Urban Economics

Fifth Edition

Mills • Hamilton

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Compositer: Black Dot Graphics, Inc.
Printer and Binder: R. R. Donnelley & Sons Company
Cover Printer: The Lehigh Press, Inc.

Library of Congress Cataloging-in-Publication Data

Mills, Edwin S.
Urban economics / Edwin S. Mills, Bruce W. Hamilton.—5th ed.
p. cm.
Includes bibliographical references and index.
ISBN 0-673-46867-4
1. Urban economics. I. Hamilton, Bruce W., 1946- . II. Title.
HT321.M53 1993
330.9173'2—dc20 93-11766
CIP

93 94 95 96 9 8 7 6 5 4 3 2 1

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The Market for Housing

Housing is important, especially in cold climates where dwellings are crucial for survival. Everywhere, dwellings are essential components of living standards, comfort, security, and social status. People devote not only large shares of their incomes to housing, but also extensive amounts of their time and energy to acquiring, financing, maintaining, repairing, improving, and operating their homes. Americans devote about 15.5 percent of personal income to housing and another 12.5 percent to household operation (e.g., utilities, insurance, maintenance, and repair).

Needless to say, housing also is a valuable asset. In fact, housing is the largest category of privately owned assets. The market value of dwellings is more than 40 percent of the market value of all privately owned fixed capital. (In addition to housing, fixed capital includes consumers' durables, business equipment, and nonresidential real estate.) The market value of housing is about 1.8 times annual disposable income. Although Americans complain endlessly about the cost of housing, most are better housed, and at lower costs relative to incomes, than are people in almost any other country.

Not only is housing this country's largest asset category, but also it is among the most durable. The average American dwelling lasts about 40 to 50 years. Many houses last 100 years, and some last longer than 200 years. Much depends on the material from which the house is constructed—brick and stone houses last longer than wooden ones. Much also depends on the care, maintenance, and repair history of the house, and on economic considerations. Some houses are converted to nonresidential uses—stores and offices—because the most valuable use of the structure shifts. In addition, many houses are demolished intentionally, either because the most valuable use of the land has shifted or because the value of the land has risen enough to justify much more intensive use of the land, for high-rise apartments, for example.

Consumer and producer equipment tends to last only 5 to 20 years, in comparison. Modern structural-steel office buildings are constructed to last longer than houses. Few structural-steel office buildings were built before the 1920s, but some of these 70-year-old buildings are still functional. Structural-steel office buildings, however, represent the only class of assets that is built to last longer than houses. Durability is advantageous in keeping housing costs low relative to construction costs, but it also causes social problems, which will be discussed subsequently.

This chapter provides an introduction to the analysis of markets for housing. The next chapter analyzes housing finance and personal decision-making regarding homeownership. Chapter 12 analyzes housing problems in the United States and housing issues that relate to the low-income segment of the population.

☐ QUANTITY AND PRICE MEASURES FOR HOUSING

Earlier chapters have referred to the price and quantity of housing, and the usual assumption was made that the quantity demanded and supplied depended on price. That assumption is appropriate whether the reference is to housing or eggs, but the concept of quantity is much more complex with housing than with almost any other commodity. Before a discussion on housing issues can continue, the meanings of price and quantity must be sorted out. For example, the statement that poor people consume less housing than wealthy people is meaningful only if price and quantity can be distinguished.

What is the difference between a $100,000 house and a $200,000 house? Is the price per unit of housing in the second house twice as high as the price of the first, does the second house represent twice as much house as the first, or is the difference a combination of price and quantity? Perhaps, the first house is twice as expensive as the second because it is closer to the CBD, it may be a difference in price, or it might simply be twice as much housing at the same price per unit. Only housing asset values can be observed directly, not price or quantity.

The measurement problem is further complicated by the extreme durability of housing and by the existence of both rental and homeowner markets. Who is paying a higher price for housing, an owner who occupies a $100,000 house or a renter who pays $700 per month for an identical house?

Quantity

Consumers value many characteristics of residences, such as floor space, number of rooms, internal layout, structural quality, decoration, appliances, and yard space. Assume that only two characteristics matter,

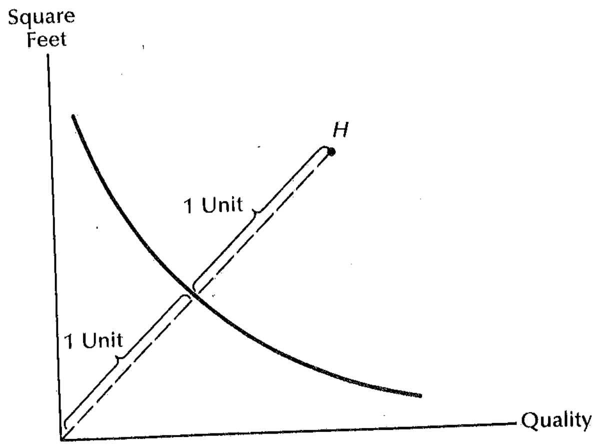

Figure 10.1 *Measuring "Units" of Housing*

floor space and an undefined quality concept. Making the usual assumption that consumers have coherent and consistent tastes, they have indifference curves between floor space and quality, one of which is shown in Figure 10.1. All combinations of floor space and quality on the indifference curve are equally desirable to the consumer. Hence, an indifference curve can be selected and the dwellings represented by the points on that indifference curve can be defined as containing one unit of housing.

We can call the indifference curve by which we have defined one unit of housing the *reference curve.* This reference curve is arbitrary. The theory of consumer behavior assumes that exactly one indifference curve passes through each square feet-quality combination. Because indifference curves can be arbitrarily numbered or renumbered, the indifference curve through any square feet-quality combination can be selected and the dwellings on that indifference curve can be defined as one unit of housing. Now, consider the house labeled *H* in Figure 10.1 as containing amounts of floor space and quality that are indicated by its coordinates on the graph. Draw a line from *H* through the origin and assume that *H* consists of twice as much floor space and quality as the house situated where the line through the origin crosses the reference curve. Then, if *H* is a two-unit house, it represents twice as much housing as a house on the reference curve. Note that, although the choice of a one-unit dwelling is arbitrary, once a one-unit house has been designated, a two-unit house is well defined. A *two-unit house* is any house on the indifference curve that passes through *H* and is twice as much house as a one-unit house. Thus, a two-unit house is a quantitative concept—twice as much house as a one-unit house—even though both one- and two-unit houses include a variety of square feet-quality combinations.

