On Setting Apartment Rental Rates: A Regression-Based Approach

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***Abstract*. This study presents a regression-based analysis of apartment rents for a cross-section of properties located in an "edge city" submarket. It attempts to provide a solution for owners and managers of apartments to the thorny problem of setting a property's rental rate. The approach used in this analysis differs from previous studies in at least three important respects: (1) vacancy is treated as part of the dependent variable, (2) the property-specific rental rate generated by the regression analysis is compared to the property's actual effective rent, and (3) each property in the submarket is ranked by the difference between its actual effective rent and its characteristic-adjusted effective rent. This is then followed by several observations concerning the advantages and disadvantages of such an analysis in a practical setting.**

Introduction

The question of setting the appropriate price for any good or service is a fundamental aspect of business management, so too for apartment owners and operators. Like other businesses, apartment markets are constantly in flux. The units demanded change with tenants' wants, needs and their ability to afford them, while competing properties continuously attempt to differentiate their product based on quality and/or price. In short, the pricing/product landscape is constantly changing. For the apartment sector (like the hotel sector), this volatility is particularly important, given the large percentage of leases expiring each year.

In this study, regression analysis is used to estimate the appropriate rental rate for a cross-section of apartment properties. Regression packages[1] are now available in most 'electronic spread sheets'. Therefore, owner/operators in the multifamily sector, as with most business managers, can substantially improve their decisionmaking processes at very little cost. Previous regression applications to real estate pricing issues include: (1) the appraisal of single-family homes (see Blettner, 1969; Case, 1967; Dilmore, 1974, Emerson, 1972; Rosen and Smith, 1983), (2) the appraisal of multifamily projects (see Hanford, 1966; Shenkel, 1969; Webb, 1982), (3) estimating demand for retail space (see Benjamin, Jud and Okoruwa, 1994; Whaley, 1990), (4) estimating the natural vacancy rate for apartment markets (see Gabriel and Nothaft, 1988; Harris, 1991; Miles, 1975; Read, 1988) and (5) estimating the market rents for apartment markets (see Sirmans and Benjamin, 1991).

This application differs from previous studies of apartment market rents (see Sirmans and Benjamin, 1991, for an extensive review of the literature concerning apartment rents)

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in three important respects: (1) vacancy is treated as part of the dependent variable, (2) the property-specific rental rate deemed appropriate by the regression analysis is determined and compared to the property's actual effective rent, and (3) each property in the submarket is ranked according to its characteristic-adjusted performance.

Research Design

Since regression-based analyses can substantially assist in the analysis of complex inter-related data, their use should substantially improve upon the rental rate decisionmaking process, compared to human judgment which is often fraught with error and bias.[2] For this reason, real estate owners and managers are well advised to add such an approach to their arsenal of marketing weapons.

In order to estimate the appropriate rental rate, a linear multiple regression analysis of the following form was used:

$$y_i = a + b_{1,i}x_{1,i} + b_{2,i}x_{2,i} + b_{3,i}x_{3,i} + e_i \,, \tag{1}$$

where:

y_i = value of the effective monthly rent,
a = constant,
b_n = coefficient modifying x_n,
$x_{1,i}$ = vector of non-dummy quantitative variables,
$x_{2,i}$ = vector of dummy quantitative variables,
$x_{3,i}$ = vector of dummy qualitative variables, and
e_i = error term.

For purposes of illustration, two-bedroom units are studied because the number of bathrooms and floor plans varies widely among the thirty complexes surveyed, all of which are chosen from the same general grade of properties. Other unit types tend to be more uniform in their bathroom/bedroom configurations.[3] Accordingly, two-bedroom units should be more interesting and informative to study. Additionally, the analysis of apartment rents tends to be easier than for other commercial properties (e.g., office, retail and industrial) as they avoid the problems of imbedded options, calculating the present value of long-term fixed-rates leases, percentage rents, etc.

For the purposes of this study, effective monthly rent (y_i) has been defined as the product of two components:

$$y_i = rate_i \text{ x } occupancy_i \,, \tag{2}$$

where:

$rate_i$ = effective rental rate, and
$occupancy_i$ = occupancy level.

The effective rental rate is computed by taking into consideration free rent and other concessions. These concessions were factored into the effective rate by amortizing the concession over the life of the lease (e.g., the stated rental rate is multiplied by 11 and divided by 12, in this market's typical case of one free month for a twelve-month lease).

The estimated occupancy represents the property's current occupancy rate for each of the properties in the dataset.

The product of rates and occupancies was used to produce an occupancy-adjusted rental rate or, effective monthly rent. Without some adjustment for how the marketplace accepts the property's rental rate structure, effective rates are insufficient for making sound business judgments. Alternatively stated, property owners should be relatively indifferent between a rental rate (after concessions) of $800 per month which generates an occupancy level of 90% as compared to a rate of $900 and an occupancy of 80%—on average, both generate $720 per unit. In practice, there may be reasons why owners would prefer the lower occupancy structure and much of this consideration may have to do with the project's structure of fixed and variable costs, as described in Colwell (1991).

