

# What Do We Know about Apartments and Their Markets?

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**Abstract.** This paper examines major themes in apartment market research. The intent is to provide an overview of academic studies of the apartment market and to outline directions for future research.

## Introduction

Rental housing and apartments have long comprised an important component of the nation's housing stock. In the 1920s, the United States was a nation of renters, with some 56% of the population living in rental housing. While this percentage has fallen since World War II, rental housing still accounts for some 36% of the housing stock.<sup>1</sup>

Apartment complexes are a common feature of the American landscape, possibly because as Richard Hurd (1903), one of the fathers of land economics in the early part of this century, has observed, "pressure of population on land results in apartment houses." Hurd cautions developers, however, against apartment structures that cost too much relative to the value of the occupied land. Other real estate market analysts have recognized that, despite its popularity with developers, the rental housing market is subject to periodic cycles that are strongly tied to overall business cycles. Art Weimer and Homer Hoyt (1966), in their classic real estate text, assert that "construction of rental housing expands in boom periods and declines in recessions."<sup>2</sup>

This paper examines the major trends in apartment research. It summarizes recent developments and surveys major literature contributions. The intent is to provide an overview of the academic studies of the apartment market and to suggest directions for future research work. We begin our survey with an examination of papers investigating apartment demand and supply.

## Apartment Demand and Supply

A number of studies have estimated price and income elasticities.<sup>3</sup> Much of this research was motivated by the Housing Allowance Demand Experiments conducted in the early 1970s. Hanushek and Quigley (1980), using data derived from a sample of low-income renters in Pittsburgh and Phoenix, report price elasticities of demand that range from  $-.22$  to  $-.54$  in Pittsburgh and from  $-.19$  to  $-.63$  in Phoenix. They further report that

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the elasticity estimates differed significantly between the two cities. Using *Annual Housing Survey* data for renters in 1977, Goodman and Kawai (1984) estimate elasticities for measured income ranging from +.2 to +.3 and from +.4 to +.5 for permanent income. Their price elasticity estimates vary from  $-.46$  to  $-.54$ . A more recent study by Hansen, Formby and Smith (1993) estimates income elasticities of demand using an innovative methodology developed from the literature on the distribution of income and consumption. In order to estimate income elasticities, they draw on Lorenz curves and associated concentration functions. Using *Annual Housing Survey* data, the authors report their income elasticity estimates for renters rise monotonically from .14 at the lowest income decile to .47 at the highest decile.

Less academic research has focused on the supply side. The long-run supply of housing is traditionally thought to be totally elastic with respect to price (see, Muth, 1960; Follain, 1979). Thus, an increase in demand is not usually assumed to drive up housing prices. DeLeeuw and Ekanem (1971), however, document supply elasticities for rental housing that are much less elastic. Using aggregate data from the Bureau of Labor Statistics (BLS), they report the elasticity of supply with respect to rent to be between .3 and .7. They also estimate that the elasticity of supply with respect to the inputs for the cost of capital to be between  $-.2$  and  $-.5$  and the elasticity of supply with respect to the number of households to fall between 1.0 and 1.1. In a reexamination of the DeLeeuw and Ekanem data using a somewhat different methodology, Grieson (1973) finds the supply of rental housing to be much more elastic, reporting price elasticities that range between 1.8 and 2.2.

## Vacancy Rates and Market Equilibrium

Casual observation of the apartment market often reveals the existence of vacant units, even in very active markets. Yet it has long been recognized that continued vacancies in the apartment market do not represent a violation of the fundamental laws of supply and demand (for example, see Blank and Winnick, 1953; Alchian and Allen, 1964, pp. 155–56).

In most cases, an apartment owner can rent a unit very quickly if he/she is willing to lower the rent to attract renters. Hendershott and Haurin (1988) assert that, “[t]he existence of vacancies . . . reflects optimizing by the landlord.” Alchian and Allen describe the landlord’s decisionmaking process as follows:

An apartment owner will build more apartments than he expects on the average to have occupied. It will pay him to build more apartments in order to satisfy the unpredictable vagaries of demand rather than relying on instant fluctuation in rents to clear the market. . . . Empty apartments *per se* are not waste. They are a method of production to economize on the high costs of predicting the future and also of the high costs of *immediately* producing whatever a person wants.