How could this representation be generalized to account for the many dimensions of housing quantity in addition to floor space and the many components of quality that matter to consumers? Economists have developed a technique called *hedonic price-index analysis* to estimate quantity and quality in realistically complex cases, and many studies have applied hedonic analysis to housing.[1] For example, a recent study concludes that central air conditioning adds about 5.4 percent to a dwelling's value and that a detached home is worth about 6.7 percent more than an attached home, assuming all other characteristics are fixed. The implication is that a non-air-conditioned detached home and an air-conditioned attached home are on indifference curves that represent nearly the same quantity of housing.

Price

Having measured quantity (relative to an arbitrary unit *quantity*), price now can be measured by dividing house value by quantity. This number is a price measure in that it captures the variation in house value that remains after correcting for differences in quantity. Returning to the example of the $200,000 and the $100,000 houses, if the quantity measures showed that the first had twice as many units as the second, we would find that $200,000 divided by 2 equals $100,000 divided by 1; that is, the price per unit of the two houses is the same. More specifically, this measure is defined as the *asset price,* as it is calculated by dividing the value of the house by quantity.

By similar means, *rental price* can be calculated by dividing monthly (or annual) rent by quantity. The rental price tells how much it would cost to rent a dwelling relative to one with characteristics that place it on the reference indifference curve.

Both value prices and rental prices, of course, may vary from time to time and from place to place. Chapter 6 introduced the possibility of spatial variation in housing prices, and this chapter looks at variations over time. The reason for going through the previous analysis is to be sure that *price* is observed in the same sense that economists and others generally use the term.

Relationship Between Value Price and Rental Price

The market relationship between value price and rental price is probably the most important concept in the analysis of housing markets.

1. Basically, hedonic analysis regresses (see the Appendix) dwelling price on a function of many dwelling (and neighborhood) characteristics. The estimated equation can be used to calculate combinations of characteristics that result in the same sales price. The technique is made feasible by the availability of large data sets of many dwelling characteristics and prices at which the dwellings were sold. Hedonic analysis was introduced by Griliches (1971) to disentangle price and quantity-quality changes in automobiles. The definitive, but difficult, theoretical report is by Rosen (1974). A pragmatic application is written King and Mieszkowski (1973). Many hedonic analyses of housing prices appear in the *Journal of Urban Economics.* The example in the following text sentence is from Mills and Simenauer (1992).

Table 10.1 *Movements in Value Prices, Rental Price, Real Interest Rates, and Nominal Interest Rates, 1965 to 1990*

Year	(1) Value Price	(2) Average Mortgage Rate	(3) Rental Price	(4) Real Interest Rate	(5) Real After-tax Mortgage Rate
1965	100.0	5.83	100.0	5.09	3.63
1966	101.4	6.40	98.5	5.24	3.64
1967	101.4	6.53	97.5	5.19	3.56
1968	102.3	7.12	95.8	5.03	3.25
1969	104.6	7.99	93.9	5.88	3.88
1970	101.6	8.52	92.3	5.88	3.75
1971	102.7	7.75	92.6	4.64	2.70
1972	105.9	7.64	92.8	4.40	2.49
1973	108.6	8.30	91.1	5.05	2.98
1974	107.0	9.22	86.2	4.85	2.55
1975	107.8	9.10	83.0	5.17	2.90
1976	110.5	8.99	82.8	4.08	1.83
1977	116.1	8.95	82.4	3.68	1.44
1978	123.1	9.68	81.8	4.58	2.16
1979	127.2	11.15	79.0	5.27	2.48
1980	123.7	12.25	75.7	5.43	2.37
1981	121.2	16.52	74.5	9.78	5.65
1982	117.0	15.79	75.8	9.90	5.95
1983	116.0	13.43	76.8	8.15	4.79
1984	116.0	13.80	78.0	8.80	5.35
1985	114.3	12.28	79.4	8.80	5.73
1986	117.6	10.07	82.3	8.97	6.45
1987	120.2	10.17	82.7	5.74	3.20
1988	119.6	10.30	82.8	5.88	3.30
1989	118.3	10.21	82.9	5.56	3.00
1990	114.0	10.08	82.3	3.97	1.45

Notes: Column 1 shows the real value price of housing: the price index of new one-family homes divided by the Consumer Price Index (CPI) and set equal to 100 in 1965.
Column 2 shows the average conventional new-home mortgage rate.
Column 3 shows the CPI rent component divided by the CPI, set equal to 100 in 1965.
Column 4 shows the estimate of the real mortgage rate.
Column 5 shows the estimate of the real after-tax mortgage rate.
Sources: Data from U.S. Department of Commerce, Bureau of the Census; Bureau of Labor Statistics; *Federal Reserve Bulletin* (Washington, D.C.: Government Printing Office); and Hulten, Charles, and Robert Schwab. "Income Originating in the State and Local Sector." Working paper (College Park: University of Maryland, 1987).

Confusion over these concepts has resulted in errors in analysis and governmental policy. Table 10.1 shows some general information that is relevant to the subject.

In principle, the relationship is straightforward: *asset price* is the present value of rent minus the present value of costs of operation.[2] In fact, the relationship is rather complicated because of considerations of

2. The remainder of this discussion will use the terms *value* and *rent* rather than the more cumbersome *asset price* and *rental price*. This substitution will cause no problems if the reader remembers that *asset value* and *rental* each refer to dwellings with the same characteristics.

taxation, capital gains, inflation, maintenance, and depreciation, as well as interest.

We begin with the simple case in which rent and value are linked only by the interest rate. In this simple model, assume that housing lasts forever, with no depreciation, maintenance, capital gains, or taxes. In this unrealistic case, if rent is to cover the landlord's costs,

$$R = iV, \tag{10.1}$$

where R is rent, i is the interest rate, and V is value. Given the simplifications assumed, the landlord's only cost is the annual interest on the investment.[3] If the rental market is competitive (and therefore the landlord makes no abnormal profit), annual rent (R) just covers annual cost (iV).

