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"Cap" Rates in Commercial Appraisal: Chicago vs. National

Han B. Kang

The following pages provide an analysis of the Chicago area commercial property market, and a comparison of Chicago to the broader US market. In this discussion, *commercial* represents numerous major categories of income producing real estate: office, shopping center, warehouse, and apartment. The discussion focuses on trends in capitalization rates for Chicago, with comparisons to the national market provided. The metro Chicago commercial real estate market's economic growth and market potential are also examined. Data on sales prices, effective rents, growth rates, and capitalization rates by property type are also presented.

The "Cap" Rate and Value

An appraisal is an estimate of market (or other specified) value under the property, market, and other conditions that prevail at a given date. The amount of income that a subject property is expected to generate over its expected holding period is a key element for estimating its market value. The same notion can be applied in security analysis: the value of a share of common stock can be estimated as the sum of the present values of all expected future dividends, while the value of a bond is the sum of all expected future interest payments plus a par value, with all these cash flows *discounted* by an appropriate required rate of return. The reason for discounting is to capture the impact of time's passage on the value of money: dollars that will be received soon contribute more to the property's current measured value than do dollars that will not be received until distant dates. The *income approach* to appraisal is based on the idea that value is related to income through a *capitalization rate*:

$$\text{Value} = \text{Income} / \text{Rate}.$$

Alternatively, we find a capitalization, or "cap," rate by algebraically rearranging the relationship shown above, dividing net income by value:

$$\text{Rate} = \text{Income} / \text{Value},$$

such that if we have estimated net income and the appropriate "cap" rate we can compute value, whereas if we have estimated net income and know the value we can infer the accompanying "cap" rate.

Capitalization thus is the process of converting a property's expected future income into an estimate of current market value by discounting expected future net cash receipts to their present values. In real estate analysis, expected *current* year income typically is treated as the first in a stream of *future* income flows. A capitalization rate embodies a return on investment (and a return *of* the dollars invested) that typical investors would require, on average, for taking the risks of providing debt or equity financing for the property being analyzed. The relationship between a capitalization rate and value therefore is an inverse one, with a lower "cap" rate corresponding to a higher value per dollar of current net income. After all, if a buyer pays a higher (lower) price, then a given level of expected net income will represent a lower (higher) percentage return on, and of, the original investment.[1]

Identifying Capitalization Rates

Selecting an appropriate "cap" rate is a critical step in income property appraisal. There are various ways to estimate the capitalization rate to apply to a property's income estimate. In *direct capitalization*, the analyst derives the rate directly from data on recently sold similar properties, dividing net operating income (NOI) by sales price. Conceptually this "cap" rate is similar to the "E/P" (earnings to price) ratio used as a tool by Wall Street stock analysts. In other words, an overall capitalization rate (OAR) extracted from market transactions can be interpreted as a reciprocal of the "P/E" (price to earnings) ratio. For example, with a 10% "cap" rate, the property is expected to sell at 10 times the current-year NOI. An appraiser who finds a consistent relationship between selling price and current NOI, after viewing recent transactions involving many properties that are physically and locationally similar to the subject, can apply the indicated "cap" rate to the subject property's NOI to estimate its value. Alternatively, value is the product of NOI and the appropriate Net Income Multiplier (the "cap" rate's reciprocal).

If the appraiser can *not* find a consistent relationship between income and value that can be extrapolated to other

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Editor: **Peter F. Colwell**, University of Illinois at Urbana-Champaign
e-mail: *pcolwell@uiuc.edu*
Associate Editor: **Joseph W. Trefzger**, Illinois State University
e-mail: *jwtrefz@ilstu.edu*
Assistant Director: **Carolyn A. Dehring**
e-mail: *cdehring@uiuc.edu*
Media Specialist: **Shelley A. Campbell**
e-mail: *scampbel@uiuc.edu*
Secretary: **Shirley J. Wells**

Address correspondence to:
Office of Real Estate Research
304-D David Kinley Hall
1407 W. Gregory Drive
Urbana, IL 61801
Phone: (217) 244-0951
FAX: (217) 244-9867
e-Mail: orer@uiuc.edu

similar properties, then it becomes necessary to construct a "cap" rate based on financial logic. In conventional *Ellwood* capitalization, the "cap" rate depends on the loan amount, interest rate, repayment term, required rate of return on equity invested, and expected changes in income and property value, among other factors. For example, the lower the interest rate sought by lenders, the lower the "cap" rate is, and the higher the indicated value. Also, the more that property value and income are expected to rise over the holding period, the lower is the capitalization rate and the higher is the indicated market value. Higher required returns raise the "cap" rate and reduce the value estimate.

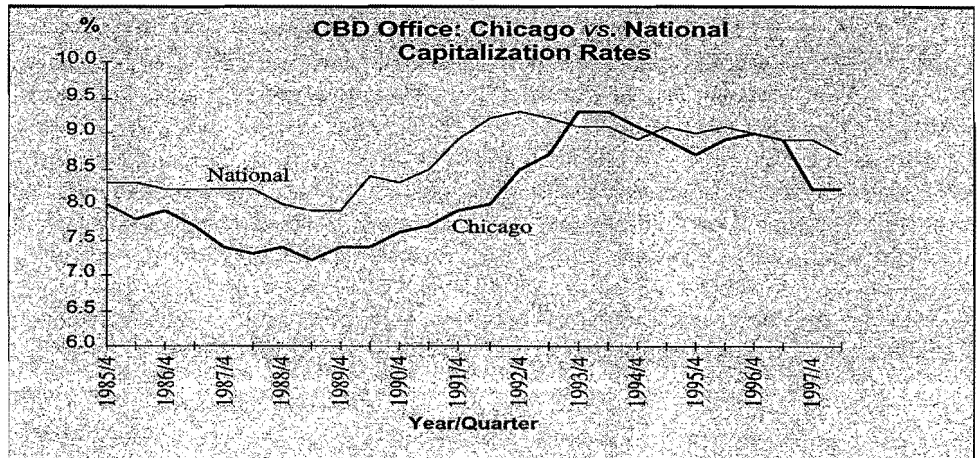
Regardless of whether the "cap" rate is extracted from market transactions or constructed based on financial logic, its level must reflect, directly or implicitly, the concerns and expectations that typical investors hold: required returns on debt and equity, the property's ability to generate future income net of expenses, and expected decline or appreciation in value. Any factor causing the capitalization rate to fall results in a higher value estimate, while any factor causing the "cap" rate to rise results in a lower value estimate, holding other things constant.

Because the risks that drive required returns, and the factors that affect growth in income and values, differ from property to property, we do not expect "cap" rates to remain uniform across property types. In a similar manner, we would not expect "cap" rates to be uniform for the same type of property in different market areas. Indeed, they should vary by market area, since real estate market conditions are never uniform nationwide. Real estate markets are typically viewed as local, in that local economic conditions have such a major impact on property values. If a community's economic activity is expected to grow at a rate above what other areas will realize, we can expect local property value to appreciate, and local rental income to increase, at above average rates because of the high demand for commercial property space. Thus, "cap" rates tend to be lower where high growth is expected. A buyer is willing to pay a higher price, relative to current-year NOI, in an area where property value is expected to appreciate. It is in this sense that the "cap" rate can capture future income and property value appreciation (or decline). The "cap" rate should vary by the property's type, location, and age, because expected changes in income and value differ with these characteristics.

Chicago Demographics and Economy

Illinois Real Estate Letter readers may have a particular interest in Chicago's commercial property market and the economic factors that affect it. The Chicago metropolitan area's population was 7.8 million in 1997, representing about 3% of the US total. Like other Midwest cities, Chicago has experienced moderate growth in population; from

Figure 1



Source: Rent and capitalization rate data provided by the *National Real Estate Index*, (800) 922-7257. The index is part of CB Richard Ellis' Global Research and Consulting group.

Table 1

Effective Gross Rent / square foot (1985 - 1998)

	Chicago Mean	Chicago S.D.	National Mean	National S.D.
CBD OFFICE	27.87	3.65	22.69	2.03
SHOPPING CENTER	14.22	1.34	14.40	1.00
WAREHOUSE	5.12	0.45	4.54	0.32
APARTMENT	10.73	1.41	9.79	1.39

Source: Rent and capitalization rate data provided by the *National Real Estate Index*, (800) 922-7257. The index is part of CB Richard Ellis' Global Research and Consulting group.

Table 2

Capitalization Rate (1985 - 1998)

	Chicago Mean	Chicago S.D.	National Mean	National S.D.
CBD OFFICE	8.17	0.68	8.65	0.45
SHOPPING CENTER	8.78	0.37	9.25	0.32
WAREHOUSE	9.20	0.44	9.29	0.24
APARTMENT	8.87	0.24	9.00	0.33

Source: Rent and capitalization rate data provided by the *National Real Estate Index*, (800) 922-7257. The index is part of CB Richard Ellis' Global Research and Consulting group.

1980 to 1990 the nine counties that make up the Chicago metropolitan area showed 2.3% population growth. Yet Chicago's growth was far below the 9.8% national average.[2] 1990-1997 population growth in Chicago was 4.9%, *vs.* a 7.3% national average. (Las Vegas, the fastest growing US city, had 48% population growth during the period.) In fact, the US Census Bureau projects an Illinois population growth rate below the national average.

It is not surprising that fast-growing Las Vegas has also ranked highest in terms of recent employment gains. The Chicago area, on the other hand, trailed even the national average, achieving a 1990-1998 gain in employment of only 11.7%, far below the 16.5% national figure. Most employment gains in Chicago, like in other areas, have been in service sectors. During 1970-1987 Chicago lost approximately 250,000 manufacturing jobs, according the Federal Reserve Bank of Chicago.[3] However, the area ranks high in terms of average home price and household income. In fourth quarter 1998 the median home price was $162,600 for the Chicago metropolitan area, while the corresponding figure for the nation was $131,000. On the other hand, Chicago's 1997 metropolitan median household income of $44,276 far exceeded the $34,618 US median. Also, Chicago has shown a higher retail sales growth rate than the national average; the area's 3.1% 1999 growth was more than double the 1.2% national figure, according to *Metro Market Facts*.[4] Chicagoland's overall economy thus shows some strength, even though a sharp increase in population is not expected. *Metro Market Facts* shows vacancy rates of 12.27% in Chicago for CBD (central business district) office space, 7.95% for industrial, and 9.8% for retail shops as of first quarter 1998.