Of the several studies that explore the relationship between change in rents and vacancy rates, most use time-series data and usually adjust nominal rents for changes in the aggregate price level; that is, they focus on changes in real rents.

Some of the studies hypothesize the existence of a natural vacancy rate, that is, the rate at which the change in real rents is zero. The natural-rate hypothesis suggests that when

the actual vacancy rate is above the natural rate, landlords adjust real rents downward until the actual rate accords with the natural rate. In contrast, when the actual rate falls below the natural rate, real rents can be expected to rise. Most empirical studies have sought to test some variation of the following relationship:

$$\% \text{ Chg } R_t = a_0(V_n - V_{t-1}) + b_1X + e_t, \quad (1)$$

where  $a_0$  is the rate at which real rents adjust to differences between the natural ( $V_n$ ) and actual ( $V_{t-1}$ ) vacancy rates,  $X$  represents other determinants of rent change, and  $e_t$  is an error term.

In a model that proposes that supply and demand factors interact to simultaneously determine the level of rents and the vacancy rate, Smith (1974) stipulates that the rate of change in rent is a function of the vacancy rate, of the vacancy rate lagged one period, and of the rate of change in property taxes (as a substitute for operating expenses). Using Canadian data, he finds that vacancy has a negative effect and that property taxes have a positive effect on the rate of change in rent. Smith concludes that the vacancy rate significantly affects the rate of change in rents and that landlords are able to pass along a significant portion of operating expenses in the form of higher rents.

Using U.S. data, Eubank and Sirmans (1979) apply the Smith model to four types of apartment buildings. As independent variables, they include the observed vacancy rate, the observed vacancy rate lagged one period, and the total operating expenses. They estimate their model for four cities by building type, as well as for pooled building types by city and for pooled cities by building type. Their results show that, in a majority of cases, the vacancy rate is not significant in explaining the change in rents, but that operating expenses are significant.

Rosen and Smith (1983) offer a further test of the Smith model using U.S. market data. They propose that the rate of change in rent is a function of the deviation in the observed vacancy rate from the natural vacancy rate. They assume that the natural vacancy rate is constant over time; thus, it is reflected in the intercept term. Their rent change equations are estimated with observed vacancy, with observed vacancy lagged one period, and with the rate of change in operating expenses (lagged one period). They find vacancy to be negative and significant for thirteen of the seventeen cities studied and also for the pooled cross-sectional regression. Using the intercept terms of the individual city equations as estimates of the natural vacancy rate, the authors develop a model of determinants of the natural vacancy rate. Explanatory variables include rent, standard deviation of rent, population, racial segmentation, renter mobility, change in housing stock, and change in population. All variables are significant, except change in population.

A further test of the relationship between the rate of change in rent and the vacancy rate is provided by Gabriel and Nothaft (1988). They regress the rate of change in rent on the observed vacancy rate and on city dummy variables. Their results show that the vacancy rate has a significant negative effect on the rate of change in rents. Estimating the natural vacancy rate for each city from their rent model, Gabriel and Nothaft calculate it to be 8% on average across the cities in their sample. There is, however, substantial variation among cities: the highest calculated rate is 12.1% in Houston, while the lowest rate is 3.9% in Seattle.

In a second stage of their analysis, Gabriel and Nothaft specify a natural vacancy rate model in which the natural rate is a function of the change in the stock of rental units, in the median rent, in the dispersion in rent, in the proportion of minority population, and

in population. All these variables are significant except dispersion in rent, which has the wrong sign. Their results indicate that natural vacancy rates are higher in rapid growth cities and high rent cities. Natural rates also appear to be higher in cities with larger minority populations. The authors hypothesize that the housing market heterogeneity associated with race is reflected in higher equilibrium vacancy rates.

To examine the relationship between rents and vacancies, Reece (1988) uses historical data for St. Louis covering 1902–1932 and for Los Angeles and six other cities. His findings further corroborate earlier studies: the observed vacancy rate is negatively related to the rate of change in rents.