Consequently, the product of each property's effective monthly rental rate and its estimated occupancy acts as the study's dependent variable. In other words, the theoretical basis for this approach lies in the classical theory of the firm, in which demand is perfectly elastic from the perspective of the firm (apartment project) and price is negatively related to output, as later indicated by the regression results.

This study jointly approaches the interaction of apartment rental rates, rent concessions and occupancy rates. That is, these factors are jointly incorporated—as described above—into a single dependent variable and, consequently, a single (multivariate) regression equation is generated. Sirmans, Sirmans and Benjamin (1994), alternatively, take the approach of independently, but simultaneously, examining each of these three factors and, consequently, three (multivariate) regression equations are generated. In theory, both approaches should render the same results. In practice, however, the "noisy" data (e.g., multicollinearity amongst independent variables, imperfect estimates of non-quantitative variables, quantitative parameters that belie more complicated renter processes, etc.) can substantially compromise the empirically derived coefficients associated with the theoretical combination. Note that these complications manifest themselves in the Sirmans et al. study: the R^2 figures differ substantially amongst the three equations as do the *beta* coefficients of independent variables common to all three equations. Accordingly, this study's approach of jointly examining the dependent variables is felt to be: (1) mathematically/statistically parsimonious, (2) conceptually concise, and (3) of significant interest to owners and operators as they confront the issues of vacancy, effective rent and variable expenses.

The Data

Apartment data[4] from the first quarter of 1991 for two-bedroom apartment units of multifamily housing complexes located northwest of Chicago, Illinois were used for the purpose of this study.[5] Though one submarket can never be considered representative of regional or national trends, the Woodfield submarket does qualify as an "edge city"[6] and, as such, may share similar characteristics with other such cities.

The dataset consists of thirty apartment complexes with fifty or more rentable two-bedroom units. This study assumes that properties having to rent less than fifty units face a different set of leasing dynamics than those larger properties that are the primary focus of this study. Seven of these thirty properties have more than one set of two-bedroom floor plans, which primarily vary by the number of bathrooms. For example, a number of these properties offer both a two-bedroom/one-bath floor plan as well as a two-bedroom/two-bath floor plan. Generally speaking the square footage of the former units are significantly smaller than the latter. Consequently, significantly different rental rates are set for each of these floor-plan configurations. These properties are denoted, for example, as Hoffman Ridge: No. 1 and Hoffman Ridge: No. 2, which represents the same property offering fifty or more two-bedroom unit types each with two different bathroom configurations. For purposes of this study, each of these qualifying configurations is treated as a separate observation. As a result, there are thirty-seven observations, comprising 6,553 units.

The factors influencing apartment rent include quantitative, as well as qualitative independent variables. A summary of the data, along with the dependent variables, is shown in Exhibit 1. A discussion of each of the independent variables is presented in Appendix 1.

The first through fourth moments, along with the minimum and maximum values, of the distributions of each of these variables are presented. The second moment—the variance of the distribution about the mean—has been converted into the standard deviation. The third moment, skewness, represents the lopsidedness of the distribution. A negative value indicates a distribution skewed to the left; a positive value indicates a distribution skewed to the right; and a value of approximately zero indicates an approximate symmetric distribution. The fourth moment, kurtosis, represents the relative peakedness or flatness of the distribution. A positive value indicates a relatively peaked

Exhibit 1
Overview of Independent and Dependent Variables

	Mean	Std Dev.	Minimum	Maximum	Kurtosis	Skewness
Independent Variables						
Age	15.11	5.98	4	22	−.8430	−.8023
Square Footage	998.47	117.90	782	1200	−1.1468	−.0189
Number of Baths	1.56	.45	1	2	−1.7864	−.2656
Number of Units	177.11	93.12	60	429	.5633	.9482
Heat Source – Gas	0.05	0.23	0	1	15.7665	4.1129
Heat Source – Electric	.30	.46	0	1	−1.2133	.9249
Building Height	2.35	.62	1	3	−.5899	−.4416
Covered Parking	.38	.48	0	1	−1.8285	.5230
Security System	.19	.39	0	1	.7782	1.6550
Reduced Security Deposit	.73	.44	0	1	−.8872	−1.0788
Location/Visibility/ Accessibility	6.57	1.84	2	10	.0167	−.5203
Quality of Management	5.41	2.17	1	9	−.2793	−.5983
Amenity Package	5.00	2.43	1	9	−1.1926	−.2010
Curb Appeal	6.24	2.10	1	10	.8889	−1.0514
Construction/Sound Transmission	5.86	1.73	3	8	−1.0443	−.6359
Dependent Variables						
Effective Monthly Rental Rate	$729.86	$80.78	$559.00	$912.00	−.4057	.0915
Estimated Occupancy	89.3%	2.0%	82.0%	95.0%	5.8390	−1.0365
Effective Monthly Rent	$651.65	$75.15	$492	$830	−.2904	.1340

distribution while a negative value indicates a relatively flat distribution. An examination of the non-dummy variables (i.e., age, square footage, number of baths and effective monthly rent) indicates that none of these variables perfectly follow a normal distribution. Naturally, the dummy variables possess significant skewness and/or kurtosis.