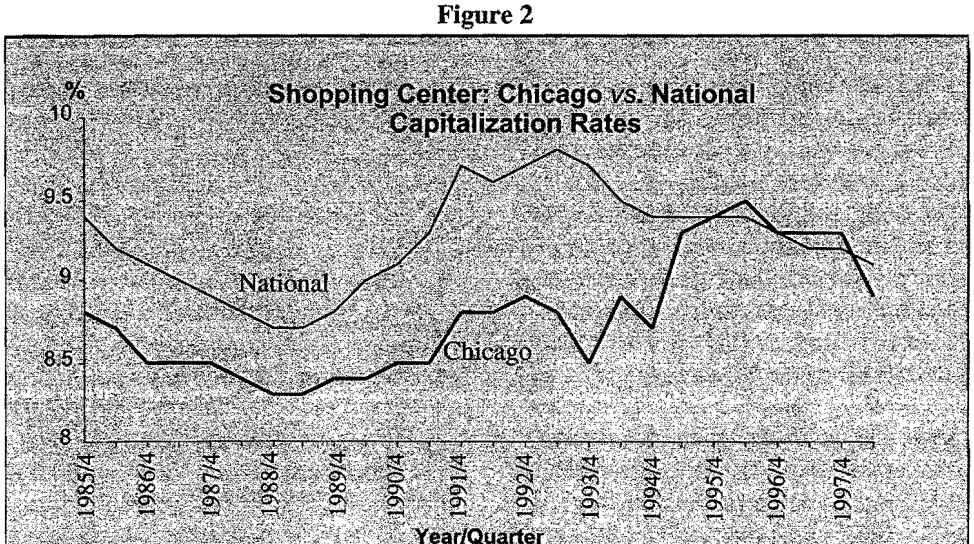
Property Type: Chicago *vs.* US

The *National Real Estate Index* (NREI) data base contains commercial transactions from fourth quarter 1985 through second quarter 1998.[5] NREI's "Market History Reports" provide data on property transactions in 56 US markets, including Chicago. Reported data are based on actual property transactions, though in some cases estimates are made based on rent and NOI trends for prototype properties. Each reported "cap" rate is based on actual NOI, from either properties actually sold or comparable prototype properties. National data are based on a weighted average of the US property stock. The Chicago area is defined as the Chicago Primary Metropolitan Statistical Area (PMSA), which includes Cook, DeKalb, DuPage, Grundy, Kane, Kendall, Lake, McHenry, and Will Counties.

Table 1 reports the mean and standard deviation of effective gross rent per square foot of rental space for each property type. Effective gross rent reflects all occupancy costs, including rent concessions and operating cost chargebacks. During 1985-1998 rents were higher in Chicago than the national average, for all property types except for retail (shopping centers). The implication is either that Chicago's shopping center market was overbuilt during the period, or else that demand for retail space had not caught up with an increase in rental space in shopping malls. Also as shown in Table 1, rent volatility was substantially higher in Chicago than the US average, especially for CBD office property. Either the turnover rate was high, or else Chicago market conditions (especially for office) were unstable during the 13 years covered.

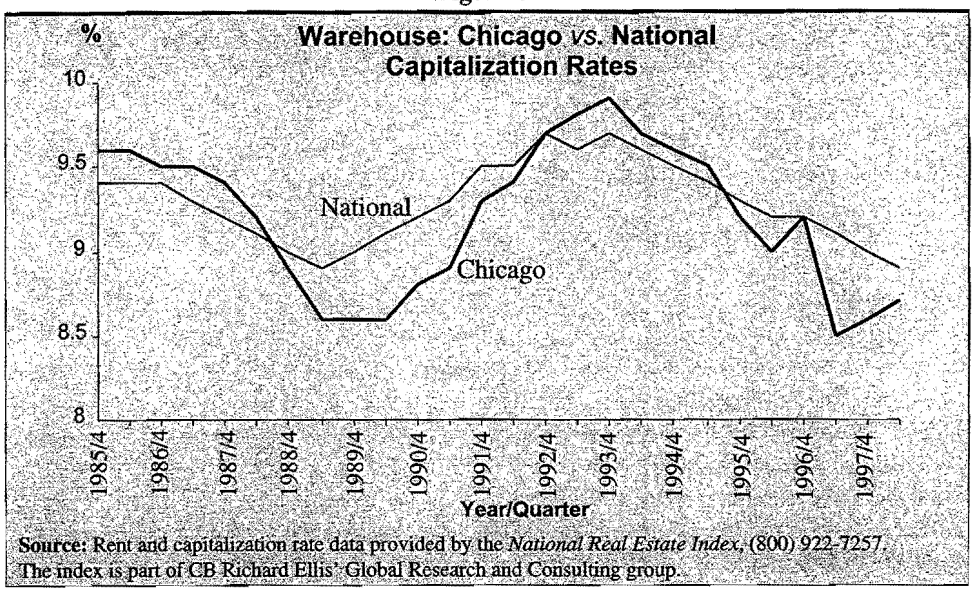
Table 2 shows the mean and its standard deviation for capitalization rate by property type. During the 1985-1998 period the Chicago PMSA market shows

Figure 2



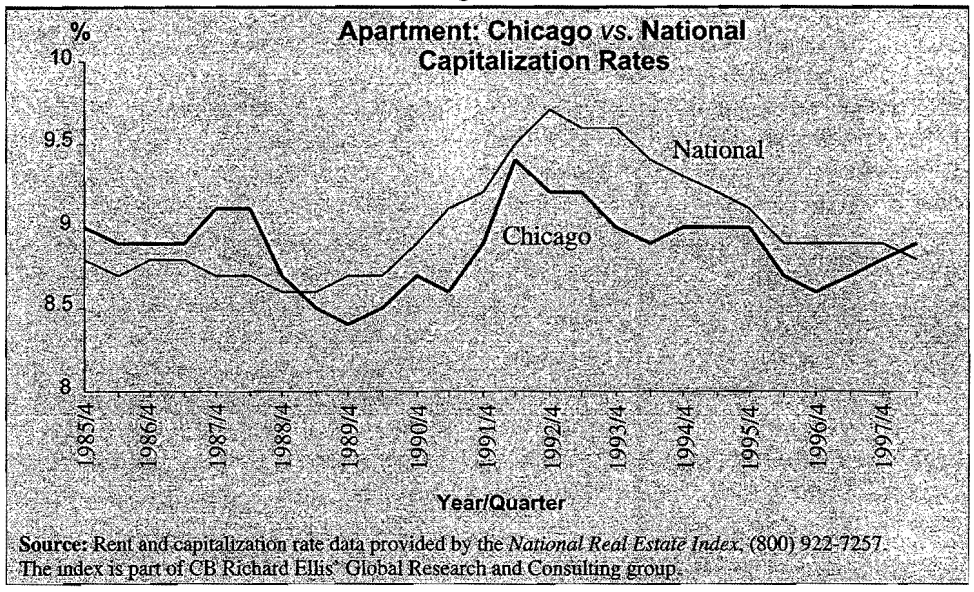
Source: Rent and capitalization rate data provided by the *National Real Estate Index*, (800) 922-7257. The index is part of CB Richard Ellis' Global Research and Consulting group.

Figure 3



Source: Rent and capitalization rate data provided by the *National Real Estate Index*, (800) 922-7257. The index is part of CB Richard Ellis' Global Research and Consulting group.

Figure 4



Source: Rent and capitalization rate data provided by the *National Real Estate Index*, (800) 922-7257. The index is part of CB Richard Ellis' Global Research and Consulting group.

lower "cap" rates than the national average. As discussed earlier, a lower capitalization rate implies that value is a higher multiple of net operating income. Buyers had been paying a higher multiple of NOI in Chicago, meaning that an above average growth rate in either NOI or resale value was expected during a typical ownership period (especially for shopping center and CBD office property). But a comparison of standard deviations shows that Chicago's "cap" rates were more *volatile* than the national average, except for apartments. One implication is that the Chicago apartment market had been more stable than other income property sectors in the area during that period.

A Dose of Caution

The four accompanying graphs' visual representation of capitalization rates may offer a somewhat broader perspective than the tables' summary statistics provide. The graphs show a general movement toward more or less equal "cap" rates in the most recent years. Figure 1, for example, shows Chicago office "cap" rates far below the US average only until early 1993. Thus, while Chicago's 8.17% "cap" rate (indicating an average selling price of 12.2 times NOI) might seem to imply higher expected value and income gains than those for other cities, the most recent data may suggest that Chicago investors are not extraordinarily optimistic.

Figure 2 shows a similar result for retail, though it was early 1995 before the very low shopping center "cap" rates that long characterized Chicago ceased to hold (though weakness was seen earlier in rents below the national average). Figures 3 and 4 show common "cap" rate trends for warehouse and apartment properties; Chicago's more moderate longtime advantage over US rates also ultimately expired (with Chicago's apartment "cap" rate actually *exceeding* the national figure for the most recent period shown). Because "cap" rates are now near or above national averages, we might use special caution in inferring that investors see strong potential for economic growth, with higher incomes and property values, for Chicago commercial properties.

Conclusions

Average data over the past 13 years show Chicago "cap" rates below US averages, a result seeming to suggest that investors view Chicago's market as offering strong potential for growth in NOI and resale prices. But Chicago's averages are based on highly volatile underlying data, and indeed the most recent observations show Chicago "cap" rates converging with, and in one sector exceeding, national averages. While 1997's *Regional Economic Growth Index* ranked Chicago 5th among 112 US metropolitan areas,[6] the most recent "cap" rate trends call for caution in predicting future market strength. ■

Notes

1. A return *of* the original investment must be considered because the improved portion of real estate constitutes a wasting asset, whereas a bond holder, for example, gets regular interest payments (a return *on* investment) and then receives a full return *of* the original principal lent when the security matures.
2. "Metro Market Facts: Chicago," *National Real Estate Index*, CB Richard Ellis, Vol. 20, Fourth Quarter 1998.
3. "Chicago's Economy: Twenty Years of Structural Change," *Economic Perspectives*, Federal Reserve Bank of Chicago, Jan/Feb 1990, pp. 15-23.
4. "Metro Market Facts: Chicago," *National Real Estate Index*, CB Richard Ellis, Vol. 20, Fourth Quarter 1998, p. 59.
5. "Market History Reports: 1985 – 1994," *National Real Estate Index*, KOLL Co.
6. "Real Estate Issues: Trends and Analysis," *Market Watch Quarterly Report*, Second Quarter 1997, LaSalle Advisors, p.10. The *Report* is based on historical employment trends and four-year forecasts of employment, population, and income growth.