Note that the relationship between R and V has been described in two equivalent ways: R is the annual cost of holding a house of value V, embodied in Equation (10.1), or V is the present value of future R (assumed to be a constant stream forever). This version of the relationship can be found by rearranging Equation (10.1):[4]

$$= \frac{R}{i} = \sum_{t=1}^{\infty} \frac{R}{(1+i)^t}. \tag{10.2}$$

The rent is the amount that a competitive landlord charges a tenant for the right to occupy the dwelling for one year. The rent, then, is the relevant price term when a renter's demand function for housing is considered. It is important to note that *the rent is also the price a homeowner faces for the right to occupy housing.* This amount can be seen in two ways. First note that the homeowner's annual cost is iV. Second the opportunity cost of occupying a house is obviously the annual rent the homeowner could charge if the owner moved out and rented the house to a tenant.

Thus, just like the renter's, the homeowner's cost of housing is the rent, and it is the rent—not the value—that enters the homeowner's demand function and governs the amount of housing he or she consumes. The value makes no difference either to the homeowner or to the renter except through its influence on the rent (via Equation [10.1] or

3. It does not matter how much of the house is financed by a mortgage. That which is not financed by the mortgage is the owner's equity. By having some of his or her wealth tied up in the house, the homeowner is foregoing interest that could be earned by selling the house and investing the equity at the market rate of interest. "Interest" includes interest paid on the outstanding mortgage plus foregone interest on the homeowner's equity. Of course, borrowing rates are actually somewhat greater than lending rates for most homeowners, but that difference is ignored here.

4. t indicates the year number. The right side of Equation (10.2) is a shorthand expression for the discounted sum of future rents:

$$\sum_{t=1}^{\infty} \frac{R}{(1+i)^t} = \frac{R}{(1+i)} + \frac{R}{(1+i)^2} + \frac{R}{(1+i)^3} = +\ldots+ \frac{R}{(1+i)^{\infty}}.$$

[10.2]). By way of example, if the value rises 10 percent and the interest rate falls 10 percent, the rent does not change, and neither the owner-occupant nor the renter is induced to change behavior. If the house is occupied by the owner, the expression "implicit rent" is sometimes used.

☐ COST OF CAPITAL: COMPLICATIONS

The coefficient linking R and V is known as the *cost of capital,* because it measures the cost of holding a unit of capital for a year. In the previous case, the only cost is interest; if the interest rate is 10 percent, the cost of holding $1.00 of capital for a year is $0.10. This section's task is to modify the cost-of-capital term to account for costs other than interest that are associated with holding housing capital.

If the house is subject to a property tax, at the tax rate T, operating costs (maintenance, repair, insurance, utilities), at the rate c, and expected capital gains net of depreciation, at the rate g, the rent becomes

$$\begin{aligned} R &= iV + TV + cV - gV \\ &= (i + T + c - g)V. \end{aligned} \tag{10.3}$$

Each of the terms multiplied by V is an item in the landlord's cost and is assumed to be proportional to value. For a house of value V and unit costs given by i, T, c, and g, R is the rent that must be charged to cover costs. R is the total cost incurred by holding the house for a year, whether the owner occupies the house or rents it to a tenant. If the owner rents it to a tenant, the owner must recover these costs in rent; if the owner occupies it, he or she incurs these costs for housing. Most of the costs included in Equation (10.3) are cash outlays. The part of iV that represents interest payments to the mortgage lender is a cash outlay. (Why are mortgage-principal payments not included in Equation [10.3]?) The part of iV that is not mortgage-interest payments is an opportunity cost, but not a cash outlay. gV is an unrealized capital gain or loss (until the house is sold), so it is a "paper" or opportunity cost, which is negative if g is greater than zero.

Inflation

The incorporation of inflation into Equation (10.3) is critical to understanding housing markets as inflation rises and falls. Incorporating inflation requires an understanding of the relationship between interest rates and inflation.

Ignoring federal income taxes, the true cost of borrowing is the interest payment less the inflation that occurs between the time of borrowing and repayment. The reason is that inflation renders the repaid dollars less valuable than the borrowed dollars. Thus, the repayment of principal does not return to lenders all of the purchasing power they lent out sometime earlier. To maintain the real value of the borrowed principal outstanding, or to keep the principal whole, competitive markets tack on an *inflation premium* to interest rates.

Expressing this observation in terms of rates of inflation and interest,

$$i = i^r + \pi, \tag{10.4}$$

where i is the interest rate, π is the inflation rate, and i^r is the true cost of borrowing in terms of purchasing power, called the *real interest rate*.[5] For example, suppose there is 4 percent inflation, and a lender demands a 3 percent real return on investment. The "nominal" interest rate (i) must be 7 percent (3 percent plus 4 percent) to keep the capital whole and yield 3 percent.

Suppose now that the nominal interest rate rises one percentage point for each percentage point of inflation and that the rate of capital gains does likewise. That is, suppose the real interest rate and the real rate of capital gains are independent of the rate of inflation. This concept can be represented by replacing i by $(i^r + \pi)$ and g by $(g^r + \pi)$ in Equation (10.3) (g^r stands for real capital gains). How does this influence the cost-of-capital expression? It gives the following:

$$\begin{aligned} R &= [(i^r + \pi) + T + c - (g^r + \pi)]V \\ &= [i^r + T + c - g^r]V. \end{aligned} \tag{10.5}$$

Since there is the same inflation premium on interest and capital gains, inflation is canceled and the cost-of-capital is unaffected by inflation. Thus, "pure" inflation is neutral with respect to the rental price of housing, just as pure inflation is neutral with respect to all relative prices.

This result is important. It says that a rise in the interest rate brought about by a rise in inflation expectations does not depress the demand for housing. In other words, an 8 percent mortgage when inflation is 6 percent is no more costly than a 2 percent mortgage when inflation is zero. In the former case, the homeowner anticipates a 6 percent capital gain (due to the 6 percent inflation), which can be used to pay all but two percentage points on the mortgage. Of course, if the mortgage rate is 8 percent and inflation is zero, the true cost of borrowing is the full 8 percent. Many people expressed surprise over the fact that the high interest rates of the 1970s and early 1980s failed to choke off housing demand. An important part of the reason is that interest rates were not high after accounting for inflation.

5. Equation (10.4) is not quite right, as it does not allow for continuous compounding. The correct expression is $1 + i = (1+i^r)(1+\pi)$. Multiplying out the right side $i = i^r + \pi + i^r\pi$. The product $(i^r\pi)$, however, can be ignored unless either i^r or π is very large.