To examine the relationship between rents and vacancy rates, Jud and Frew (1990) use micro data for individual apartment projects. In their model, the natural vacancy rate is determined by an apartment unit's atypicality. The change in rent equation includes a measure of atypicality (following the index developed by Haurin, 1988), the observed vacancy rate lagged one period, and a binary variable to represent the use of rental concessions. The results show a positive effect of atypicality and a negative effect of vacancy on the change in rent. To estimate the natural vacancy rate for the apartment units, the authors employ the estimated coefficients and the sample means. They report the natural rate to be 6.5% in their sample. This natural rate, however, is quite sensitive to the atypicality of the particular unit as measured by the atypicality index. For properties whose units are highly substitutable with others, the authors report that the natural rate is very low; for others, whose units are very atypical, the natural rate is quite high.

Although the overwhelming consensus of research suggests that rents and vacancy rates are negatively related, a recent study by Belsky and Goodman (1994) points out that the aggregate national time-series data on rents and vacancies, when plotted over the past two decades, do not conform to the traditional hypothesis. While there is a tendency for rent changes to be negative when vacancy rates are high, this relationship is not strong. And during much of the 1980s, real rents rose and remained high, while vacancy rates were rising. Belsky and Goodman contend that the unexpected positive correlation between real rent changes and vacancies during the 1980s can be explained by measurement problems, by changes in search behavior of tenants and landlords, and by an increase in the natural vacancy rate.

When landlords are faced with vacant units, they seek help in locating prospective tenants through advertising. Rental advertising plays much the same role in apartment markets that "help wanted" advertising plays in labor markets. A recent study by Steele (1993), using data from Toronto and Ottawa, shows that advertising rates lead vacancy rates as landlords tend to anticipate actual vacancies with advertising. Steele finds that the association between rent changes and advertising is closer than between rent changes and vacancy rates.

## Rent Control

Over the years, numerous political jurisdictions have resorted to rent controls to limit rental increases in the face of low vacancy rates. Rent control as a political policy is a controversial issue, usually favored by tenants and opposed by landlords. The rent control topic has generated a large scholarly literature, surveyed recently by Benjamin and Sirmans (1994). Their survey finds consensus on several issues. First, in the presence of rent control, landlords can continue to operate their properties without diminishing

tenant services, but landlords would then experience reduced profits. Second, to maintain their profit margins, landlords often reduce services or under-maintain rent controlled properties (Kiefer, 1980). Lastly, if rent controls are in place over long periods with resulting continued property under-maintenance, landlords then seek to remove their properties from the market (so as to lessen their current or potential losses) by abandoning them or converting them to other uses.

Benjamin and Sirmans report that most research reveals that rent control helps renters in the short run (Fallis and Smith, 1984; Linneman, 1987), but hurts them in the long run by making rental markets less efficient and by reducing the number of available rental units (Murray et al., 1991). Among the inefficiencies created by these controls are reduced maintenance and lower investment, both of which exacerbate housing shortages over the longer run. As housing shortages in controlled areas push excess demand onto other locales, controls also may alter the geographic pattern of rents by lowering rates in controlled areas and forcing rents higher in uncontrolled areas nearby. Rent control areas typically have lower vacancy rates which also adds to housing search costs for low- and moderate-income renters.

### **Demographic Determinants of Apartment Demand**

Variations in the demand for rental housing are strongly related to the size, age distribution, and growth rate by age group of the population. Apartment demand is directly related to population and the number of persons in the 18-to-35 age group. Rental demand is also positively associated with the number of persons aged 65 and over. Carn, Rabianski, Racster, and Seldin (1988), in their market analysis text, demonstrate how demographic factors can be incorporated in projecting rental housing demand. Rosen (1989) employs a similar analysis to project demand by census regions and major metropolitan areas.

An early paper by Ogur (1973) develops a model of rental housing demand that proposes that monthly rent is a function of median income, percentage of manufacturing employment, population density, and college enrollment as a percentage of population. Ogur's research shows rent to be positively affected by income and college enrollment and negatively affected by manufacturing employment. These same variables prove significant (except college enrollment for whites) when the data are segmented by white and non-white heads of households. Gilderbloom and Appelbaum (1987) also develop a model of rental housing markets, but stress that relationships among landlords and between landlords and tenants constrain how the free market responds to changes in rental housing supply. Using 140 urban areas from the 1980 census, they find that the following rental-related variables are significant: the proportion of housing stock that is rental, median house price, median income, proportion of units built before 1940, population growth, and degree of professionalization of the local rental market. In a recent paper by Cunningham (1994), which formulates an econometric model of the Orange County, California apartment market, the demand for apartments is found to be a function of the number of non-married households, number of householders in the 20-to-35 age cohort, travel time to work, and rent. Cunningham's supply price of apartments (rent) is determined by the cost of homeownership, median price of homes, number of bedrooms, age of the apartment structure, travel time to work, number of vehicles per household, and the level of condominium ownership.