Dr. Kang is a Professor of Finance in the Department of Finance, Insurance and Law at Illinois State University.

Venus de Milo vs. Goddess Durga: The Value of ARMs

Peter F. Colwell and Shelley A. Campbell

The statue of Venus de Milo, the Roman goddess of love, created during the 2nd century BC, once had them, but then they were lost. The Hindu goddess Durga definitely has them, in what some may consider an abundance. The answer to this riddle is: arms. For those who need a refresher, the Venus statue was found in 1820 with her arms missing, while Durga, by some accounts, has ten arms. With arms playing such a prominent role in the arts, it is not surprising that arms – or, more specifically ARMs – have made their way into the art of home mortgage lending. This article explains ARMs (adjustable rate mortgage loans) and their values in comparison to traditional fixed rate mortgage (FRM) loans.

The *variable rate* loan stands in contrast to the traditional fixed rate, constant payment mortgage (FRM) loan, in that its interest rate rises and falls over the payment term as market interest rates fluctuate. One type of variable rate loan is the *adjustable rate mortgage* (ARM) loan. The ARM is a restricted type of variable rate loan, in that there are limits on the amount by which the interest rate can vary from period to period, and on the frequency of interest rate adjustments.

ARMs came about in response to the need for a loan instrument to reduce the interest rate risk inherent for lenders in long term, fixed rate loans. As shown in our Summer/Fall 1996 FRM discussion, the fixed rate mortgage loan saddles the lender with asymmetric interest rate risk. When market interest rates rise *above* the loan's contract rate, the loan's value falls because the rate of return is lower than it would have been if the lender had waited to lend its money at a higher interest rate. But the lender suffers when market rates drop *below* the contract interest rate, as well, because the borrower refinances and prepays the book value of principal owed, and the lender must reinvest the sum prepaid at the new, lower market rate. Thus, when interest rates rise a lender holding a portfolio of long term, fixed rate mortgage loans faces losses equal in amount to the borrowers' gains. Yet when rates drop, the lender does not enjoy above-market returns for long, because borrowers prepay. The ARM (like other variable rate loans) allows the lender to pass some of a loan's interest rate risk along to the borrower, by adjusting the interest rate periodically so that the borrower absorbs at least part of the cost imposed by changing market rates.

How the ARM Works

The ARM is designed to be acceptable to borrowers, yet with needed flexibility for lenders. The interest rate for an ARM is based on a specified *index*: a verifiable market rate to which the ARM's adjustments are tied. US Treasury security yields and lenders' regional costs of funds are common indices. (Surveyed Champaign-Urbana banks consistently use the one year US Treasury yield as the index.) Of course, no lender would make home loans *at* the Treasury rate; the ARM rate is set at a specified amount *above* the index. This *margin* by which the ARM interest rate exceeds the index is a premium to compensate the lender for the extra risk of getting uncertain loan payments instead of holding government bonds.

Of course, households that seek mortgage loans surely are no more willing to face unlimited interest rate risk than are lenders. To avoid drastic rate fluctuations during periods of great market volatility, ARM agreements set *caps* on interest rate movements. A cap sets the maximum amount by which the borrower's interest rate can rise (or fall), at each adjustment and over the loan's life, thereby protecting both borrower and lender from interest rate shocks. The level of interest rate risk borne by each depends on the caps and the frequency of rate adjustments.

A simple example can illustrate ARM concepts. Assume that the yield on a one year Treasury security is 4.50%. Using this index, a lender offers an ARM with a 7.25% initial rate (2.75%, or 275 *basis points*, over the index, a typical margin level) and a "2/6" interest rate cap. This cap limits rate adjustments to 2% per adjustment period (adjustments are typically permitted annually) and 6% total over the loan's life. If, by the first adjustment date, the Treasury yield had risen to 7.00%, the interest rate paid by the ARM borrower would rise not to 9.75% (7% index + 2.75% margin), but only to 9.25%, because of the 2% cap. The maximum rate the borrower could *ever* be required to pay would be 13.25% (7.25% original rate + 6% lifetime cap).

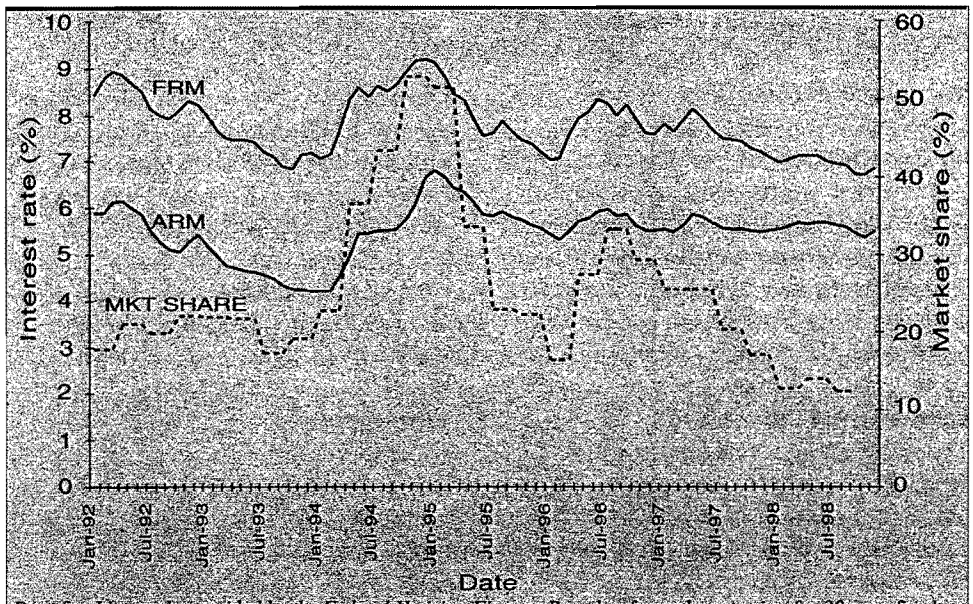
Teaser Rates

ARMs assure home lenders that they will not be stuck with level returns during periods of sharply rising funds costs, a situation that arose in the FRM-dominated early 1980s. To give borrowers an extra incentive to consider ARMs, a lender may offer an artificially low initial interest rate – a *teaser rate* – that is less than the initial index plus the margin. Based on the earlier example, the teaser rate would be set at less than 7.25%, perhaps 6.50%. Thus, even if the index had not risen by the first adjustment date, the borrower's rate would rise to the index plus margin level of 7.25%. A *rise* in the index would permit adjustment to an even higher rate, though not more than 8.50%, in line with the 2% periodic cap.

Which to Choose: ARM or FRM?

The borrower therefore benefits from an ARM lending arrangement if the index does not rise much during the loan's life, but suffers if it does. Note that the ARM's index plus margin should produce an initial interest rate below the rate charged on FRMs.[1] Because the ARM borrower faces risks, it is useful to examine factors that determine a customer's choice of an ARM over an FRM loan. We analyzed determinants of the odds of selecting an ARM and found that, as an indicator of market share, the interest rate on FRMs explains 55% of the variation in the frequency with which ARMs are chosen over FRMs.[2] This result is evident in Figure 1, which illustrates interest rate levels over the past six years, along with ARMs' market share. The ARM market share has risen with increases in market interest rates. For example, when the 30-year FRM rate rose from January 1994's

Figure 1



Data for this graph, provided by the Federal Housing Finance Board, refer to the averages for 30-year fixed rate mortgage loans and one-year adjustable rate mortgage loans nationwide for each time interval shown.

7.07% to 9.2% in January 1995, the ARM market share rose by 30% (to 53% overall). A year later, when the FRM rate was down to 7.2%, ARMs' market share fell to 22.2%. When market rates are high, borrowers have an increasing propensity to choose ARMs because of the lower initial rate, and perhaps the expectation that rates will fall in the future. However, because the ARM subjects a borrower to interest rate risk not present with FRMs, the ARMs' relative attractiveness depends both on market interest rate levels and on the risk an individual borrower is willing to carry.

Borrower Mobility

Another major influence on ARM choice – and the topic of the remainder of this discussion – is borrower *mobility*, the chance that the borrower will prepay the loan early in its term (probably as a result of moving to a new home). University of Illinois economist Jan Brueckner has written extensively on borrower mobility. Among relevant questions are the role that mobility plays in selecting appropriate interest rate and discount point combinations for loan contracts,[3] and the way mobility affects the selection and pricing of FRMs and ARMs.[4] The paragraphs that follow build on Brueckner's ideas, focusing on pricing combinations that lenders might offer to low- and high-mobility borrowers considering FRMs and ARMs.

A mobile borrower anticipates repaying the loan quite early, and is willing to take on some additional interest rate risk in return for a lower interest rate in the earlier years of the loan. Since the highly mobile borrower intends to repay very early in the loan's term, his overall costs are usually reduced by the initially lower ARM interest rates. At the same time, the low-mobility borrower, intending to keep the loan in force long into its term, may be willing to pay a little more in initial interest for a FRM, to insure against future rate increases. Borrower mobility thus plays an important role in pricing FRM and ARM loan products. But anticipating the type of loan a borrower will prefer based on his mobility provides a serious challenge to the lender who must deal with prepayment uncertainty.

A Graphical Analysis

The loan pricing dilemma with regard to mobility can be shown graphically.[5] Figure 1 shows the tradeoff between interest rate and caps for a lender earning a normal profit. *Normal* profit is just enough to compensate a credit provider for the risks faced, the outcome seen in a competitive industry. A lender's normal profit lines are shown for two different types of borrowers: low-mobility (l) and high-mobility (h). The vertical axis represents a loan's initial interest rate; interest rate risk – measured by an ARM's lifetime rate cap – is shown along the horizontal axis (a higher cap increases the potential future rate fluctuation). Thus, locations along the vertical axis represent FRM loan contracts, with rate changes capped at zero (no interest rate risk; the rate will never change). Any location to the right of the vertical axis represents an ARM contract, offering a given interest rate/cap combination. The lender wishing to sustain a normal profit when working with each borrower type must offer loan contracts that meet the combinations located along the respective normal profit lines.