Federal Income Taxation*

The reason that many people think that inflation is good for homeowners is that they concentrate on the capital gains and not on their interest payments (and, of course, not on foregone interest on their equity). These days, interest rates quite fully reflect the market's anticipated inflation rates. Homeowners benefit from inflation if they obtained a fixed-interest rate mortgage and if inflation that the lender did not anticipate when the mortgage was originated occurs during the life of the loan. That requires the owner-borrower to be lucky or to outguess a market in which thousands of smart people pay careful attention to all publicly available information that is relevant to trends in interest rates and inflation. Don't depend on outguessing the market! More on this subject will be discussed in the next chapter.

The next step is to introduce federal income taxation. Federal tax law treats owner-occupied and rental housing differently. This section provides a brief introduction to taxation of owner-occupied housing. A full discussion of taxation of owner-occupied and rental housing will be presented in the next chapter.

As was pointed out, what has been referred to as interest payments consists of two parts: mortgage-interest payments and the foregone interest on the homeowner's equity in the house.[3] As a good approximation, the assumption will continue to be that the interest rates on the two parts are the same. Mortgage-interest payments are deductible on the federal income tax form, provided that the taxpayer itemizes. Interest on an investment, such as a federal government or corporate bond, that the homeowner could have made instead of investing his or her equity in the home is fully taxable. (Interest on state and local government bonds is not taxable by the federal government, but interest rates are lower on such investments by about the top marginal income tax rate.) Thus, whether the homeowner has a large mortgage or a large equity in the home, it is aftertax interest that represents his or her cost. If the interest is paid on a mortgage, the federal government pays a fraction t of the interest, where t is the homeowner's top marginal tax rate. Thus, the homeowner's after-deductibility interest rate is $i(1-t)$. If the interest is foregone interest on the homeowner's equity, it would be taxable, so the owner's opportunity cost is $i(1-t)$. Thus, the new rent to value equation becomes

$$R = [i(1-t) + T(1-t) + c - g]V, \qquad (10.6)$$

where t is the homeowner's marginal income tax rate. This expression recognizes that interest (but not principal) payments and property taxes are tax deductible. Thus, the homeowner's cost is interest payments or foregone interest plus property tax minus the income tax reduction that

* This section is somewhat difficult and can be skipped without loss of continuity.

results from the deductions, plus the other terms in Equation (10.6) that are the same as in Equation (10.5). Equation (10.6) specifies that the aftertax rent is what the homeowner cares about.

A simple example will suggest magnitudes. Suppose you own a \$200,000 house, for which the mortgage and foregone interest rates are 8 percent, so i is .08. Annual property taxes are 1.0 percent of the property's value, and the items included in c are 2 percent of the house's value. You anticipate a 4 percent appreciation of the house per year. (Realistically, you might anticipate 3 percent inflation, so the real interest rate [i^r] is 5 percent and the real capital gain [g^r] is 1 percent.) Then, using either form of Equation (10.5), your rent to value ratio (R/V) is .07. It costs you .07(200,000) or \$14,000 per year to rent your house from yourself. Using the same numbers for Equation (10.6) and assuming your income puts you in the 31-percent tax bracket, your rent to value ratio becomes .0621. Taking account of federal (and local) taxes, the cost of renting the house to yourself comes down to \$12,420 per year. Readers should do similar calculations for other data to gain a sense of the importance of the tax status of owner-occupied houses.

The fact that the homeowner's inputed rent is not taxed (yet mortgage-interest and property-tax payments are deductible) and that capital gains are nearly tax free are two important ways in which owner-occupants are favored over landlords and renters in the federal tax law. Although few countries tax the homeowner's inputed rent or capital gains, most countries do not permit deductions of mortgage-interest and real-estate tax payments on national income tax forms.

Inflation and Income Taxation Combined*

The neutrality of inflation disappears when the interaction of inflation and taxes is included. Federal tax law treats the two inflation entries differently, creating a situation in which inflation does not cancel out in the rent to value equation. To see this, remember that interest and capital gains both have an inflation component and a real component.

As has been stated, both the real and inflation components of capital gains on owner-occupied houses are virtually untaxed. For mortgage-interest payments, both the real and inflation components are deductible. Again, separating interest and capital gains into real and inflation components, the rent to value equation now becomes

$$\begin{aligned} \boldsymbol{R} &= [(\boldsymbol{i}^r + \pi)(1-\boldsymbol{t}) + \boldsymbol{T}(1-\boldsymbol{t}) + \boldsymbol{c} + (\boldsymbol{g}^r + \pi)]\boldsymbol{V} \\ &= [(\boldsymbol{i}^r + \boldsymbol{T})(1-\boldsymbol{t}) - \pi\boldsymbol{t} - \boldsymbol{g}^r + \boldsymbol{c}]\boldsymbol{V}. \qquad (10.7) \end{aligned}$$

Now it can be seen that the deductibility provisions do indeed make inflation the homeowner's friend. Equation (10.7) is the same as

* This section is somewhat difficult and can be skipped without loss of continuity.

Equation (10.6), except that in Equation (10.6) the real and inflationary components of interest and capital gains are separated. Thus, with the parameters in the previous example, it can still be concluded that the rent to value ratio is .0421 when the inflation rate is .03. Now, suppose that the inflationary component of interest and capital gains rises to .05, with the real components of interest and capital gains remaining at .05 and .01. In this more inflationary environment, the rent to value ratio falls to .0359. Inflation has substantially reduced the rent to value ratio. The reader can verify that an inflation rate of .1658 would reduce the rent to value ratio to zero. The reason that inflation is the homeowner's friend is that the inflationary component of interest is deductible, whereas the inflationary component of capital gains is not taxed.

☐ THE MARKET FOR HOUSING

The cost-of-capital expression, despite its complexity, is the crucial link between the supply and demand sides of the market for housing, and it is apparent that the market for housing cannot be analyzed without an understanding of the cost of capital. The following section will designate the cost of capital as ρ, recognizing that it incorporates all the terms in the square brackets in Equation (10.7).

Demand for Housing

So far, the discussion has been on rent for owner-occupied housing. Rent for renters is similar and somewhat simpler, as none of the foregoing deductibility analysis applies to rental markets. Specific differences in rent for renters will be covered in the next chapter. Meanwhile, rent will be referred to as ρV, where ρ is the cost of capital—the annual cost of occupying an owner-occupied house per dollar of its asset price.

Economists always say that demand for a commodity or service depends on its price and on income. That is as true for housing as for anything else. However, as seen in the previous sections, the notion of a price per unit of housing is complex. If there were no inflation (or if there were no taxes!) and if house value were proportionate to the number of housing units (as defined at the beginning of the chapter) in the dwelling, then ρ would be the price per unit of housing. Indeed, in those ideal circumstances, the rent per unit of housing would be the same for owner-occupiers and for renters.