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## **The Rent or Buy Decision**

Demographic variables also are very important in explaining the decision of households to rent or own. A very large literature exists on the determinants of such household tenure choice. This literature has been reviewed by Hendershott and Shilling (1982), Rosen (1979), and Haurin, Hendershott and Kim (1994). Studies based on aggregate data often explain the ratio of renters to total households in terms of various social, economic, and demographic variables. Microeconomic studies of tenure choice usually explain the decision to rent in terms of the marital and family status of the household structure.

An innovative recent study by Haurin et al. (1994) develops a model that accounts for the possible simultaneity of tenure choice with household formation and labor supply decisions. They find that tenure choice is influenced by wealth, the cost of renting relative to homeownership, and demographic variables, such as the presence of children, the marital and family structure, and race. Renting is found to be significantly higher for blacks and families without children.

## **Apartments and Business Cycles**

Housing has long been recognized to be subject to periodic cycles that are related to the pace of aggregate economic activity. Residential building permits are included by the U.S. Department of Commerce as a component of its widely used Index of Leading Economic Indicators. In a study of construction cycles in the United States since World War II, Grebler and Burns (1982) report that the expansion in residential construction tends to end nearly a year before GNP turns down, but the trough in construction activity tends to correspond to that of total output. They also find that the volatility of private residential construction has increased over the post-war period.

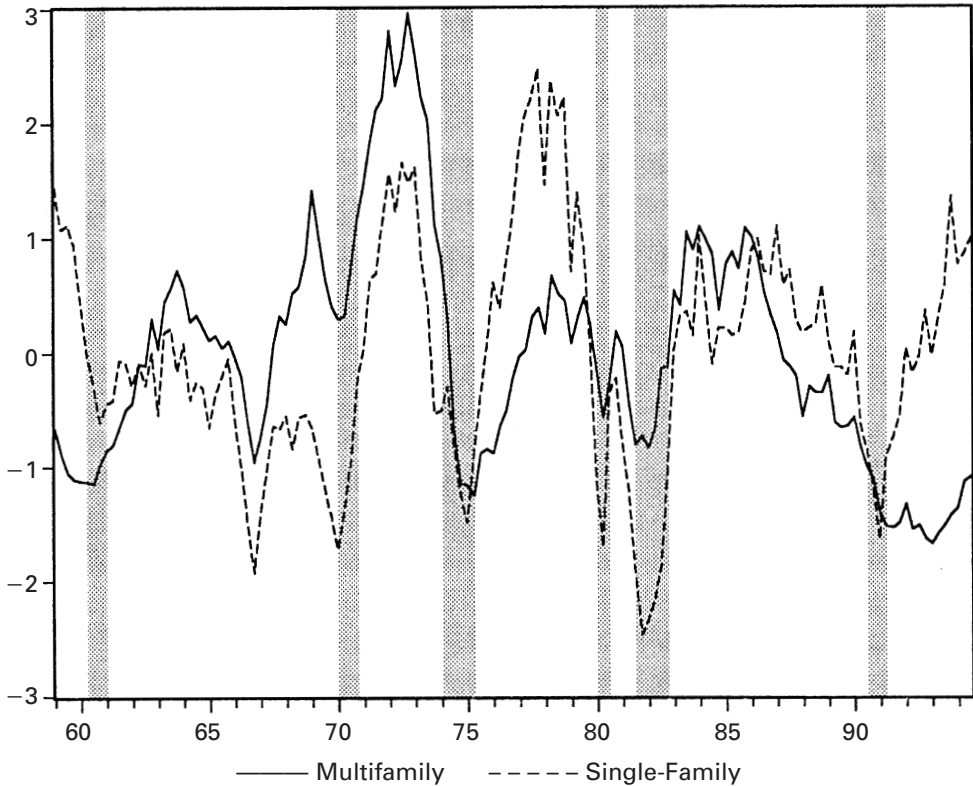
Exhibit 1 updates the analysis of Grebler and Burns by plotting single-family and multifamily housing starts from the first quarter of 1959 through the third quarter of 1994. The movements of the times series during the 1980s confirms earlier findings: both single-family and multifamily starts lead on the downturn and tend to turn up more or less coincident with the end of recession. An interesting anomaly to this historical pattern is the stall in multifamily starts following the end of the 1990–91 recession when the slow upturn in multifamily construction seemed to be another indication of the depth of the 1990s commercial real estate bust (see Rosen, 1994).