The lender is indifferent among contracts on a normal profit line. But as the graph indicates, the lender must charge borrower l a higher rate to earn a normal profit than is charged borrower h. The reason is that a loan to a low-mobility borrower carries more interest rate risk for the lender, since it has a longer *duration* (more time will pass before principal is repaid and can be lent at a new market interest rate). For a given lifetime cap, the lender would like to charge the low-mobility borrower a higher interest rate than the high-mobility borrower to compensate for this risk. For example, assume that borrower h is expected to repay the remaining loan balance in full after three years, whereas l will not repay until 20 years into the original term (of, perhaps, 30 years). The lender could earn a normal profit lending to borrower h with, for example, a 7% FRM or an ARM with a 6.25% initial rate and a 6% lifetime cap. Normal profit could also be earned with an 8.25% FRM to l, or an ARM with a 6.625% initial rate and a 6% lifetime cap.

If a lender could identify a loan customer as being one of the two borrower types, it would offer a contract on the appropriate normal profit line. Because the lender can *not* distinguish among applicants, however, it offers a limited number of contract choices, such that a borrower *self-selects* the contract for the type of loan the lender wants to make.

Good, Bad, or Indifferent

Figure 2 introduces curves along which the two *borrower* types, l and h, are indifferent. Two *indifference curves* (I_{l1} and I_{l2}) are shown for the low-mobility borrower, while three (I_{h1} – I_{h3}) are shown for the high-mobility borrower. Any

Figure 2

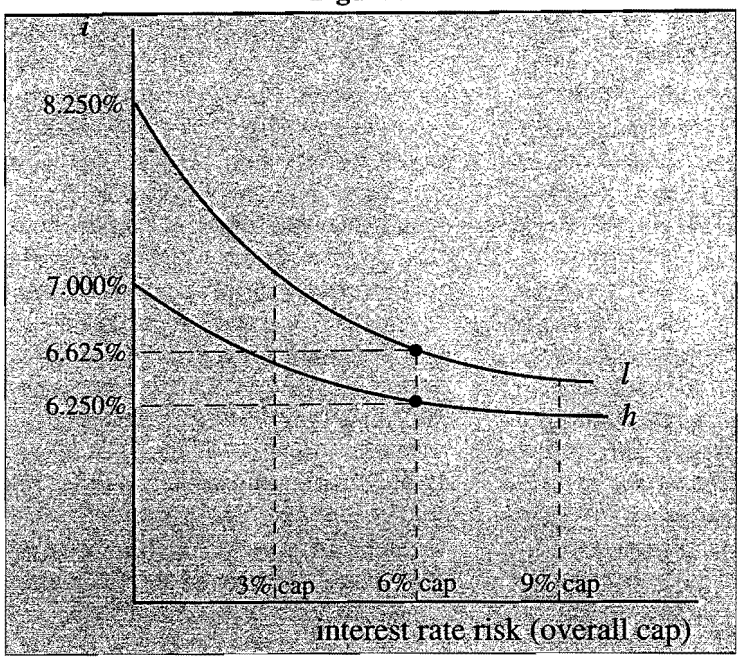
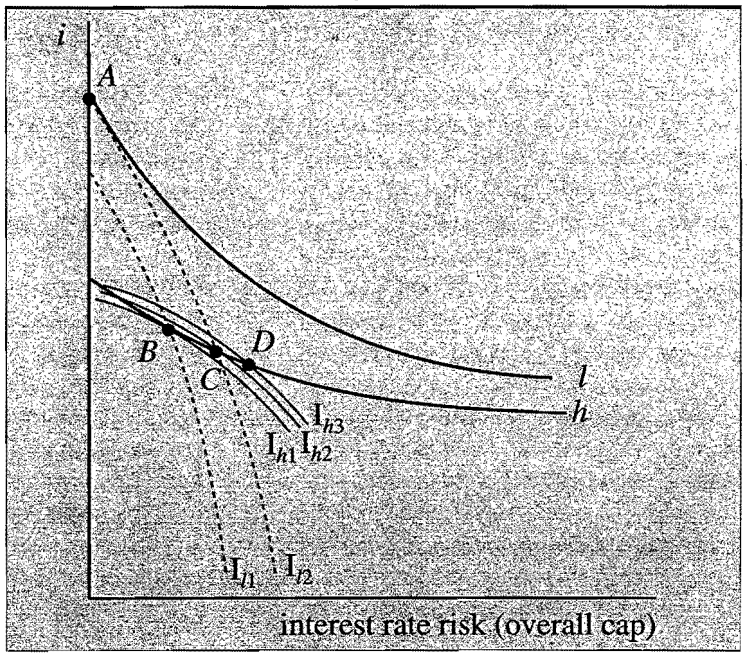


Figure 3



point along a given indifference curve is just as acceptable to that borrower as any other point on that curve. But whereas typical indifference analysis is based on con*vex* (u-shaped) curves associated with two "goods," this analysis involves two "*bads*" (borrowers dislike higher interest rates *and* higher caps), so the indifference curves are con*cave*, and curves closer to the origin represent positions preferred to those on higher curves. Note also the relative flatness of I_{h1}, I_{h2}, and I_{h3}; since they will prepay before market rates can rise much, mobile borrowers are not happy to pay higher rates in return for lower caps.

For our example, assume a pricing scenario in which the lender offers two contacts: FRM contract *A* and ARM contract *B*. Contract *A* is located at the *tangency* of the lender's normal profit line for low-mobility borrowers with borrower *l*'s indifference curve I_{l2}. Contract *B* is located at the tangency of the normal profit line for high-mobility borrowers with borrower *h*'s indifference curve I_{h1}.

The lender might like to limit type-*l* borrowers to contract *A* and type-*h*'s to *B*, in order to earn normal profits on both contracts. However, the lender must offer all consumers the same choices. Note that *B* is located on borrower *l*'s indifference curve I_{l1}. Offering contacts *A* and *B*, the lender would find that type-*l* borrowers would not accept *A* if *B* were available, because *B* lies on a lower (preferred) curve than does *A*. But the lender can not profit by extending *B* contracts to type-*l* borrowers. More specifically, the lender would earn normal profits on ARMs extended to type-*h* borrowers and lose on ARMs extended to type-*l* borrowers. There would be no "takers" for FRMs.

The lender must design an alternative contract combination that leads each type of borrower to a choice that provides a normal profit. Consider contract *C*, which is also on the lender's normal profit line for type-*h* borrowers. If the lender were to offer FRM contract *A* and ARM contract *C*, we would find type-*h* borrowers preferring *C*, while type-*l* borrowers would be indifferent between *A* and *C*, since both contracts are located on indifference curve I_{l2}. The lender thus still would suffer losses because of type-*l* borrowers selecting ARM loans.

To prevent losses, the lender would have to design a contract that would appear just to the right of contract *C* on the normal profit line for type-*h* borrowers. One such point is contract *D*, which lies on borrower *h*'s indifference curve I_{h3}. High-mobility borrowers would select *D*, preferring it to *A*, while low-mobility borrowers would uniformly select *A* over *D*. By offering as its selection menu contracts *A* and *D*, the lender would induce borrowers to self-select, with the less mobile choosing the FRM contract and the more highly mobile picking the ARM.

Conclusions

ARMs offer benefits to both lenders and borrowers. Lenders welcome the opportunity to share some interest rate risk with borrowers, and some borrowers prefer a loan product that enables them to accept added risk in return for a lower initial interest rate. Theoretically, borrower mobility plays a role both in borrowers' choices and in the loan pricing tactics used by lenders. Empirical evidence shows that the overall level of interest rates has a greater impact on ARM loans' market share than does the difference between long-term and short-term interest rates. ■

Notes

1. This relationship has not held in recent years. For example, in late 1999 the one year Treasury rate was about 5.75%, such that adding a 2.75% margin would indicate a first-year non-teaser rate of 8.5% for an ARM. Yet the FRM rate did not exceed 8.5%, but rather hovered just under 8%.
2. More specifically, results of a *regression* analysis explained 55% of the *logarithm* of the odds that an ARM is chosen. We found interest rate levels, not rate differentials, to be the best determinant of ARM market share distribution; high rates promote ARMs.
3. A *point* is 1% of the principal borrowed, paid at closing by the borrower. For a technical discussion, see Brueckner, Jan, "Borrower Mobility, Adverse Selection, and Mortgage Points," *Journal of Financial Intermediation* 3 (1994), pp. 416-441.
4. See Brueckner, Jan, "Borrower Mobility, Self-Selection, and the Relative Prices of Fixed and Adjustable-Rate Mortgages," *Journal of Financial Intermediation* 2 (1992), pp. 401-421.
5. Some of the presentation that follows is based on Brueckner, Jan, "Mortgage Points: Separating Borrowers by Mobility," *Illinois Real Estate Letter* 11 (3) (1997), pp. 7-9. However, we are responsible for any deficiencies.

Horizontal Apartments

Randy Hughes

Every investment should be considered not only for its potential return on capital (money) invested, but also for its long-term viability with respect to the owner's personality and management talent. This idea is especially relevant to individuals who begin investing in real estate, a realm where an owner can apply good sense and skill to create enviable results. It is true that self-managing real estate involves combining returns on invested money with returns on labor; small real estate investors are not passive observers like holders of stocks and bonds. If your goal is to have free time, then buy mutual fund shares. If your goal is to maximize the benefits of your money, your energy, and your abilities, then consider investing in real estate and managing it yourself.

It would be possible, of course, to buy income-producing real estate and hire out the management. Stockholder-owned corporations are professionally managed; mutual funds add another layer of management that has to be paid for. Indeed, there is no shortage of fine property managers who earn their livelihoods dealing with the day-to-day headaches of real estate investing, and for complex situations their expertise may be crucial (and the scale economies of large properties or portfolios may allow their services to be paid for efficiently). Smaller scale investors, though, can often expect to realize their best returns if they manage the properties they own.

The issue is not simply the payment of a management fee, which can consume 10% of the return that otherwise would accrue to the owner. Having someone else do a job for you leads to many potential difficulties, known in financial circles as *agency problems*. These problems can range from mismanagement (no one will look after your real estate as carefully as you will) to conflicting goals (compensation structures may give the manager incentives to operate in ways that are contrary to the owner's interests) and even theft (a preventable result, but sometimes only with high *monitoring* costs). In an extreme case, hired management might cost 30% of the cash flow.