In the real world, the rent per unit of housing is different for owners than for renters, different for people in high tax brackets than for people in low tax brackets, different in periods of high and low inflationary rates, and different depending on where one lives. (The value of a given house is lower in small than in large metropolitan areas and may be lower in suburbs than in central cities.)

In any case, the basic equation is that the rent of a dwelling is the cost of capital multiplied by the value of the dwelling, $R = \rho V$. In principle, the rent per unit of housing is R divided by the number of units of housing in the dwelling, as defined at the beginning of the chapter. Thus, we can write

$$\bar{R} = \frac{\mathbf{R}}{H} = \frac{\rho V}{H}. \tag{10.8}$$

In Equation (10.8), H is the number of housing units in the dwelling and $\bar{R}$ is the rent per unit of housing. $\bar{R}$ is the price on which the consumption demand for housing depends.

The decision to occupy a house is a consumption decision; it gives the occupant the right to consume the housing services provided by the housing asset for a period of time, such as a month or a year. The decision to buy a house is an investment or portfolio decision. One asset (the house) is exchanged for others (the mortgage and the down payment). The demand for housing also is a consumption decision. The investment decision will be discussed in the next chapter.

Empirical Estimates of Demand for Housing

Despite the complexity of the preceding discussion, $\bar{R}$, the rent per unit of housing, is the price concept that is relevant to the demand for housing consumption. Then, the demand curve for housing, making the usual assumption that it is downward sloping, is as shown in Figure 10.2. In addition to rent per unit, a household's housing demand depends on its income and on its demographic characteristics, such as how many children, how many workers, and life-style. Finally, there are costs of changing housing consumption; substantial changes typically require a move. Moving entails transaction costs, which are costs that are incurred by virtue of moving but do not depend on the amount of housing

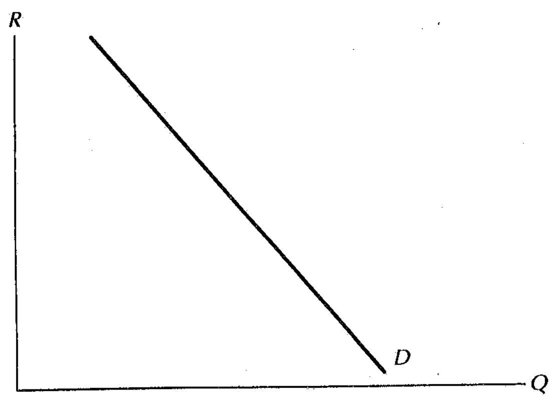

Figure 10.2 *Demand Curve for Housing Services*

consumed. Examples are search costs, costs of moving possessions, and costs of negotiating a sale, purchase, or lease. These costs will be discussed in detail in the next chapter. Here, it is important to recognize that the transaction costs imply that households may be considerably out of equilibrium much of the time, consuming more or less housing than is indicated by their demand equation.

The foregoing suggests that estimating housing-demand equations may be complex and frustrating. Indeed, some of the most ingenious and persistent applied research in economics during the last century has been carried out in this area. Such hard work has been motivated not just by scholarly curiosity but also by the social importance of the subject, especially the housing plight of low-income people.

Progress in estimating housing-demand equations has been especially rapid since the late 1950s, the result of better theoretical understanding, more and better data, better estimating techniques, and vastly more powerful computers.

To estimate the effect of price on demand, it is necessary to have data in which the price varies. Chapter 6 showed that urban-location theory provides an intriguing possibility. Thus, as was shown, in ideal circumstances, rent per unit of housing would vary by distance from the CBD, so as to keep households with the same money income on a given indifference curve. Those circumstances should enable economists to estimate the income-compensated demand equation for housing, the gold ring of demand estimation. Chapter 12 will show that the world is more complex than the ideal circumstances, but that careful work can nevertheless provide estimates of demand equations.

Another intriguing possibility relates to interest rates. An example earlier in this chapter showed that the interest rate is the biggest component of the cost of capital. Since governments have at least some control over interest rates, it would be very desirable to know how much housing demand would be stimulated by a reduction in interest rates. However, at any given time, interest rates hardly vary within or among metropolitan areas. Thus, cross-sectional data will not reveal the world's secrets to the curious housing economist. Many interest rates vary greatly through time; however, real interest rates affect the cost of capital, and real rates vary much less through time.

Income varies greatly among households at any given time. Even taking community averages, income may vary by a factor of 5 within a given metropolitan area at a given time. Income, however, must be measured carefully. Because of the transaction costs of moving, households do not change their housing consumption in response to small or temporary changes in income. Nevertheless, high-income people consume much more housing than do low-income people. The answer is that households make housing consumption decisions based on forecasts of their average income over several years. Economists refer to this income measure as permanent income. It is, of course, not permanent but is more nearly permanent than current income. Although what households forecast as their income for the next several years is not normally known, it has been found that approximations of permanent income (for example, average income during the last three years), provide much better explanations of housing demand than does current income. Not surprisingly, permanent-income measures suggest higher income elasticities of housing demand than does current income. Households with very high or low current income probably have current incomes above or below their permanent income. Because housing demand depends on permanent income, housing consumption adjusts little to fluctuations that are thought to be temporary.

Coping with these and other problems, a gradual consensus has emerged about the important parameters of housing-demand equations. Price elasticity appears to be in the vicinity of −0.65 and income elasticity appears to be in the vicinity of +0.75. No theorem says that all households or all communities must have the same price elasticities, or the same income elasticities, so these figures must be taken as approximations. Nevertheless, nearly all housing specialists now agree that housing demand is inelastic with respect to price, and most agree that the income elasticity is somewhat less than one.

Such estimates have important consequences. In one example, it has been observed that the poor spend larger percentages of their permanent incomes on housing than do the rich. That observation is a consequence of an income elasticity less than one, which implies that the share of income spent on housing increases as income decreases. If, in addition, the poor are concentrated closer than the rich to the city centers, where land and housing prices are high, it is easy to explain much larger income shares spent on housing by the poor.