A number of authors have hypothesized the existence of real estate cycles (Pritchett, 1984; Brown, 1984; Pyhrr, Born and Webb, 1990), but documentation and dating of the cycles has been difficult because of the lack of high quality cross-sectional, times-series real estate data. A notable exception is the data used by Wheaton (1987) to study cycles in office markets. A more recent study by Mueller and Laposa (1994) documents and dates office market cycles in fifty-two cities from 1967 to 1993. Similar work on the apartment market has not been undertaken.

## **Hedonic Analysis of Apartment Rents**

To explain the actual rent paid in the market for particular apartment units or projects, most studies have drawn on hedonic price theory. The hedonic approach is developed in

**Exhibit**  
**Housing Starts, 59.1-94.3**  
**(normalized scale)**



the work of Rosen (1974), Lancaster (1971), and others, and it has been employed extensively in the study of housing values and rents. Previous hedonic studies of the rental housing market include the work of Follain and Malpezzi (1981), Jaffe and Bussa (1977), Shenkell (1975), Guntermann and Norrbin (1987), Sirmans, Sirmans and Benjamin (1989) among many others.

The hedonic approach looks at rent as being determined by the attributes and characteristics of the property and the neighborhood. To explain the determination of market rent for multifamily, income-producing real estate, empirical work has produced substantial lists of attributes and characteristics. These factors range from physical attributes to property management quality characteristics. In addition, rent has been shown to be affected by such factors as rental concessions and length-of-residency discounts.

Most rent studies employ some measures of physical characteristics. These usually include square footage or a proxy, such as bedrooms, and age. Using data from the *Annual Housing Survey* for years 1974 to 1977 from the Census Bureau, Malpezzi, Ozanne and Thibodeau (1987) show that apartment rents consistently decrease with building age (defined as age of apartment structure in years) at nearly a constant rate. In

addition, several studies investigate the effects that amenities and services have on the rent determination process. Among recent hedonic studies of rents are those by Guntermann and Norrbin (1987), Jud and Winkler (1991), Marshall (1990), Ozanne and Malpezzi (1985), Sirmans et al. (1989), Sirmans, Sirmans and Benjamin (1990), and Smith and Belloit (1987). This literature has been reviewed by Sirmans and Benjamin (1991).

Various amenities, services and physical characteristics have been demonstrated to affect rent; however, prior studies yield widely varying estimates of the marginal impacts. This diversity of findings strongly indicates, as demonstrated by Guntermann and Norrbin, that location plays a role in establishing the estimated value of particular attributes. This is because different specific submarkets have populations that demand differing specific attributes.

The notion that rents vary across space depending on proximity to specific nodes is very old. It can be traced at least to the work of von Thunen (1926). Validating the idea that proximity to an economic focal point, such as the city center or a campus, positively affects apartment rents are a number of empirical studies that include papers by Jaffe and Bussa (1977), Jud and Winkler (1991), Marks (1984), and Prave and Ord (1987).

Several papers by Gross (1988), Kroll and Smith (1988), and Smith and Kroll (1988, 1989) focus on the characteristics of renters and their willingness to pay for certain rental features. These authors demonstrate that differences exist in the marginal values placed by apartment dwellers on selected features. Accounting for these differences are geographic zones, tenant profiles (such as sex, marital status, income, children, etc.) and property profiles (such as, age of the complex, covered parking, etc.).