While the parameters of the quantitative factors are fairly definite, the same cannot be said for the qualitative factors. From the standpoint of minimizing subjectivity and human error, it would be preferable to exclude the qualitative factors. Notwithstanding these problems, the inclusion of the qualitative variables, as demonstrated later, adds substantially to the explanatory power of the data.

While much of the data is readily available, one substantive difficulty in a study such as this is obtaining reliable occupancy estimates. Unlike commercial properties (which extensively use third-party leasing brokers and, accordingly, need to disclose their available space), residential property owners/managers are reluctant to disclose their occupancy status. Nevertheless occupancy estimates were obtained on twenty-five of thirty-seven properties which amounted to 4,621 apartment units—or slightly more than 70% of the total sample. However, the estimates were most often of the property's overall occupancy level, as opposed to that specific to their two-bedroom units. If a reliable estimate of a property's occupancy could not be obtained, this study used the unit-weighted average occupancy estimate for those properties on which reliable estimates were received.

Results

The ordinary least squares regression analysis, in the form described and as shown in equation (1), results in the coefficients shown in Exhibit 2.

Exhibit 2
Beta Coefficients and Associated Confidence Levels

Independent Variables	*Beta* Coefficient	Standard Error	*t*-Statistics	Confidence Level (%)*
Intercept	340.07	101.68	3.34	99.81
Age	−.72	2.47	−.29	22.80
Square Footage	.24	.10	2.46	98.14
Number of Baths	36.39	22.71	1.60	88.23
Number of Units	−.19	.10	−2.00	94.67
Heat Source – Gas	−19.98	54.12	−.37	28.58
Heat Source – Electric	37.05	27.43	1.35	81.48
Building Height	−27.85	19.74	−1.41	83.32
Covered Parking	30.93	22.36	1.38	82.49
Security System	33.05	21.41	1.54	86.85
Reduced Security Deposit	−20.14	26.04	−.77	55.56
Location/Visibility/Accessibility	−8.35	5.80	−1.44	84.13
Quality of Management	8.11	5.56	1.46	84.71
Amenity Package	−3.07	5.65	−.54	40.99
Curb Appeal	21.23	6.99	3.04	99.56
Construction/Sound Transmission	1.07	6.84	.16	12.31

*related to rejecting the null hyposhesis: $b_i = 0$.

An examination of the *t*-statistics presented in Exhibit 2 indicates that only four of the seventeen variables can be accepted, at better than a 90% confidence level, as statistically significant variables. Six more variables are acceptable at better than an 80% confidence level. However, the overall measures of goodness of fit indicate that the equation provides substantial explanatory power:

R-squared	.828
Adjusted *R*-squared	.706
F-statistic	41.34

Given the *F*-statistic, the regression equation can be accepted at better than a 99.99% confidence level as generating significant explanatory power. In the present case, approximately 83% of the movement in the dependent variable is explained by the movement in the independent variables.

Additionally, the range of the *R*-squared and Adjusted *R*-squared values (i.e., .828 v. .706) suggests that the inclusion of most all of the independent variables is significant in terms of explaining investments in the dependent variable. However, this range also suggests that the possibility of multicollinearity amongst the independent variables merits examination. The correlation matrix (see Exhibit 3) presents the correlation coefficients amongst the individual independent variables as well as the dependent variables.

Inspection of Exhibit 3 indicates that the correlation coefficients amongst several of the independent variables has an absolute value in excess of .50. Accordingly, there is some concern that the individual *beta* coefficients may be unbiased but inefficient estimates. In turn, this may have a significant adverse impact upon the reliability of the *t*-statistics.

High correlation among the independent variables may confuse the relationships between any one independent variable and the dependent variable, because more than one independent variable may be explaining the same movement (variance) in effective rents. Thus, it seems plausible that some coefficients may not align themselves with industry intuition. All the more reason why a systematic, regression-based approach might yield more insight than other less rigorous approaches.

Error Terms

Before moving on to other facets of this study, it should also be noted that much of the statistical inference is based on the assumption that the error terms (i.e., the differences between the actual and predicted values) are normally distributed (or approximately so) and homoscedastic (i.e., of constant variance). This was found to be generally true. (See Exhibit 4 which plots the value of these residual values.) Though a more precise analysis is given by individually reviewing each independent variable, for purposes of economy a single exhibit is presented.