Housing Supply

In the short run, housing supply is dominated by the nearly fixed standing stock. The supply of dwellings can be increased in less than a year, mainly by splitting one large dwelling into two or more small ones and by converting stores, offices, warehouses, or churches into dwellings. Although it may take only three to six months to build a dwelling, it takes much longer to plan, obtain required permissions, and arrange financing for new construction. Thus, the short-run supply curve is quite, but not completely, inelastic. This is depicted in Figure 10.3.

Table 10.2 reports annual housing starts from 1959 through 1990. Note that housing starts fluctuate by as much as 50 percent over very few years.

In the short run, housing prices and rents are determined primarily by demand. Demand depends on rents. Rents translate into house values via Equation (10.7), which is simply another way of saying what is true for any asset with a supply that is fixed in the short run: Its price is that at which the public is willing to hold the stock. With housing, the public is willing to hold the stock at a price at which rents compensate owners for

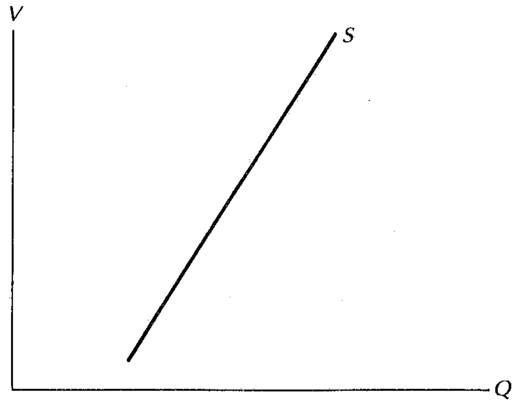

Figure 10.3 *Supply Curve for Housing Services*

the cost of capital. Remember, assumptions have been made that imply that the cost of capital is the same, whether the owner is the occupant or a profit-seeking landlord. We also noted that the cost of capital depends on prospects for capital gains, which depend on supply and demand prospects. Capital gains will be discussed more extensively in the next chapter.

In the long run, housing prices are set by construction and land costs or development costs. If the short-run price at which the public is willing to hold the existing stock exceeds development costs, then developers build houses and make a profit equal to the difference

Table 10.2 *Housing Starts by Year (Millions of Dwelling Units)*

Year	Millions of Dwelling Units	Year	Millions of Dwelling Units
1959	1.55	1975	1.17
1960	1.30	1976	1.55
1961	1.37	1977	2.00
1962	1.49	1978	2.04
1963	1.63	1979	1.76
1964	1.56	1980	1.31
1965	1.51	1981	1.10
1966	1.20	1982	1.07
1967	1.32	1983	1.71
1968	1.55	1984	1.76
1969	1.50	1985	1.75
1970	1.47	1986	1.81
1971	2.08	1987	1.62
1972	2.38	1988	1.49
1973	2.06	1989	1.38
1974	1.35	1990	1.19

Source: Data from U.S. Department of Commerce, Bureau of the Census. *Construction Reports;* and *Statistical Abstract of the United States* (Washington, D.C.: Government Printing Office, 1991).

between sale prices and development costs. If the short-run price is less than development costs, developers cannot make money by building new houses and development slows down.

The foregoing needs some elaboration. Developers, of course, try to anticipate demand a year or more in advance, so they can have enough houses available to match the demand. To the extent that anticipations are accurate, supply can increase to match an increase in demand with almost no increase in prices above the long-run equilibrium level. The process also works in reverse. Housing starts dropped almost 50 percent from their peak in 1986 to the worst months in the 1991 recession. During that period, median prices for new homes rose about as fast as the overall price level, and the vacancy rate showed no upward trend. Developers apparently anticipated quite accurately the dramatic and painful decrease in demand that occurred during that period. Changes in housing demand that are not anticipated by developers can, however, result in much larger price charges.

A second elaboration relates to land values. At given input prices, the long-run supply of housing is perfectly elastic. The important input prices in housing construction are construction labor, building materials, and land. As was shown in Chapter 6, land prices at the periphery of a metropolitan area equal the value of the land in nonurban use, typically agriculture. As a metropolitan area grows, most new housing is added at the periphery. The periphery gradually moves out, but land values at the periphery do not change unless agricultural or some other opportunity cost of land in the surrounding area changes. Thus, new home prices do not rise as the metropolitan area grows. As was illustrated in Figure 6.10, however, land and, therefore, house prices in the interior of the metropolitan area increase as the metropolitan area grows. Thus, average house prices in a metropolitan area increase with the size of the metropolitan area even though development costs, land values, and house prices at the periphery are unaffected by the size of the metropolitan area.

Market Equilibrium

At this point, the supply and demand analysis can be put together to describe housing-market equilibrium. The key to understanding the complexity of this issue is to note that housing supply depends on the asset price of housing (developers build more housing the greater the asset price relative to development costs), whereas demand depends on rent. Equation (10.7) links rent and value via the cost of capital.

Figure 10.4 demonstrates the linkage. The top graph shows supply and demand in value terms, and the bottom graph shows supply and demand in rent terms. The supply curve in the top graph shows supply (S) as an increasing function of value per unit of housing, for values in