How I Learned to Love the Bungalow

If we can accept the argument that the smaller scale real estate investor should self-manage, the next topic to address is the *type* of property that the individual investor should hold as his real estate portfolio grows over time. The typical response is that the small investor should start with a single-family house (SFH) or two, but then use the equity that builds over time to "move up" to "real" investments in apartment buildings. This view is incorrect, however. The pundits should devote less attention to gross rent multipliers and internal rates of return, and focus more on the factors – including emotion – that are the true determinants of value. It turns out that the SFH is not only the best *initial* purchase for the individual real estate investor; it is also the ideal *long-term* investment vehicle for the owner who can self-manage. Instead of "trading up" to a traditional apartment complex, the investor who builds equity over time should construct a *horizontal apartment* complex: a portfolio of SFHs. For the self-managing buyer, SFHs offer advantages over multifamily buildings in important areas that include privacy, liability exposure, and tenant relations.

Consider the privacy issue. You can own one SFH or 100, and no one will know exactly how many you have. This anonymity helps to prevent unwanted attention from those who might hope to get rich suing those they see as having "deep pockets." Such privacy is not enjoyed by owners of apartment buildings (especially larger complexes), who tend to be perceived as rich. The general public does not understand that the owner of an expensive real estate asset is likely to owe massive amounts to a lender, and that many real estate investments produce losses rather than gains for their owners.

One type of lawsuit that particularly concerns all real estate investors is the liability suit. The liability exposure of traditional apartment complex owners is greater than that faced by owners of horizontal apartments. There can be a tendency for apartment dwellers to socialize with, and be influenced by, their fellow tenants; indeed, complexes develop reputations as havens for "singles" or other groups who may like to live in close proximity. This proclivity need not be undesirable (think of a "seniors" complex), and may be a natural outgrowth of the complex's location and amenities. Yet whether the tenants are student or elderly, the renter of a traditional apartment unit is more susceptible to negative influence from other tenants than is someone who rents a SFH. The larger the apartment complex, the greater is the chance for the type of contagious dissatisfaction (the "us *vs.* them" mentality) that can lead residents to jointly sue.

Tenant relations at the individual level presents its own legal minefield but, again, owners of traditional complexes face difficulties that owners of horizontal apartment complexes can avoid. Whereas traditional apartment complex residents must all be treated equally (lest there be a mutiny by those who perceive they have been "discriminated" against), the SFH owner deals with unique separate properties, and therefore can set rents and lease terms with little threat of discrimination charges. No sensible or ethical owner would wish to give different treatment to people under similar circumstances; anyone who would try deserves the sanctions under existing laws that protect SFH and apartment tenants equally. The problem is that tenants may not understand the manner in which circumstances can differ, especially in a rapidly changing market. The SFH owner can set rental terms based on features specific to the transaction (including tenant willingness to adhere to specified rules), and not on the threat of class action suits initiated by aggressive attorneys on behalf of tenants who do not understand rental economics.

A further advantage to owning horizontal apartments is that some maintenance costs are routinely borne by tenants. Those who live in traditional apartments expect the landlord to perform all maintenance, whereas SFH tenants typically mow the lawns and shovel the walks, and may provide for some other maintenance at their own expense as well. SFHs may

seem less like apartments and more like the houses in which the tenants grew up; a tenant who does not share the premises with others may take some pride in their appearance. Offering the tenant a rental discount as an incentive for handling some maintenance items not only helps the owner's maintenance budget, but also saves valuable management time. Some SFH tenants even make improvements that increase the values of the properties they inhabit, at little or no cost to the owners (a situation never encountered with tenants of traditional apartments).

You'd Better Shop Around

Just as all real estate is not created equal, houses in different price ranges and in different neighborhoods present different opportunities for the investor. Understanding the intangibles that collectively create a desirable environment for family living, and empathizing with prospective tenants' reasons for preferring one area over another, are the keys to identifying where you should buy SFHs for your horizontal apartment portfolio.

A cornerstone of SFH management is to invest in neighborhoods, rather than in houses *per se*. A bargain priced, well built, attractive house can be a poor long-term investment if located in the wrong neighborhood, due to high management costs. Investors sometimes do well by specializing in very low-priced SFHs (*short-term* investors may try to "turn around" low-end units quickly by making improvements and replacing problem tenants), but renting to lower-income families requires knowledge of complex federal programs. Therefore, the novice horizontal apartment investor is better advised to buy SFHs in areas that meet the needs of large numbers of average, middle class people, avoiding management-intensive SFHs in marginal areas.

An ability to select tenants is perhaps the horizontal apartment owner's most important skill; handing a tenant the key to a SFH unit is the equivalent of lending a total stranger $70,000-$100,000 on an unsecured basis (the 1% damage deposit provides little "security"). Therefore, it is in the investor's best interest to buy in neighborhoods where high quality tenants seek to live. Too often the amateur SFH landlord rents to the first person who comes along, rather than waiting a few days for a better tenant. The owner who focuses on long-term investment goals will not put his property in jeopardy in reaction to short-term anxieties over vacancy (as when a loan payment is due and the property is empty). After all, the objective is not to see the unit occupied, but to optimize investment yield safely.

Breaking Up Is *Not* Hard to Do

Another benefit of horizontal apartments is that the investor can sell individual units. Since part of the financial return can come through reselling SFHs (often to the tenants who occupy them) at appreciated values, it is logical to build a portfolio of the types of houses that potential tenants would most likely want to buy.

The single-family house is not only the best initial purchase for the individual real estate investor; it is also the ideal long-term investment vehicle for the owner who can self-manage.

Surveys show that more than 90% of buyers prefer the 3 bedroom, 2 bath arrangement. A mid-priced house with these features will attract higher quality tenants, yet be sufficiently affordable to offer high appreciation potential. In the Champaign-Urbana area, homes bought for less than $100,000 have shown the greatest recent value gains (it is wise to buy at or slightly below an area's average price). Since few such mid-priced SFHs are built today, their values are pulled up at increasing rates as more expensive homes appreciate. Further, because the SFH tenant or other ultimate buyer will offer a price based more on emotion than on "the numbers," the investor's yield can be greater than on commercial or traditional multifamily properties. It can be quite high if the SFH is originally bought at a market discount from a seller motivated by distress conditions (divorce, job transfer, fear of foreclosure).

Another advantage to average priced houses is that good tenants compete for them, paying high rents under stringent lease terms. Good tenants and value appreciation combine to provide generous returns on the SFH owner's time and money invested; average cash flows supporting average loan payments, with average maintenance costs, can produce above-average yields. More expensive houses, even if purchased at larger dollar discounts, would produce less cash flow. For example, SFH rents in Champaign/Urbana tend to top out at about $1,500 per month. Thus, the monthly rent on a $400,000 house would not be much above the $1,500 that a $200,000 house would rent for. It is illogical, from the standpoint of generating cash flow, to buy "upper end" SFHs as investments.

A final advantage of owning horizontal apartments is that, historically in most metropolitan areas, rent or value (one or the other) is always increasing. When rents are rising, values typically either stay flat or increase at a lesser rate. When values increase, rents level off or edge upward at a slower pace. This relationship helps to assure the long-term SFH investor the "best of both worlds."

The Demographics Look Good

The SFH's status as an investment *and* consumption item encourages many families to include the "American Dream" in their financial plans. Even those who must rent often aspire to live in SFHs, viewing them as more prestigious than multifamily buildings. Consequently, carefully selected horizontal apartments should continue to yield high returns if the demographics remain supportive.

Investors can take heart in a recent housing study by the National Association of Realtors®, which concluded that population trends early into the next century will support strong housing demand. The US population is expected to grow by more than 40 million people over the next two decades. More than a million new households (the basic consumer unit for housing) will be formed each year of the coming decade. Aging Baby

(continued on page 13)

Nine Causes of Sprawl

Richard K. Green

"Sprawl," a term used when some people perceive "out-of-control growth," has become a leading public policy issue of the late 1990s. The front page of the "Week in Review" section of the November 15, 1998 *New York Times* featured sprawl as a "key election issue." (*Illinois Real Estate Letter* readers were introduced to the sprawl topic in "Truly Smart 'Smart Growth'" and "The Brawl Over So-Called Sprawl," Summer 1999.) Even places that traditionally were hospitable to development, such as Phoenix, have seen the rise of anti-growth ordinances.

But in the debate over sprawl, few policy makers seem interested in investigating the phenomenon's root causes. This failure is disturbing, even if sprawl *is* undesirable. Without understanding sprawl's causes, officials may make policy choices that exacerbate its effects, while voters are unable to make choices among a set of alternative outcomes.

The discussion that follows presents nothing that is not already well known within urban economics; it is simply an attempt to put what is known into one integrated and convenient source. The hope is that if theories of urban economics are put in an accessible place, policy makers and voters will better understand some of the choices that lie before them.

I therefore submit to you nine important causes of sprawl. The list is certainly not exhaustive, but it likely explains a substantial share of the "suburbanization" that has characterized post-World War II America. The nine causes can be seen in the section headings marked by Roman numerals in the following pages. Some of these phenomena surely can be defended as benign influences. Others, however, are malignant, and should be addressed.

I. The Rent Gradient

Modern urban economics has its roots in models developed by William Alonso, Edwin Mills, and Richard Muth. These models show that two key determinants of urban land values are 1) the value of undeveloped land at the metropolis's edge and 2) transportation costs. Put simply, it is desirable to be near the hub of commercial activity, so people who live near job centers pay more for land and those living near the periphery pay less.

Where land is relatively expensive, it makes sense to economize on its use; therefore, the ratio of structures to land is high in places with high land values. For that reason, we tend to see dense development near city centers. Conversely, on cities' peripheries, land is relatively inexpensive, so the ratio of structures to land is low. A result is that at the relatively less expensive periphery each home takes up more land (houses sit on larger lots), and therefore peripheries generally exhibit more sprawl than do city centers. This tendency is not necessarily a problem, because relative prices reflect the relative scarcity of resources. After all, such construction components as timber and labor are, like land, scarce resources. The question is whether the relative prices of land and improvements appropriately take into account *all* resource costs (a topic to which we will return later).

At the relatively less expensive periphery houses sit on larger lots, and therefore peripheries generally exhibit more sprawl than do city centers.

