventories and sales are computed as the sums of the three stage-of-construction components. Thus

$$I/S = \frac{I_1 + I_2 + I_3}{S_1 + S_2 + S_3} \, ,$$

which equals $s_1(I_1/S_1) + s_2(I_2/S_2) + s_3(I_3/S_3)$ , where $s_i = S_i/(S_1 + S_2 + S_3)$, the share of sales by stage of construction ($i = 1, 2, 3$). The composition-adjusted I/S ratio fixes the $s_i$ weights at their pre-1980 averages.

8.  This trend exemplifies the market-specific factors referred to in the box.

9.  This result is roughly consistent with Topel and Rosen's (1988) finding that "most of the long-run adjustment occurs within one year."

10.  We have suggested that the slow response of the housing stock to changes in sales is related to increased construction time, but it might also reflect a more cautious attitude toward speculative home building in the wake of the boom and bust cycle of the 1980s.

11.  The relative cost index is

$$\frac{Cost}{Price} = \frac{C_t + \beta_t C_{t+1}}{\beta_t P_{t+1}} \, ,$$

where $C_t$ is a cost index and $P_t$ is a price index (both fixed-weight—that is, quality-adjusted), and $\beta_t$ is a nominal discount factor $(1/(1+ \text{three-month Treasury bill rate}))$.

12.  See Crist (1999), for example.

13.  For example, "Interior Struggle: A Dearth of Drywall Leaves Contractors with Their Studs Bare," *Wall Street Journal*, March 15, 1999, reports that some outlets are rationing drywall, causing builders to delay the completion of new houses.

## References

Bils, Mark, and James A. Kahn. 2000. "What Inventory Behavior Tells Us about Business Cycles." *American Economic Review*. Forthcoming, June.

Crist, Dean. 1999. "The Cost for Building Materials and Components." *Housing Economics* 37, no. 3 (March).

Topel, Robert, and Sherwin Rosen. 1988. "Housing Investment in the United States." *Journal of Political Economy* 96, no. 4 (August): 718-40.

U.S. Bureau of the Census. 1982-99. *Characteristics of New Housing*, various issues.

## About the Author

James A. Kahn is a research officer in the Domestic Research Function of the Research and Market Analysis Group.

### Get New Publications Quickly via Electronic Alert

By subscribing to our free Electronic Alert Service, you can automatically receive e-mail notifications when new publications are posted at the Research and Market Analysis Group's web site. You can then go directly to the site and download the materials. Please visit http://www.ny.frb.org/rmaghome for details.