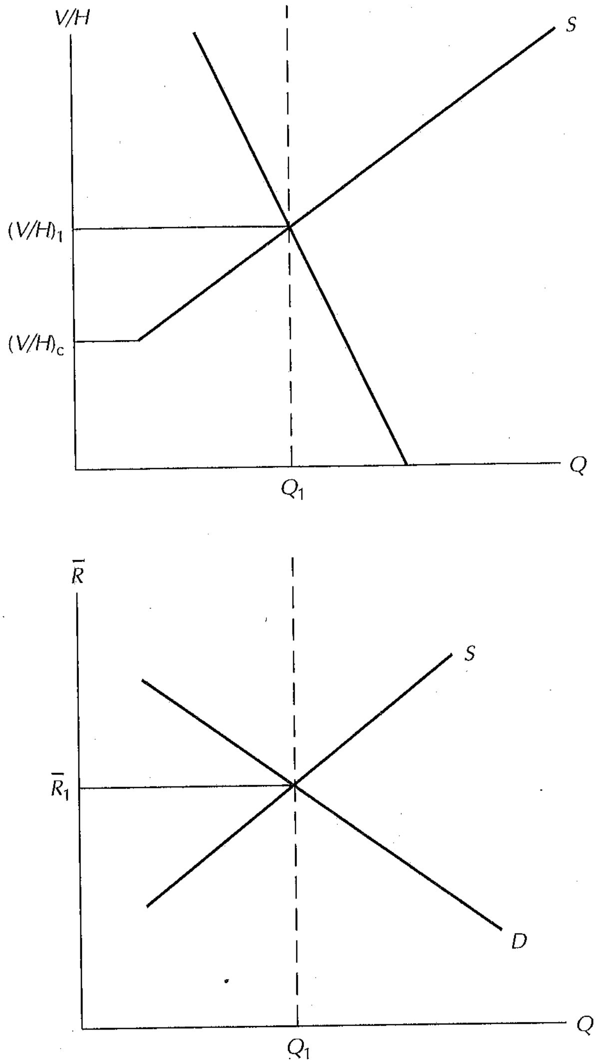

Figure 10.4 *Housing Market Equilibrium*

excess of construction costs ($([V/H])_c$). The bottom graph shows housing demand (D) as a function of rent ($\overline{R}$). For fixed ρ, Equation (10.7) permits supply to be expressed as a function of rent in the bottom graph and demand as a function of value in the top graph. Both rental and asset markets must be in equilibrium for the housing market to be in equilibrium.

As an exercise, the reader should trace the shifts in the curves and in market equilibrium that result from a change in the cost of capital, perhaps because of a change in the interest rate.

It was argued that housing supply is almost completely inelastic in the short run. The reader can draw the curves implied by this assumption. It was also argued previously that housing supply is perfectly elastic at development cost $(V/H)c$ in the long run. In that case, the supply curves in Figure 10.4 are horizontal, the equilibrium value equals development cost, and the equilibrium rent is the rent that Equation (10.7) gives when V/H is $(V/H)c$. It must be remembered, however, that, if the market is a metropolitan area, the supply of new housing at the periphery of the metropolitan area is likely to be perfectly elastic, but the value of the average house in the metropolitan area increases as the metropolitan area enlarges. This force is important because it limits the sizes of metropolitan areas. For example, in the late 1980s, growth of the Los Angeles and New York metropolitan areas was limited by the very high housing prices in those metropolitan areas.

Development Sector

So far, housing supply has been discussed without indicating who does it: Who actually builds houses? The answer is developers.

A *residential developer* is a firm that develops residential real estate. The residential developer is the entrepreneur who takes the responsibility and risks of building residences. Developers acquire building sites, decide what kinds and mixes of dwellings to put on the site, obtain legal permission to develop the sites, design the dwellings to be built, arrange financing, deal with interior and external environmental issues, build the dwellings, market the dwellings, and ascertain customer satisfaction so as to do a better job next time. In many suburban communities, developers also take pains to confer with business, residential, and governmental groups already in the community in which they wish to build to facilitate obtaining zoning and other provisions, to avoid public opposition to the proposed development, and to learn about local market potential.

Developers are extremely diverse in size and function. The smallest are "pickup truck" developers who acquire a few sites when they see a good buy and build just a few dwellings a year. Typically, they subcontract much of the plumbing, electrical, and other specialized construction work; use architectural plans "off-the-shelf"; employ local attorneys, as they need them; obtain construction financing from a friendly local bank; and employ local realtors to sell the completed houses. Although each of these developers builds only a few dwellings, there are many of them, and a large part of housing development is their work. The largest developers, in contrast, perform most of the above functions with their own personnel, and each may build many thousands of houses per year. Small developers tend to work in a small number of suburban communities of a single metropolitan area; the largest developers operate nationally, but even some quite large developers are regional firms. The need for detailed knowledge of local laws, regulations, and markets restricts the geographical diversification of all but the largest developers.

Developers relate to their customers in a variety of ways. Most residences are built "on spec," which means that the developer may have sites for several dozen houses, but builds them a few at a time and builds subsequent dwellings at a speed that depends on how quickly and at what prices the first ones sell. Often, the construction of subsequent houses is financed, at least in part, by sales of the houses that have been completed. A "contract" builder does not start building until a contract has been made for the house with a buyer. Typically, the contract requires the buyer to make "progress payments" as construction proceeds.

Developers, large or small, are notoriously short of money and engage in a range of strategies to finance development. Often, the buyers (of previously built houses in the case of a spec developer and of the house being built in the case of a contract builder) provide partial financing. A purchaser of a contract builder's dwelling must carefully monitor the developer's progress to avoid paying for work not completed. Even if the work has been completed, the developer's reliability must be carefully judged. It is very expensive to hire a builder to finish the construction on a project on which the developer has declared bankruptcy before finishing the job. When a developer is in financial trouble, his or her focus may be more on lenders and lawyers than on the speed and quality of work on the building sites.

In any case, developers typically obtain at least some financing through "construction loans," usually from a bank. Construction loans are typically for no more than five years, and they carry considerably higher interest rates than "permanent" mortgage financing on the completed and sold home. Construction lenders also are wary of having to foreclose on a loan on a partially built home, if the developer declares bankruptcy.

It may seem odd that banks are willing to finance the riskiest part of the residential real-estate market. The reason is that the bank's commitment is short term, in contrast to a usual mortgage on a finished home. Sometimes, a construction loan is accompanied by a promise of permanent financing on the finished home, provided, of course, that the buyer meets the bank's underwriting standards. Developers then use the availability of financing as a strategy for marketing the homes.

Homebuilding is among the most unstable businesses in the country, as will be documented in the next chapter. One reason is a simple accelerator effect. The durability of dwellings means that construction to replace houses that leave the stock because of demolition, disaster, or conversion is small relative to the stock. There are about 105 million dwelling units in the country (housing a population of about 250 million people); the average dwelling has a life of 40 to 50 years; and the average age of the stock is less than 17 years (reflecting large construction rates during the 1970s and early 1980s). Only about 1 percent of the stock needs to be replaced per year, so replacement demand is little more than one million dwellings per year.

In the 1990s, the population of the household formulation age group (20 to 29 years old) will shrink. Thus, the growth demand for housing will be small and will come mostly from increased longevity of the population.

The implication of the foregoing data is that the relatively steady replacement demand for housing is about one million units per year. Growth demand is much more volatile. Young people stay with parents and double up in hard times. (Baby boomers who return to their parents' homes after college, divorce, or job loss are sometimes referred to as "baby boomerangers.") In the worst periods of the 1990 to 1991 recession, home building was about 900,000 per year, which is a little less than replacement demand, having fallen from 1.8 million in 1986, or 50 percent in about 5 years. No sector outside construction is the victim of such instability!