II. Demographic Changes

Land use is driven partly by the composition of households. Since World War II's end, many demographic changes have brought about a reduced average household size. Specifically, people are waiting longer to marry, are more likely to divorce, are having fewer children, and are living much longer after their children have grown. This confluence of events has caused the average US household size to fall from around 3.5 persons in 1940 to 2.5 persons today. Thus, even if population had stayed constant and housing units' land use density had remained unchanged, the amount of land required to house our population would have risen by 40% between 1940 and now.

It might be argued that smaller households could be accompanied by higher unit density (*i.e.*, that a given tract of land could hold more, but smaller, housing units). Accomplishing this increase in density might not be so easy, however. Consider an older house in the middle of a city. The house is in good condition, but not easy to subdivide into multiple units. So it is occupied by (on average) 2.5 people, rather than 3.5. Even existing multifamily units would be impossible to resize for smaller households.

Until consumer tastes change *and* our existing housing stock is largely replaced, smaller household size will not, by itself, reduce the amount of land *per capita* needed for housing our population. This outcome is, arguably, benign, unless we wish to argue that it is bad social policy for someone to marry late, divorce, have few children, or continue to live in a house after the children have left. I am content to avoid such arguments here.

III. Growing Affluence

The US has become more affluent in the post-World War II era. We could argue about whether the distribution of this growth has been acceptable or not, but it remains the case that, across all income groups, households are materially better off now than they were in 1945 (or in 1965, for that matter; I will avoid the controversy over what has happened at the bottom of the income distribution since 1974). At the top end of the spectrum, the number of households earning in excess of $100,000 in *real* income has increased sixfold over the last ten years.

The influence that this affluence has had on land use is profound from two perspectives: what economists call an *income effect* and a *substitution effect*.

We might call the income effect the "George Carlin effect:" as people have more money, they want more "stuff." Land certainly falls within the "stuff" category. From the standpoint of substitution, think about transportation. If a large share of income is spent on transportation, a family will want to economize on it, or better still, avoid its cost altogether by substituting something else into the monthly budget (as we might substitute pork for beef when the latter is costly). This substitution could involve living in the center of a city, where per square foot land prices are high. So people buy land near their jobs to escape high transportation costs, but the high per unit price of that land causes them to build on relatively small parcels (*i.e.*, to consume less).

Of course, as transportation becomes relatively less costly, people will seek to economize on land cost, and will therefore move to places where the per unit price of land is low. If land is inexpensive, people will consume more of it.

In the context of our modern society, transportation costs are largely fixed; while acquiring and maintaining a car are costly, the cost per mile for driving is small. Therefore, while transportation concerns dictate location decisions for low earners, transportation costs are relatively unimportant for higher earners. It is very likely that the marginal (extra per mile) cost of transportation is not as high as it should be (see below). Nevertheless, all other things held equal, more affluence leads to greater land consumption.

IV. Transportation

A great insight of Joel Garreau's wonderful *Edge City* is encompassed in one of the "laws" cited at the back of the book: "The Maximum Desirable Commute, Throughout Human History, Regardless of Transportation Technology: Forty-five Minutes." So it is that a cause of sprawl has been the ubiquity of the automobile. When people in ancient times walked to work, cities could stretch only for a mile or two. With average driving speeds of 30 miles per hour, people today can be quite content living ten miles from work.

Garreau also shows that development has responded to the desired commute by placing office space on the periphery of cities, so that commuters can avoid the density and concomitant traffic of downtowns. Thus it is the case that the amount of office space in suburbs now is generally greater than the amount in traditional downtowns. The most common commuting pattern in America today is from suburban home to suburban office. Households' desire to reap the private benefits of low density while avoiding lengthy commutes has pushed cities to spread out.

The amount of office space in suburbs now is generally greater than the amount in traditional downtowns; the most common commuting pattern in America today is from suburban home to suburban office.

This result would all be fine and well if households bore the full costs of their commuting. Unfortunately, they do not. For example, the City of Milwaukee's Department of Administration calculates that automobiles in that city cost society about $400 apiece each year beyond what their owners pay in licensing fees and gasoline taxes. These added costs relate primarily to congestion and pollution.

What is remarkable about the $400 figure is that Milwaukee has relatively little congestion, as large American cities go. In many cities, the costs are certainly much higher. One method for making commuters pay these costs is to increase fuel taxes. For instance, someone who drives 10,000 miles per year in a car that gets 25 miles per gallon uses 400 gallons of gasoline per year. Thus, increasing the gasoline tax by $1 per gallon would *internalize* the costs of congestion in Milwaukee. The problem, of course, is that there are places (*i.e.*, rural areas) where congestion costs are much lower, such that gasoline taxes should be lower. But the lower taxes would give metropolitan area residents an incentive to drive outside their cities to buy their gasoline (a point on which I concur with Edwin Mills's analysis in "Truly Smart 'Smart Growth'"). An important question, however, is whether people's time is sufficiently inexpensive that it is worth their while to go out of their way to buy gas.

Other potential methods for internalizing commuting costs include tolls and commuter taxes. We could argue that all such taxes have strengths and weaknesses, and could also argue that all are politically difficult to implement. But the consequences of underpricing the social cost of automobile use has also led to a politically unacceptable outcome.

V. Government Service and Attitudes

Economist Charles Tiebout pioneered the idea that local units of government compete with each other for citizens. Specifically, local officials put forward packages of services in return for a given tax level, in the hope of attracting people and capital to their communities. This interesting theory is supported by *empirical* (based on real-world data) evidence suggesting that people respond to these packages. While a popular view is that people seek to avoid taxes at all costs, work by Therese McGwire, Michael Wayselenko, and others has shown that people do prefer communities with better services. Indeed, they apparently tend to move to cities that provide the services they want at the lowest possible tax costs.

This competition puts newer cities at an advantage relative to their older counterparts. First, old cities' infrastructures tend to be old and often inadequate, and replacing infrastructure is very expensive. Newer cities can offer better infrastructure at lower cost, and therefore are more competitive. Second, and perhaps more importantly, newer cities have used land regulation to prevent the construction of low priced housing. Old cities, on the other hand, have old housing, which tends to provide lower quality service than newer housing and, because it is less desirable, also tends to be more affordable. Low income people, who require a disproportionately large share of public services, therefore are concentrated in central cities. This concentration of individuals drawing on public resources puts central cities at a fiscal disadvantage as they try to offer "middle-class" benefits.

Newer cities, on the other hand, can provide these services at lower levels of taxes. Lower taxes draw the middle class to the newer cities, a migration that further increases the concentration of poverty in the older cities, which in turn worsens the older cities' competitive position. Ed Glaser of Harvard argues that, because of this middle class exodus, higher levels of government (perhaps the federal government) must take responsibility for income redistribution and social services spending if older central cities are ever to become more competitive.

We should also note that older cities have often been run by politicians who were hostile to private development in their jurisdictions' central areas. This hostility stands in contrast to newer cities, which often subsidize industrial parks and use tax-increment financing (TIF) to stimulate business development. Older cities are already at a fiscal disadvantage relative their less aged counterparts; when the political class that runs an older city erects hoops through which businesses must jump before they are allowed to develop, the fiscal disadvantages of the community get even larger.

This observation is not a suggestion that an older city should provide tax incentives to attract a business to its locale (unless the business provides the community with a large *positive externality* – a benefit for which it is not compensated in the private marketplace). But we should encourage older cities to avoid going out of their way to make it difficult for businesses to prosper.

VI. Racial Discrimination, Segregation

Perhaps the most inexcusable reason for sprawl is the presence of discrimination and, as a result, segregation in providing housing. Discrimination remains a central fact in US housing markets; the statistical evidence, while in itself not conclusive (just as statistics can never *prove* that smoking causes cancer), is nevertheless overwhelming. Leaving aside, for the moment, the moral repugnance of discrimination, discriminatory behavior is harmful because it generates perverse incentives, thus producing economically unappealing outcomes. One unwanted outcome is unnecessary sprawl. For example, "white flight," by definition, requires development of land that would not be developed absent race related behavior. And while discrimination may have become a less pervasive element of individual minority group members' treatment in the housing arena, the rising share of minorities in American society means that discrimination could become an increasingly destructive feature of the housing market in the years to come.

Because more expensive houses generally sit on larger lots than do less expensive homes, our income tax code's encouragement for buying relatively expensive homes contributes to the incidence of sprawl.

Consequently, one of the most important things that governments wishing to attack sprawl can do is to vigilantly and strictly enforce fair housing laws. After more than 30 years of federal fair housing laws, we still observe widespread patterns of discrimination and segregation, as numerous credible studies have shown. As time passes, it becomes clearer that testing is likely the only effective mechanism for enforcement. Testing involves sending equally financially qualified white and minority transactors into the housing market, and determining whether they are disparately treated. Disparate treatment implies discrimination, and thus is illegal. Putting widespread testing into practice is a severe and expensive means of enforcing fair housing laws. But if we, as a society, are serious about eliminating the blot of housing discrimination, we must do something serious in response.

VII. Holdouts and Land Assembly

From at least one perspective, redeveloping at the city center always has a disadvantage relative to new development at the urban periphery: land assembly costs. Suppose that a company is considering where to locate a new manufacturing facility. If it can get zoning approval from the local government to develop at the periphery, then the company can negotiate an option to purchase from one land owner, typically a farmer. If the farmer will not sell at a price that is agreeable, then the developer of the facility can find another place to locate.

By contrast, city centers tend to be characterized by small parcels owned by many different people. As a result, the owners of the last few parcels needed by a developer have *monopoly* power in setting price. Once the developer has bought the majority of parcels she needs, she may not be in a position to walk away from outrageous asking prices sought by a few *holdout* owners whose land is needed for the assembly to be complete.

The periphery has another substantial advantage over the central city: property on the periphery generally is environmentally "clean," while central city parcels often require costly environmental cleanups. Parcels on the periphery therefore are more feasible for development, from a private sector perspective (though not necessarily from a societal perspective).

VIII. Federal Income Tax Policy

Federal tax policy has generally favored development on the periphery of cities. A striking example is the mortgage loan interest deduction; more subtle is the tax treatment of parking. One part of our tax code that has been enshrouded in mystery is the mortgage interest deduction (MID), which lets a household deduct home loan interest from ordinary income in determining its federal income tax liability. The MID is a residual part of the original tax laws; it was not designed to stimulate housing. The original 1913 federal income tax code allowed for deducting *all* consumer interest. The Tax Reform Act of 1986 phased out consumer interest deductions, with one prominent exception: interest on a home mortgage loan.