A statistical review of these residual values would include:

Mean	\$.00
Standard Deviation	\$31.15
Skewness	−.082
Kurtosis	.254

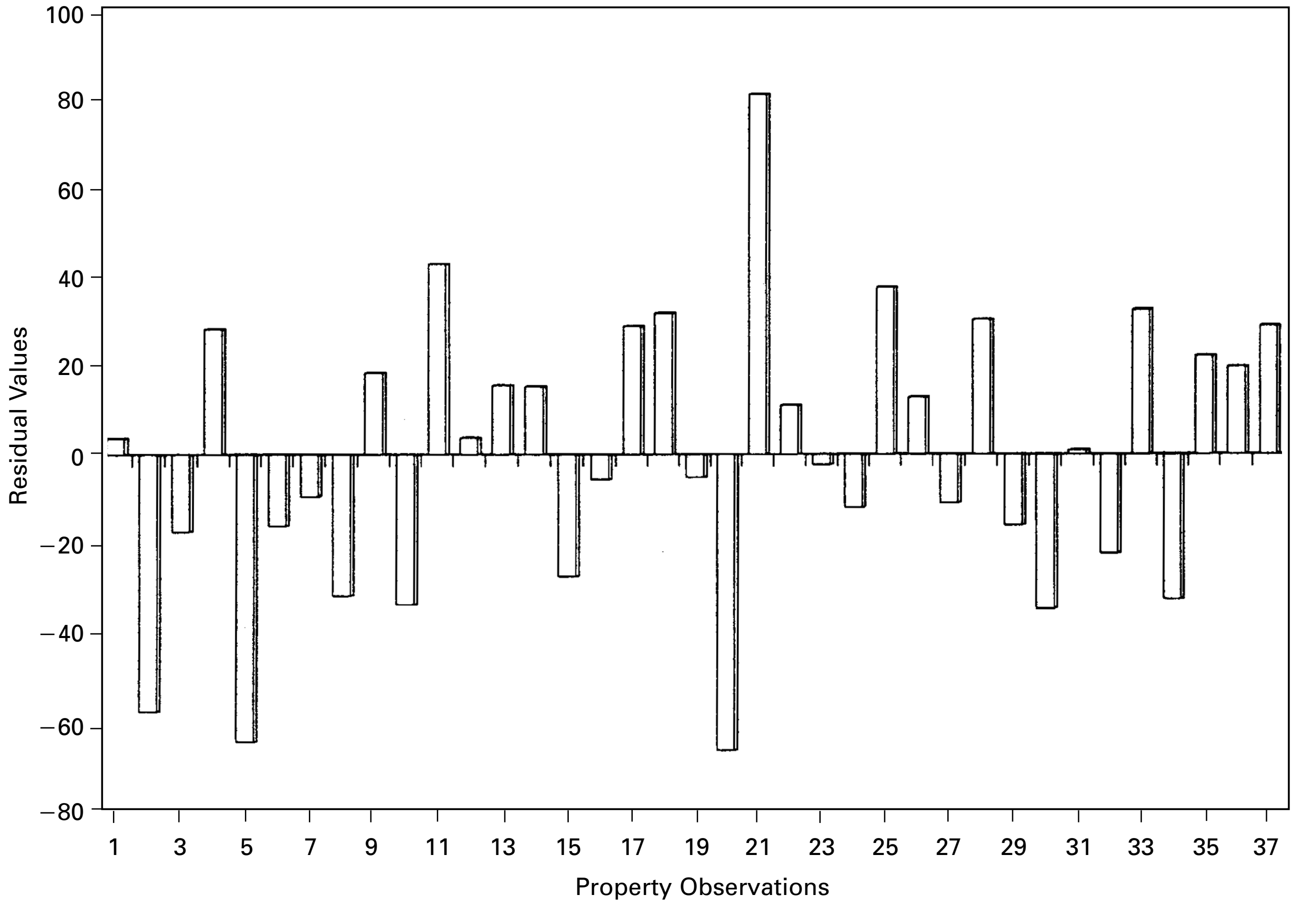
Exhibit 3
Correlation Matrix of Independent and Dependent Variables

	Age	Square Footage	Number of Baths	Number of Units	Heat Source – Gas	Heat Source – Electric	Building Height	Covered Parking	Security System
Independent Variables									
Age	1.000								
Square Footage	.184	1.000							
Number of Baths	.056	.597	1.000						
Number of Units	.272	.284	.215	1.000					
Heat Source – Gas	−.404	−.137	−.032	−.262	1.000				
Heat Source – Electric	−.586	−.250	−.022	−.086	−.155	1.000			
Building Height	.171	.364	.213	.073	−.134	−.082	1.000		
Covered Parking	.405	.327	.236	.000	−.187	−.264	.632	1.000	
Security System	.107	−.125	−.066	.068	−.115	−.012	−.493	−.235	1.000
Reduced Security Deposit	−.193	−.344	−.087	−.122	.145	.396	−.047	−.027	.139
Location/Visibility/Accessibility	−.003	.372	.294	.023	.056	.024	.297	.123	−.224
Quality of Management	−.372	.198	.183	.134	.175	.178	.194	.060	−.280
Amenity Package	−.052	.369	.311	.237	−.295	.122	.553	.390	−.227
Curb Appeal	−.353	.334	.257	.119	.200	.094	.430	.122	−.352
Construction/Sound Transmission	−.216	.252	.439	.205	.019	.154	.370	.158	−.282
Dependent Variables									
Effective Monthly Rental Rate	−.388	.499	.531	−.020	.052	.210	.155	.145	−.104
Estimated Occupancy	.034	.200	−.063	.007	.088	−.060	.014	.004	.161
Effective Monthly Rent	−.362	.518	.496	−.018	.067	.191	.155	.146	−.070