Prave and Ord (1987) utilize a conjoint methodology (that is, a decompositional method for modeling of consumer preferences) to model tenants' preferences for apartment rent, location relative to a university campus, condition of unit, types of neighbors occupying adjacent units, size of apartment, and whether or not units are furnished. Their segmentation methodology appears to successfully model the market's heterogeneity by showing the relative importance fixed on each attribute.

### **Other Influences on Rents**

A number of recent studies have examined the effects of factors other than amenities and location on apartment rents. The influence of rental concessions has been studied by Sirmans et al. (1990) and Frew, Jud and Winkler (1990) and Sirmans, Sirmans and Benjamin (1994). Their results show a positive effect of concessions on monthly rent; that is, rental concessions can substitute for reductions in posted rents. Frew et al. demonstrate that the use of concessions is more likely in projects that are atypical. Sirmans et al. (1994) show that concessions have a positive effect on both rent and occupancy.

A specific kind of rental concession is a length-of-residency discount, the effects of which Marshall and Guasch (1983) and Goodman and Kawai (1985) examine. Marshall and Guasch's premise is that landlords offer rent discounts to tenants who remain in their units for more than one contract period and that the discount increases with each additional contract period. They also propose that landlords wishing to retain desirable tenants may also offer tenants a one-time "sit" discount at the first contract renegotiation. Rent is estimated to be a function of a vector of specific physical and other



characteristics, a binary variable representing whether the tenant has resided for less than or more than one year, and the residency discount times the length of time the tenant has occupied the unit. OLS results show both these variables to be significant and negative. When the data are corrected for censoring bias, however, there is insufficient evidence to conclude that landlords offer residency discounts. Goodman and Kawai (1985) also find that length-of-stay discounts exist in rental housing. Using the 1997 *Annual Housing Survey* data and maximum likelihood procedures, they find that long-term tenants receive rental discounts of 8.2% to 1.1%. The results of both these studies support the industry practice of non-moving tenants paying lower rents than moving tenants.

Recent research also has investigated the effect of professional management companies on rent. Management provides or monitors services, such as tenant screening and intermediation, repair quality, maintenance, security, etc. These services may be valuable to the rental market and may affect rent. Benjamin and Lusht (1993) show that the larger the management company, the higher the rent, arguing that the ability of the management company to reduce the search costs of tenants has a positive effect on the level of rent. They estimate rent as a function of physical characteristics, location, vacancy, time trend, lease provisions, and a variable representing search cost (the number of apartment unit types managed by the management firm). Results show that the variable, number of unit types managed, has a positive effect on rent per unit.

Sirmans and Sirmans (1992) examine the relationship between the quality of property management services and apartment rent. They postulate that the quality of management services is positively correlated with the professional designations held by property managers because such designations act as a signal indicating the managers' levels of competence based upon education, training and experience. The results show that management companies whose managers hold designations produce higher average monthly rents. The coefficients in the semilog model of rents suggests that these management companies generate monthly rents that are about 4% higher on average, other things equal.

To analyze the property owner's choice of management scheme, Sirmans, Sirmans and Turnbull (1994) apply incentives theory. Their model modifies the traditional empirical hedonic rent specification and derives empirically testable relationships between equilibrium rent function, choice of management scheme (owner managed versus third-party managed), and other observable management characteristics. Empirical results from their sample of apartments are consistent with the theoretical model: rents are higher for owner-managed firms, higher when managed by professionally designated or certified firms, and lower the greater the number of units managed by the management firm.

The impact of local historic zoning on apartment values is examined by Asabere, Huffman and Mehdian (1992) in a study that draws on the experience of Philadelphia and a sample of apartment sales over time. They report that a local historic designation is associated with significantly lower value; apparently the increased cost associated with the designation outweighs the benefits.

## Investment Returns

Almost three decades ago, Paul Wendt and Sui Wong (1965), in an introduction to their seminal study of apartment returns, lamented that "surprisingly little is known about the

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comparative realized yields of rental property and common stocks . . . .” Since then, a sizeable body of research has analyzed the returns to common stocks and REITs, but much less has been done in exploring the pattern of apartment returns.

Wendt and Wong examine the returns to twenty FHA-financed apartment properties in the San Francisco area during 1952–62. Lacking actual selling prices, they assume that the properties were sold in the final period at the prevailing capitalization rate. A similar study, conducted by Kelleher (1976), uses a different database.