Yet as it currently exists, the MID does little to promote home ownership. The reason is that for those at the margin of home owning, the MID is not worth very much. Someone who pays little in property and state income tax may find that, even with the MID, the standard

deduction is more valuable than itemization. Even for those who itemize, the MID may have little value, because the typical marginal federal income tax rate for low to moderate income families is 15%: each dollar paid in home mortgage loan interest is worth a mere 15¢ in tax relief.

Contrast this situation with that faced by those higher up the income scale, where each dollar of deduction is worth between 28¢ and 39.6¢, depending on the marginal tax rate. Of course, households with higher incomes are likely to own their homes regardless of the tax treatment of mortgage loan interest. Note that in Canada and Australia, countries without mortgage loan interest deductions, home ownership rates are quite similar to the rate in the United States.

On the other hand, the MID *does* encourage high income people to buy more *expensive* homes than they otherwise would, because the size of the implicit subsidy increases for costlier residences, up to a point (interest can be deducted only on up to $1.1 million of home loan debt). More expensive houses generally sit on larger lots than do less expensive homes. Our tax code's encouragement for buying relatively expensive houses therefore contributes to sprawl.

More subtle is the tax treatment of parking. A firm on the Chicago periphery, where land is relatively cheap, can pave some acreage and provide free parking for its employees, a benefit on which recipients pay no income tax. Workers in the loop, on the other hand, typically must pay to park, a cost the IRS views as personal and therefore not deductible. (Adding insult to injury, parking in major downtown areas is uniformly expensive; the *opportunity cost* of land is too high to let people park cheaply.) As a result, an employer can pay an employee less in the suburbs than in the central city, and still leave the employee better off. Thus on the surface, everyone at the periphery benefits. The implication is that the tax treatment of parking gives firms incentives to locate on the periphery, where land is cheap, rather than in city centers.

IX. Land Use Regulation

We have already discussed how newer communities use land use regulation to prevent settlement by low income households, and how this activity contributes to sprawl. But even seemingly innocuous land use regulations can cause more land to be used than is necessary to house a given number of people. These regulations fall into a variety of categories, including setback, minimum lot size, street width, and, ironically, green space requirements. Simply put, all of these policies reduce the number of housing units that can be placed within a particular land area, in turn reducing population density, which, perforce, creates sprawl. World Bank planner Alain Bertaud has shown how seemingly small changes in these regulations can have a large impact on the number of housing units that can be fit into a particular land mass.

Conclusion

Sprawl has a variety of causes, some benign and others malignant. If policy makers are truly concerned about the malignant underpinnings of sprawl – discrimination, fiscal zoning, transportation that imposes social costs, federal tax policy, and regulations that needlessly consume land for residential development – then they will deal with these causes directly. Otherwise, we will know that they, and their voting constituents, are content with the way things are. ■

Dr. Green is on faculty in the Department of Real Estate & Urban Land Economics at the University of Wisconsin/Madison.

Horizontal *(continued from page 9)*

Boomers are likely to be a prime market for trade-up, upscale, and vacation homes over the next twenty years. The demand for starter homes will be taken up by earlier cohorts of the Millennium Generation midway through the coming decade, if they consume housing the way earlier generations did; they will then become the market for more upscale housing. These trends indicate solid markets for new and existing homes through the first two decades of the next millennium.

Safe and Effective

Finally, the SFHs that make up horizontal apartments have proven over time to be safe investments. Indeed, people often select more volatile investments because the quoted returns on SFHs tend to be understated. It is true that between 1976 and 1997 the resale values for existing US homes rose by only 5.7% annually, while stock market returns reached unprecedented highs. But a meaningful measure would include the cash-on-cash return on investment, principal paydown on underlying loans, positive cash flow, and tax savings (through depreciation, interest, and operating expenses), along with SFH appreciation. Still, appreciation benefits alone can form a basis for favorable investment performance. Local real estate investors feel that the recent annual appreciation rates for moderately priced SFHs have been as much as 5-8%; with inflation running less than 2% per year, SFHs have provided 3-6% *real* annual returns even without cash flow benefits.

Leveraging – using borrowed money – by itself can lead to 50-100% returns per year. If an investor borrowed $90,000 to buy a $100,000 SFH (equity would be the $10,000 paid down) that increased in value by $8,000 (8% is at the high end of the recent appreciation range), the return on equity, even with no cash flow benefits, would be $8,000/$10,000 = 80%! As values continue to rise, the rate of return on the *initial investment* can become extremely high if the appreciation rate does not decrease. The rate of return on *equity* declines (especially when loan principal reduction is factored in), but can still be impressive. Leverage and tax savings help the investor to purchase more property (unlike with some other investments), and the cycle goes on.

Since housing generally tends to appreciate steadily over most years, the longer you own your SFHs, the greater the overall returns. The Realtors® study predicts that home price appreciation will exceed increases in consumer prices for most of the next two decades. If the stock market is due for a slowdown, the time may have come for you to seriously consider owning horizontal apartments. ■

Mr. Hughes owns Champaign-based Hughes Real Estate, Inc., which manages SFHs and commercial buildings. He has written widely on real estate, and has taught courses for the Illinois Association of Realtors® and Parkland College.

Figure 1: Gable

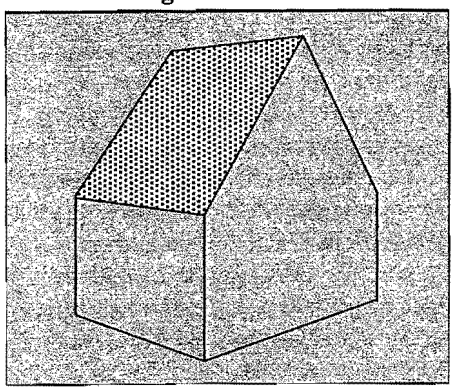


Figure 3: Saltbox

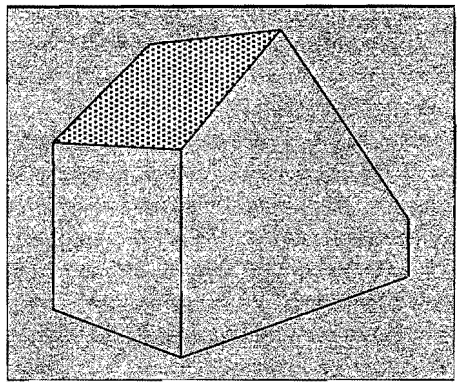
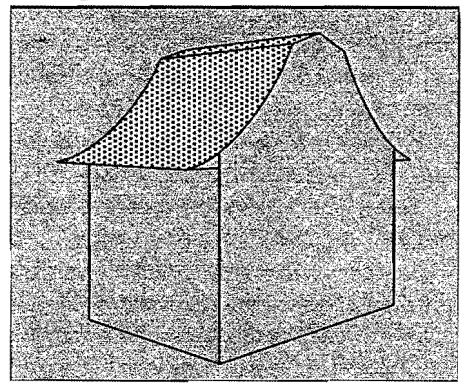


Figure 5: Rural Dutch Gambrel



(continued from page 16)
roof on the *saltbox* is asymmetric, with one rectangular side extending down, in some cases, almost to the ground (albeit with the same pitch as the other side). It was dubbed a saltbox house because its design resembled boxes people kept for storing salt; see Figure 3. The saltbox might be thought of as a traditional gable design, with one side augmented by an abutting shed having the same roof pitch. The design emerged in New England's cold climate, where the roof's long side faced north to protect the home against cold winter winds. The wall that supported the roof's south-facing short side was taller, with more windows to let sunlight penetrate the home's interior. The design is not uncommon even today, but it is unfortunate that builders often position saltboxes incorrectly on their lots (with the windowed front facing north and the roof's long protective side facing south).

A Field Guide to American Houses (an excellent book by Virginia and Lee McAlester, Knopf, 1984) discusses houses' architectural styles in the context of roof types. For example, a home built in the Tudor style generally has a steeply pitched gable roof (in excess of 45°, or 12/12), while the Folk Victorian typically has a moderately pitched gable (30-45°, or about 7/12-12/12) and the Craftsman has a low pitch (less than 30°, or 7/12).

Another gable variation is the *gambrel*. Whereas each of the roof designs examined above has a *single* rectangular surface on each side, the gambrel features *two* rectangular surfaces, each with a different slope, on each side of the roof. The lower surface has the steeper pitch. Figure 4 depicts a gambrel roof. The gambrel design offers more headroom under the roof for living or storage area.

There are several gambrel roof varieties. The two surfaces on each of an English gambrel's sides are about equal in length. The top surface's slope is approximately 25°; the lower surface's pitch is about 45°. The two surfaces on each side of a Dutch gambrel differ in length. The shorter top surface is pitched at about 22°, while the longer bottom surface is fairly steeply pitched, at approximately 60°. Gambrel roofs are associated with the Dutch Colonial and Georgian styles of house, among others.

One version of gambrel, seen on some Rural Dutch Colonial style homes, has short linear top surfaces, with longer lower surfaces that are curved inward, as shown in Figure 5. The lower surfaces tend to sweep out past the walls of the house, resulting in a bell-shaped appearance. The Rural Dutch gambrel's flaring eaves, sometimes called *flying gutters*, were once a function of necessity; the wide overhangs protected old-world clay (which was mixed with lime and straw) walls from the elements. In America, more durable and stable stone and wood replaced clay, but flared eaves remained.

Nonlinear roofs are not unique to the Rural Dutch Colonial. In fact, another Dutch style of house had the *single* roof surfaces of a standard gable design, but with inward curves and flaring eaves. Another nonlinear twist on the gable is the *round* roof, with *outward* curves, a design seen on some barns. This type of roof, depicted in Figure 6, was a logical outgrowth of the gambrel, in that it made use of storage capacity above the walls. This style was popular for a period following World War I, perhaps because of its appearance. It did not gain lasting acceptance in the farming community, though, because round roofed barns were more expensive and complicated to build than their more mundane counterparts.