Exhibit 3 (continued)
Correlation Matrix of Independent and Dependent Variables

	Reduced Security Deposit	Location/ Visibility/ Access	Quality of Management	Amenity Package	Curb Appeal	Construction/ Sound Transmission	Effective Monthly Rental Rate	Estimated Occupancy	Effective Monthly Rent
Independent Variables									
Age									
Square Footage									
Number of Baths									
Number of Units									
Heat Source – Gas									
Heat Source – Electric									
Building Height									
Covered Parking									
Security System									
Reduced Security Deposit	1.000								
Location/Visibility/Accessibility	−.044	1.000							
Quality of Management	−.250	.429	1.000						
Amenity Package	.100	.424	.446	1.000					
Curb Appeal	−.133	.560	.737	.626	1.000				
Construction/Sound Transmission	−.294	.475	.518	.316	.509	1.000			
Dependent Variables									
Effective Monthly Rental Rate	−.235	.347	.624	.446	.675	.480	1.000		
Estimated Occupancy	−.180	−.036	.190	−.159	.093	−.109	.104	1.000	
Effective Monthly Rent	−.263	.321	.634	.394	.664	.439	.980	.299	1.000

Exhibit 4
Plot of Residual Values



Thus, the residual values have a mean zero with a standard deviation equal to less than 5% of the average effective monthly rent (of $652). Moreover, the third and fourth moments indicate a distribution that is approximately normal. Consequently, the error terms appear to be homoscedastic. If this is not the case, the error terms will be heteroscedastic and the coefficient estimates may be inefficient, though unbiased.

Other Equation Forms

At the risk of "data mining" (see Black, 1993), other functional forms were also tested. These tests included using only the "reliable indicators" (independent variables with *t*-statistics significant at a 90% confidence level) and eliminating some or all of the qualitative factors. These functional forms were tested in logarithmic forms, as well as arithmetic forms. The results of these other forms are presented in Appendix 2. While Appendix 2 provides a comparison so that coefficient stability can be examined, the reader is cautioned against directly comparing models using different scales (linear and semi-log). In all cases, the equation's explanatory power—as measured by the adjusted *R*-squared—was less than that of the current model.

The Appropriate Rent and the Price/Value Analysis

Based on the regression results in Exhibit 2, the predicted value of effective rents was generated. This is the regression-determined appropriate rent. These figures, along with the values of the independent variables, are shown in the right-hand side of Exhibit 5.

These values were then compared to the project's actual effective monthly rent and the difference between the two is reported in both dollar and percentage terms. Positive differences indicate that the property is apparently achieving more in practice than that which is suggested simply by its physical and operational characteristics, while negative differences indicate that the property is achieving less than it ought.

Characteristic-Adjusted Properties Ranked by Performance

Exhibit 6 ranks each of the properties according to their ability to command effective rents in excess of that hedonically suggested by the property's physical and operational characteristics. The properties were sorted by the percentage difference between the actual and predicted effective rents.

Thus, this hedonic model, in addition to rate setting for existing and to-be-built properties, may also have applications in the areas of:

- assessing property manager performance, and/or
- identifying undervalued acquisitions.

In the case of manager performance, such a ranking offers a preliminary indication of which firms are "out managing" their property's characteristics. All other things being equal, owners would want property managers who can deliver effective rents in excess of that merely suggested by the property's physical and operational characteristics. Note that management quality is already estimated to add $8.11 (see Exhibit 2) for every point awarded on the subjective scale of 1 to 10. Thus, the difference between superior and poor management may result in differential rental rates of approximately $80 per month per unit. Consequently, property management quality may significantly impact a property's income stream.

In the case of undervalued acquisitions, such a ranking offers a preliminary indication that properties may be able to enhance their revenue streams merely by an increase in the quality of property management. Thus, properties with a negative difference between actual and predicted effective rents combined with lowly rated management quality suggest instances where this possibility may offer its greatest reward.

Conclusions

With most any system of rate setting there will be advantages and disadvantages. Knowing the strengths and weaknesses of the regression-based system demonstrated here enables owners and managers to augment the system with their judgment, intuition and experience. This augmentation may provide a substantial enhancement to the model's predictive power.