Not surprisingly, instability has affected the organization of the housing-development sector. Instability places a premium on small organizations that can contract out many functions and on organizations that rent construction machinery instead of buying it. These characteristics would not be efficient in a more stable world, but are adaptations to the world that has existed and will probably continue to exist. Housing development is not a business for people with weak hearts!

Stock of Housing

The stock of housing is the legacy of past construction, alteration, depreciation, and retirements. The stock depreciates quite slowly, probably little more than 1 percent per year. Furthermore, alterations are a relatively minor source of changes in the housing stock. Home improvement expenditure runs about 1 percent of the value of stock, but this figure overstates the volume of upgrading; much of this expenditure should properly be called *maintenance*. Thus, the most important means of altering the housing stock are construction and retirement, and even these processes operate on the massive housing stock rather slowly.

For an idea of the quantitative impact of construction and demolition on the housing stock, consider the data in Tables 10.3 and 10.4. These remarkable data provide a complete picture of changes in the housing stock in the ten-year period between 1973 and 1983. Much more detailed data are available in the source. The first column in each table shows the total number of dwellings that existed in the year and places indicated. The second column shows the parts of the stock that existed in both years. The third column is the difference between the first two in each table, except that the data are all estimates from samples, so the arithmetic is inexact. For example, the first row of Table

Table 10.3 *Sources of 1983 Housing Stock by Region (Thousands of Dwelling Units)*

	1983 Stock	Same in 1973	Total Addition	New Construction
United States	94,421	70,739	21,972	16,171
MSA	62,603	48,472	12,970	10,157
Central city	27,240	22,556	3,962	2,990
Outside	35,363	25,916	9,008	7,167
Northeast	20,256	16,942	2,726	1,743
MSA	15,205	12,964	1,786	1,172
Central city	6,623	5,766	603	257
Outside	8,582	7,198	1,183	915
Midwest	24,067	19,205	4,474	3,291
MSA	15,102	12,411	2,446	1,993
Central city	6,539	5,688	672	496
Outside	8,563	6,724	1,773	1,497
South	31,782	21,773	9,484	7,257
MSA	18,099	12,731	5,051	4,076
Central city	8,287	6,481	1,586	1,371
Outside	13,683	6,251	3,465	2,705
West	18,316	12,819	5,288	3,879
MSA	14,197	10,365	3,687	2,916
Central city	5,791	4,621	1,100	865
Outside	8,406	5,744	2,587	2,051

Source: Data from U.S. Department of Commerce, Bureau of the Census. "Components of Inventory Change." *Census of Housing* (Washington, D.C.: Government Printing Office, 1983).

10.3 shows that there were about 94.4 million dwellings in 1983, of which approximately 70.7 had existed in 1973. These two numbers imply that 23.7 million units were added to the stock between the two years, whereas the third column records additions of nearly 22 million. Thus, there is a discrepancy of about 1.7 million units.

Of the nearly 22 million additions reported, almost 16.2 million were constructed during the seven-year period. The remainder were conversions from nonhousing uses (hospital to apartments, warehouses to residential lofts in Greenwich Village in New York City) and from the separation of one dwelling unit into two or more (a three-story town house, for example, is converted to three apartments). Table 10.3 shows that new construction provided approximately 16 million of the nearly 22 million dwellings added to the stock during the ten years. Thus, although construction accounted for about 74 percent of the additions to the stock, nearly 6 million dwellings were added by conversion and separation. Such nonconstruction additions are sometimes an important source of growth in the supply of low-income housing and are entirely separate from the filter-down source to be discussed in the next chapter.

Table 10.4 shows that almost 6.1 million dwellings disappeared from the 1973 stock by 1983, but that only about 2.4 million had been demolished (including disasters, such as fire and flood, which often

Table 10.4 *Disposition of 1973 Housing Stock by Region (Thousands of Dwelling Units)*

	1973 Stock	Same in 1983	Total Losses	Demolition and Disaster
United States	78,484	70,739	6,097	2,444
MSA	52,885	48,472	3,243	1,510
Central city	25,087	22,556	1,731	1,009
Outside	27,797	25,916	1,512	500
Northeast	18,501	16,942	979	442
MSA	14,123	12,964	695	341
Central city	6,545	5,766	477	252
Outside	7,579	7,198	217	89
Midwest	21,126	19,205	1,502	671
MSA	13,507	12,411	603	461
Central city	6,425	5,688	513	351
Outside	7,082	6,724	290	110
South	24,758	21,773	2,552	983
MSA	14,080	12,731	1,080	449
Central city	7,163	6,481	485	270
Outside	6,917	6,251	595	180
West	14,099	12,819	1,064	348
MSA	11,175	10,365	665	258
Central city	4,955	4,621	256	137
Outside	6,220	5,744	409	122

Source: Data obtained from the U.S. Department of Commerce, Bureau of the Census. "Components of Inventory Change," *Census of Housing* (Washington, D.C.: Government Printing Office, 1983).

precede demolitions). The remaining 3.7 million units of the 1973 stock that had disappeared by 1983 were converted to nondwelling uses (such as stores and offices) or were merged (gentrification, for example, may result in the merger of three apartments in a town house into one dwelling). Thus, for the country as a whole, additions to and subtractions from the housing stock by conversion and merger and separation just about balanced at around 6 million units during the ten years. In net terms, construction accounted for virtually the entire growth of the stock, about 16 million units.

☐ Summary

The unifying theme of this chapter is the relationship between the value and rental prices of housing. The rental price is the price of occupying a standard-size house for one year; the value price is the price of the right to permanent ownership. Consumers basically care only about the rental price, while suppliers are concerned only about the value price, making analysis of the market somewhat complicated. This chapter also traces recent movements in value and rental prices of housing, and examines the reasons for these movements.

Questions and Problems

1. Is it possible that dwellings last too long, in that tastes and technology change so that nobody wants to live in the oldest dwellings?
2. Does the discussion at the beginning of the chapter imply that the data in Tables 10.3 and 10.4 understate the increase in the stock of housing from 1973 to 1983?
3. Although housing construction fell dramatically during the late 1980s and early 1990s, the housing vacancy rate hardly increased. That finding is in contrast with earlier housing recessions, when the vacancy rate rose considerably. Why was the recent recession different?
4. Does the cost of capital concept also apply to businesses? If so, do you think that the cost of capital for businesses is greater or less than that for housing? Why?
5. In housing, demand instability shows up mostly in instability in the production of new units, whereas in agriculture it shows up mostly in price instability. Why?

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