Figure 2: Shed

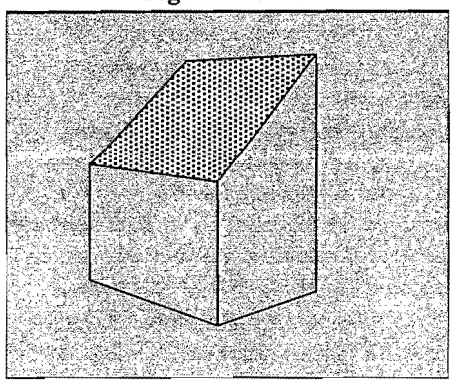


Figure 4: Gambrel

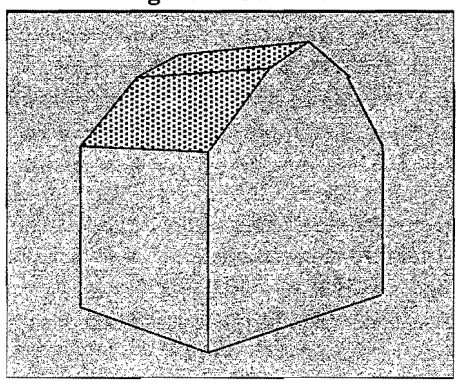


Figure 6: Round

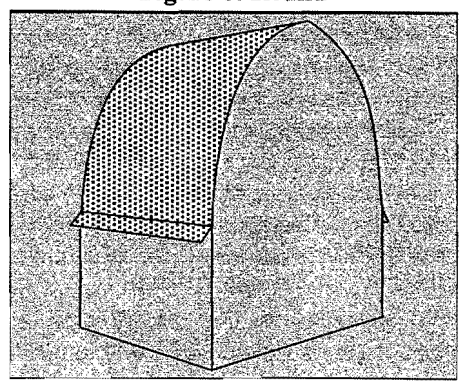


Figure 7: Hip-With-a-Ridge

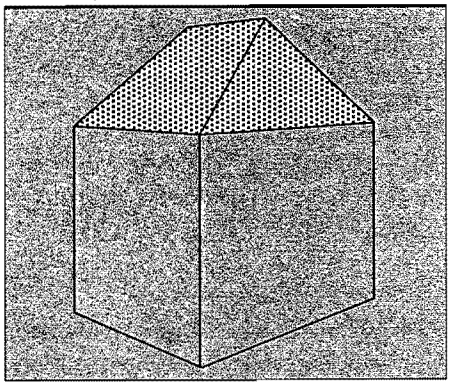


Figure 9: Mansard

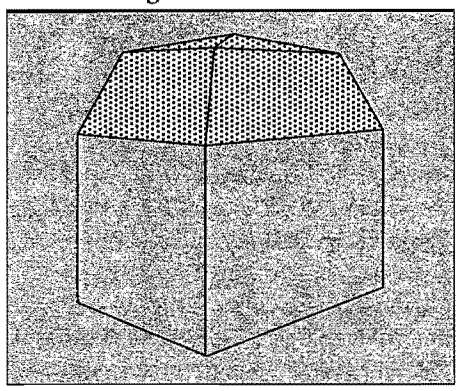
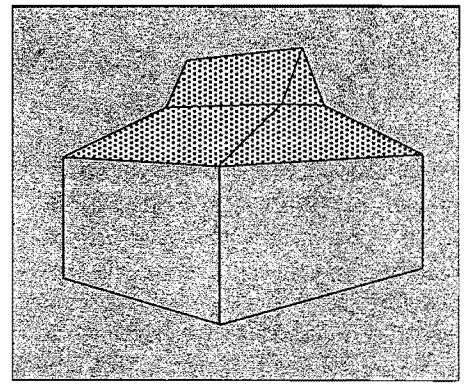


Figure 11: Gable-on-Hip



Like, Are You Hip?

Whereas each of the roof styles discussed above is a variation on the gable design, another family of roof styles consists of variations on the *hip* roof design. A basic hip roof has four sloping surfaces, with one surface resting on each exterior wall of the house. If there is a ridge along the top of the roof where the four surfaces come together (similar to the ridge seen on a gable roof), the roof is referred to as a *hip-with-a-ridge,* shown in Figure 7. We might think of the hip-with-a-ridge as a gable roof with sloping (non-vertical) gables. Two of the four surfaces (what we might call the "sloped gables") are triangular in shape, while the others are trapezoids (four-sided figures with top widths narrower than their base widths). If there is no ridge, such that all four sloping roof surfaces meet at a single point, the roof is a *pyramid hip*. The pyramid hip, all four surfaces of which are triangular, is illustrated in Figure 8.

One variation on the hip roof is the *mansard*, a roof of French origin, depicted in Figure 9. The mansard might best be thought of as a *dual-pitched* hip roof. It actually has *eight* surfaces, a pair for each side of the house, with the lower member of each pair displaying the steeper pitch. The mansard's lower surfaces are sometimes straight, but also can be curved inward, curved outward, or even S-shaped. Its upper portion is a basic hip style. Prior to the mansard's introduction, roofs in France were very steep, and of single pitch. The mansard's appeal is that it permits a nearly full upper story of usable space (the Second Empire style is said to have used mansard roofs to disguise living area as attic, thereby reducing property tax). Thus, the gambrel is to the gable what the mansard is to the hip. Interestingly, 17th century French architect Francois Mansart, for whom the style is named, never actually built a standard variety mansard roof.

Another dual-pitched hip roof is associated with a rural French home style found in the humid Mississippi valley. Like the mansard, this roof has two surfaces for each side of the house. In this case, however, the *lower* surfaces have the flatter pitch, with the higher surfaces rising steeply to a ridge. This roof style, illustrated in Figure 10, is thought to have evolved from a steeply pitched hip-with-a-ridge that was modified so that it could cover a porch encircling the structure.

Putting It All Together

Two variations that combine the basic hip and gable roof styles are the *gable-on-hip* and *hip-on-gable*, hybrids shown in Figures 11 and 12, respectively. The gable-on-hip (also called *hip-gable* or *partial hip*) roof has a sloping surface resting on each of the four exterior walls. Here, the lower level is hip; the upper gable portion rests on the lower hip portion. Thus, like the dual-pitched hip, the gable-on-hip has two roof surfaces for each exterior wall. (Note the difference between this gable-on-hip and the dual-pitched hip depicted in Figure 10. With the latter, each upper roof surface is sloped, with a pitch less than 90°, whereas the former's triangular surfaces are gables that rise vertically.) The hip-on-gable is the reverse of gable-on-hip (although there are not two roof surfaces for each wall), in that its lower level is gable and its upper portion is hip.

May you never again look at a French Eclectic or Chateauesque house without noticing its steeply pitched hip roof, or a Prairie or Italianate style home without noticing its low pitched hip roof. Understanding roof styles helps us to identify, and to better enjoy, the rich architecture of our diverse American housing stock. ■

Figure 8: Pyramid Hip

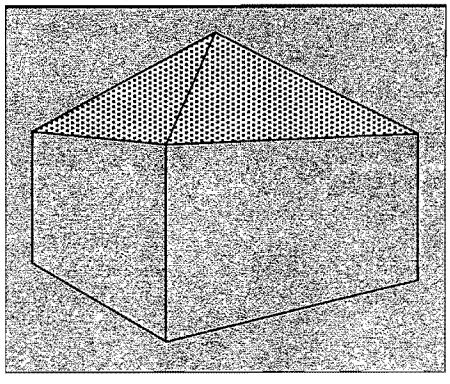


Figure 10: Dual-Pitched Hip

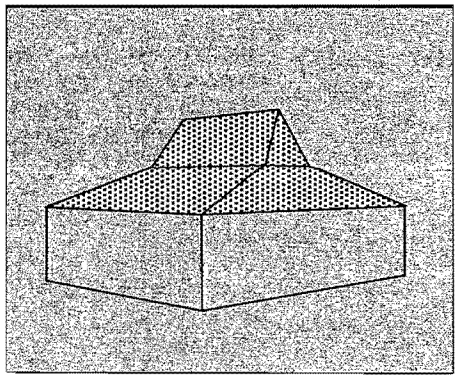
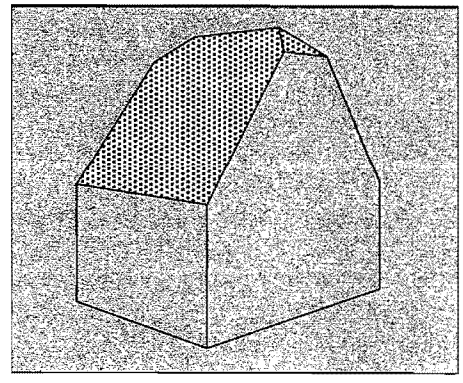


Figure 12: Hip-on-Gable



Up On the House Top: A Primer on Roofs

Carolyn A. Dehring

A roof's obvious function is to protect a building from the elements: rain, snow, wind, and sun. Historically, American homes' roof styles were dictated by climate, availability of materials, technology, and the regions of origin of settlers who built them. For much of this century, however, roof styles were driven not by function, but by aesthetics. In fact, it can be argued that the roof – of which many styles are found in the US – often is what best reveals a home's architectural style.

The Venerable and Versatile Gable

A *gable* roof consists of two sloping rectangular surfaces, which come together in a horizontal seam along the roof's peak. The two planes form an inverted "V;" they rest atop the building's outer walls, rising on triangular upward extensions of the walls called gables. A house with its main entrance under a gable is referred to as *front-gabled*, while a main entrance under a rectangular roof surface indicates a *side-gabled* house. A house with a gable roof is depicted in Figure 1.

The gable roof's rectangular surfaces were originally sloped at 60° angles (with about 20 inches of rise for each 12 inches of horizontal run, or "20/12" in roofing jargon). The "pitch" was steep to accommodate thatch, the roofing material early American settlers had known in Europe. Rain could penetrate thatch and seep into the home if the roof was not sufficiently steep. With a high pitch, water ran down the thatch and off (not into) the structure. When early settlers found that thatch was not well suited to New England's harsh winters, they replaced it with wood boards or shingles. These new materials did not *require* the extreme steepness of pitch that had been necessitated by thatch (though *some* steepness is always helpful for snow removal), yet the steep pitch remained a design standard for many decades despite the lack of a functional need.

Variations on the Theme

Because a *shed* roof has only one rectangular surface, it might be thought of as a gabled house split down the middle. The shed roof's highest elevation therefore is along one wall, rather than in the middle of the structure; see Figure 2. Shed roofs were once common in the Pacific Northwest. They were also found on what came to be called "urban half houses;" because this type of structure literally looked like only half of a house, it was considered only half finished, and was taxed accordingly.

An American adaptation of the basic gable roof developed in New England. Unlike the gable shown in Figure 1, the

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