The advantages of a hedonic approach include:

- *Systematic Approach*
  As noted previously, regression analysis can substantially improve on human abilities to synthesize large amounts of complex data. Accordingly, a regression-based model offers a statistically rigorous and systematic approach to setting a property's rental rates, thereby avoiding undue human influences. In fact, there is some evidence to suggest that human predictive power decreases as the number of information pieces increases.[7]

- *Systematic Data-Gathering*
  The requirements of the model used in this study, combined with a changing marketplace, suggest that the regression-based model will impose a systematic approach to data-gathering. It is no longer acceptable to set rates without a comprehensive array of market-based statistics. In the process, owners, managers and leasing agents become more familiar with the characteristics of their property's competitors. This should help in making better decisions.

- *Avoids Occupancy Fixation*
  Many owners, lenders, property managers, and leasing agents feel that a property is only successful if it is 95% occupied. This, of course, ignores the inherent trade-offs between occupancy and rental rates. The approach taken in this study looks at the product of these two factors (noting that it may be advisable to operate with a higher vacancy rate, but a higher effective rental rate) in the context of the property's physical and operational characteristics.

While these advantages are substantial, a review of the disadvantages of a regression-based approach should also be noted. These disadvantages would include:

- *"Black Box" Syndrome*
  Such an approach leads to the possibility that owners and managers will treat the exercise as a "black box"—abdicating all judgment and discretion to the computer ("It must be right, it's off the computer"). In short, the human factor

Exhibit 5
Summary of Independent and Dependent Variables and Predicted and Residual Values

	Quantitative Factors									
					Heat Source					
Property Name	Age	Square Footage	Number of Baths	Number of Units	Gas	Electric	Building Height	Covered Parking	Security System	Reduced Security Deposit
Barrington Lakes	21	985	2.00	261	0	0	3	1	0	1
Brentwood	18	975	1.50	78	0	0	1	0	0	0
Colony – Mt Prospect	19	850	2.00	216	0	1	2	0	1	1
Countryside	18	1,100	1.75	130	0	0	2	1	0	0
Deer Grove – Palatine	14	895	1.00	205	0	0	2	0	1	1
Forest Cove	16	978	1.00	120	0	0	2	0	1	0
Garden Glen	4	1,078	2.00	304	0	1	2	1	1	1
Greenbriar	17	848	1.00	238	0	1	2	0	0	1
Hoffman Ridge: No. 1	21	782	1.00	131	0	0	3	1	0	1
Hoffman Ridge: No. 2	21	1,090	1.50	66	0	0	3	1	0	1
Lincoln Square	6	982	2.00	64	0	1	2	0	0	1
Mallard Lake	17	1,125	2.00	429	0	0	2	0	0	0
Manor Tree	22	1,125	1.50	152	0	0	2	0	1	1
The Moorings	14	900	1.00	106	0	1	2	0	0	1
Palatine Square	12	900	1.00	95	0	0	2	0	0	0
Remington Place: No. 1	5	836	1.00	150	0	1	3	0	0	1
Remington Place: No. 2	5	1,136	2.00	150	0	1	3	0	0	1
Run Away Bay	18	1,132	2.00	207	0	0	3	0	0	0
Saratoga	17	1,075	2.00	168	0	1	3	1	0	1
Schaumburg Square	10	890	1.50	240	0	1	2	0	0	1

	Quantitative Factors									
					Heat Source					
Property Name	Age	Square Footage	Number of Baths	Number of Units	Gas	Electric	Building Height	Covered Parking	Security System	Reduced Security Deposit
Schaumburg Villas: No. 1	20	850	1.00	224	0	0	1	0	1	1
Schaumburg Villas: No. 2	20	1,000	2.00	110	0	0	1	0	1	1
Stonebridge	17	1,200	2.00	370	0	0	3	0	0	0
Tree House	12	1,000	2.00	200	0	0	2	0	0	1
Twelve Oaks	20	1,200	2.00	287	0	0	3	1	0	0
21 Kristen Place: No. 1	17	1,006	1.00	125	0	0	3	1	0	0
21 Kirsten Place: No. 2	17	1,036	2.00	66	0	0	3	1	0	0
Versailles	20	846	2.00	108	0	0	3	1	0	1
Village in the Park	17	1,115	1.50	242	0	0	3	1	0	1
Village Tree: No. 1	21	1,200	2.00	175	0	0	3	1	0	1
Village Tree: No. 2	21	1,075	1.00	144	0	0	3	1	0	1
Walden	20	1,083	2.00	222	0	0	3	1	0	1
Windsong: No. 1	5	850	1.00	60	1	0	2	0	0	1
Windsong: No. 2	5	1,012	2.00	90	1	0	2	0	0	1
Woodfield Gardens	22	900	1.00	394	0	0	2	0	0	1
Wyndam Court: No. 1	5	843	1.00	64	0	1	2	0	0	1
Wyndam Court: No. 2	5	1,046	1.50	112	0	1	2	0	0	1
Average	15.11	998	1.56	177	.05	.30	2.35	.38	.19	.73
Standard Deviation	5.98	118	.45	93	.23	.46	.62	.48	.39	.44
Minimum	4	782	1	60	0	0	1	0	0	0
Maximum	22	1200	2	429	1	1	3	1	1	1