Market-determined prices and return series for commercial real estate in general and apartments in particular have not been available because properties are traded infrequently and because no centralized property exchange exists. To estimate prices of properties that are not actually sold, Hoag (1980) and Miles, Cole and Guilkey (1990) have employed hedonic techniques, but the problems of model specification in such studies raise questions. Some studies have tried to construct synthetic return series by applying capitalization rates to rental income series. Included here are those of Firstenberg, Ross and Zisler (1988), Wheaton and Torto (1989), and Liu, Hartzell, Grissom, and Grieg (1990). The problem with this approach is that small errors in the cap rate can generate very large differences in returns.

Appraisal-based return series, such as the Russell-NCREIF Property Index, have been examined by a number of researchers, but these series generally show a level of volatility that is suspiciously low. Papers by Ross and Zisler (1987), Gau and Wang (1990), and Geltner (1991) outline the problems with using appraisal-based returns and suggest some ways to adjust the indexes for smoothing problems. Other researchers have employed stock market data from REITs to construct return series. A review of REIT-based return studies is found in Gyourko and Keim (1992). The idea motivating these studies is that the stock market reflects information about real estate markets more accurately than do property appraisers.

Miles and McCue (1984) examine returns using a sample of properties from “a diversified portfolio of real estate held by a large Commingled Real Estate Fund (CREF).” Again, because the properties are not sold at market at the end of the period, this approach relies on end-of-period appraisals in calculating returns. Miles and others extend the analysis of commercial real estate returns in a series of papers, although frequently the number of apartment properties in their samples is too small to be separately reported and in all cases the returns are appraisal based.<sup>4</sup> Several other researchers have looked at the pattern of real estate returns, but they have not been able to analyze apartments separately.<sup>5</sup>

## Summary and Observations

This paper has examined some of the history of rental housing in the U.S. along with its burgeoning literature. Various issues have been prominent as evidenced by the scope of academic research. Some studies have examined apartment demand and supply by estimating various ranges for price and income elasticities. Other studies have produced various elasticities of supply with respect to rent.

A number of studies have examined vacancy rates and apartment market equilibrium. Some studies hypothesize that a natural vacancy rate other than zero exists, one at which the change in real rents is zero, and that the change in rent is a function of the deviation in the observed vacancy from the natural vacancy rate. There are studies that show that

vacancy is not significant in explaining changes in rents, but that other factors such as operating expenses are. Although one study finds that during the 1980s real rents and vacancy rates rose simultaneously, in general, the consensus of research indicates a negative relationship between rents and vacancy.

Other studies have examined the issue of rent control in apartments. Most research reveals that rent control helps renters in the short run but hurts them in the long run by making rental markets less efficient and by reducing the number of rental units.

There are studies that have examined the demographic determinants of apartment demand. Results show a relationship between rental rates and size, age and growth rate of population. Some research shows a positive relationship with income and college enrollment and a negative relationship with manufacturing employment. Other factors seem to be travel time, the price of housing, age of apartments, etc.

Studies have examined the business cycle of housing. A general finding is that both single-family and multifamily housing starts lead on the downturn and tend to turn up with the end of the recession.

Hedonic pricing models have been used in certain studies to determine the actual rent paid for particular apartment units. A number of factors including physical characteristics, rental concessions, and management quality characteristics are shown to affect rent.

Some studies have used returns series to measure real estate returns. A problem in this type of analysis is a lack of market-determined prices (and therefore a reliable returns series) because real properties are traded infrequently and no centralized property exchange exists. And, some studies have used appraisal-based returns data with suggestions on adjusting for smoothing problems. In general, it has been difficult to examine the pattern of real estate returns and even more difficult to analyze apartments separately.

## Notes

<sup>1</sup>U.S. Census Data, various years.

<sup>2</sup>The current development fad of the 1990s, although small, is apartment projects.

<sup>3</sup>See, for example, Friedman and Weinberg (1981) and Gahvari (1986).

<sup>4</sup>See, for example, Hartzell, Hekman and Miles (1986, 1987), Miles and McCue (1984); and Miles, Cole and Guilkey (1990).

<sup>5</sup>See, for example, Ibbotson and Siegel (1984) and Wurtzebach, Mueller and Machi (1991).

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