Exhibit 5 (continued)
Summary of Independent and Dependent Variables and Predicted and Residual Values

	Qualitative Factors					Rent x Occupancy			Price/Value Analysis		
										Difference in	
Property Name	Location/ Viability\ Access	Quality of Management	Amenity Package	Curb Appeal	Construction/ Sound Transmission	Effective Monthly Rental Rate ($)	Estimated Occupancy (%)	Effective Monthly Rent ($)	Forecasted Monthly Rent ($)	Dollars	Percentage
Barrington Lakes	5	2	6	7	6	707	88.5	626	622	4	.59
Brentwood	7	4	2	5	4	665	89.3	594	651	(58)	−8.84
Colony – Mt Prospect	6	5	6	4	7	685	88.0	603	620	(17)	−2.90
Countryside	5	7	5	6	7	883	91.0	758	730	28	3.86
Deer Grove – Palatine	2	6	6	7	3	672	89.3	600	664	(64)	−9.69
Forest Cove	8	5	2	7	6	740	89.3	661	677	(16)	−2.37
Garden Glen	7	7	7	7	7	843	90.0	759	768	(9)	−1.23
Greenbriar	6	5	4	5	6	623	87.0	542	574	(32)	−5.53
Hoffman Ridge: No. 1	3	1	2	2	3	559	88.0	492	474	18	3.88
Hoffman Ridge: No. 2	3	1	2	2	3	619	88.0	545	578	(34)	−5.81
Lincoln Square	8	8	5	7	7	868	89.3	775	732	43	5.34
Mallard Lake	5	5	4	7	7	760	89.3	678	675	4	.56
Manor Tree	9	4	4	6	3	703	95.0	668	652	16	2.38
The Moorings	7	5	2	7	6	750	89.3	669	654	15	2.34
Palatine Square	6	5	1	4	7	630	89.3	562	590	(27)	−4.63
Remington Place: No. 1	7	5	7	8	8	685	89.3	611	617	(6)	-.90
Remington Place: No. 2	7	5	7	8	8	845	89.3	754	725	29	3.98
Run Away Bay	7	4	4	5	7	720	91.0	655	623	32	5.09
Saratoga	9	8	5	7	7	802	89.3	716	721	(5)	−.71
Schaumburg Square	6	6	3	5	7	614	90.0	553	619	(66)	−10.72

	Quantitative Factors										
	Qualitative Factors					Rent x Occupancy			Price/Value Analysis		
	Location/ Viability\ Access	Quality of Management	Amenity Package	Curb Appeal	Construction/ Sound Transmission	Effective Monthly Rental Rate ($)	Estimated Occupancy (%)	Effective Monthly Rent ($)	Forecasted Monthly Rent ($)	Difference in Dollars	Difference in Percentage
Schaumburg Villas: No. 1	4	1	1	1	4	658	89.0	586	505	81	15.96
Schaumburg Villas: No. 2	4	1	1	1	4	686	89.0	611	599	11	1.84
Stonebridge	8	8	7	9	7	785	90.0	787	709	(2)	−.32
Tree House	9	7	9	8	8	793	82.0	650	662	(12)	−1.30
Twelve Oaks	7	9	7	10	8	912	91.0	830	792	38	4.74
21 Kristen Place: No. 1	7	8	7	7	7	765	89.3	683	670	13	1.91
21 Kirsten Place: No. 2	7	8	7	7	7	800	89.3	714	725	(11)	−1.51
Versailles	8	7	7	9	7	775	91.0	705	675	30	4.49
Village in the Park	7	8	7	7	8	710	92.5	657	673	(16)	−2.37
Village Tree: No. 1	9	4	9	7	5	706	89.0	628	663	(35)	−5.21
Village Tree: No. 2	9	4	9	7	5	678	89.0	603	602	1	.16
Walden	10	4	7	7	7	719	84.0	604	626	(22)	−3.55
Windsong: No. 1	7	7	2	8	6	745	90.0	671	638	32	5.09
Windsong: No. 2	7	7	2	8	6	750	90.0	675	707	(32)	−4.59
Woodfield Gardens	7	7	5	5	3	599	90.0	539	517	22	4.28
Wyndam Court: No. 1	5	6	7	7	3	763	89.3	681	661	20	2.97
Wyndam Court: No. 2	5	6	7	7	3	838	89.3	748	719	29	4.03
Average	6.57	5.41	5.00	6.24	5.86	730	89.3	652	652	.00	.0
Standard Deviation	1.84	2.17	2.43	2.10	1.73	81	2.0	75	68	31.15	5.1
Minimum	2	1	1	1	3	559	82.0	492	474	(66)	−10.7
Maximum	10	9	9	10	8	912	95.0	830	792	81	16.0

Exhibit 6
Hedonically Ranked Property Performance

Property Name	Effective Monthly Rent ($)	Forecasted Monthly Rent ($)	Difference in	
			Dollars	Percentage
Schaumburg Villas: No. 1	586	505	81	15.96
Lincoln Square	775	732	43	5.84
Twelve Oaks	830	792	38	4.74
Windsong: No. 1	671	638	32	5.09
Run Away Bay	655	623	32	5.09
Versailles	705	675	30	4.49
Wyndam Court: No. 2	748	719	29	4.03
Remington Place: No. 2	754	725	29	3.98
Countryside	758	730	28	3.86
Woodfield Gardens	539	517	22	4.28
Wyndam Court: No. 1	681	661	20	2.97
Hoffman Ridge: No. 1	492	474	18	3.88
Manor Tree	668	652	16	2.38
The Moorings	669	654	15	2.34
21 Kristen Place: No. 1	683	670	13	1.91
Schaumburg Villas: No. 2	611	599	11	1.84
Mallard Lake	678	675	4	.56
Barrington Lakes	626	622	4	.59
Village Tree: No. 2	603	602	1	.16
Stonebridge	707	709	(2)	−.32
Saratoga	716	721	(5)	−.71
Remington Place: No. 1	611	617	(6)	−.90
Garden Glen	759	768	(9)	−1.23
21 Kristen Place: No. 2	714	725	(11)	−1.51
Tree House	650	662	(12)	−1.80
Village in the Park: No. 1	657	673	(16)	−2.37
Forest Cove	661	677	(16)	−2.37
Colony – Mt. Prospect	603	620	(17)	−2.80
Walden	604	626	(22)	−3.55
Palatine Square	562	590	(27)	−4.63
Greenbriar	542	574	(32)	−5.53
Windsong: No. 2	675	707	(32)	−4.59
Hoffman Ridge: No. 2	545	578	(34)	−5.81
Village Tree: No. 1	628	663	(35)	−5.21
Brentwood	594	651	(58)	−8.84
Deer Grove – Palatine	600	664	(64)	−9.69
Schaumburg Square	553	619	(66)	−10.72

is lost. This would be a sad consequence to an approach aimed at assisting, not overtaking, human judgment.

- *Financial Considerations*

The approach taken in this study does not consider the financial costs attributable to generating those observed effective rents. For example, it is possible that substantial advertising expenditures are used to generate large numbers of potential renters, thereby increasing the chances of "closing" units at higher rents. Other examples would include: (1) the amount spent on the quality, training and marketing assistance of leasing agents, (2) the use of high-cost locator services vis-à-vis internal leasing staff, (3) the costs of the maintenance/janitorial and administrative staffs needed to service the needs of the residents, and (4) the manager's discretion (and attendant costs) concerning the useful life of a unit's appliances, carpeting, painting/wall coverings, etc. All of these factors indirectly influence the satisfaction of existing tenants signing leases which, in turn, has an impact on the property's achieved rents. In short, this study does not attempt to measure returns on assets or equity. It is a purely revenue-driven model.

- *Marketing Considerations*

The approach used in this study also specifically excludes certain market strategies, which may not be captured by simply maximizing effective rent. These strategies may include: (1) expanding, or contracting, market share for purposes of predatory behavior vis-à-vis the property's key competitors, and (2) adjusting the property's tenant profile (and, accordingly, its long-term cost structure) by lowering or raising rates.

- *The Joint-Hypothesis Problem*

Just as tests of the efficient market hypothesis suffer from a joint-hypothesis problem, so too suffers the hedonically ranked property performance. To paraphrase Fama (1991, p. 1576): "when we find anomalous evidence on the behavior of (apartment rents), the way it should be split between (rental) market inefficiency or a bad model of market equilibrium is ambiguous."

In the context of this study, this joint-hypothesis problem suggests that each of the following should be carefully considered:

- *Market Imperfections*

  Given the high cost of tenant searches and the imperfect nature of market information, it is possible that the marketplace is slow to recognize a mis-valued property and that this misperception persists for some period of time. Accordingly, it is important to periodically perform this analysis in order to gauge the market's changing attitude.

- *Unexplained Variances*

  Notwithstanding the model's high explanatory power, there is still approximately 15% of the variation in the dependent variable that is unexplained. This leads to the possibility that there are one or more independent variables that may add substantially to the model's explanatory powers.

Lastly, because the marketplace is constantly changing, the model's parameters also need to be constantly updated. The model should be viewed as a dynamic tool designed to capture an ever-evolving marketplace.

Appendix 1

This appendix describes the independent variables used in the multiple regression analysis. They have been grouped into quantitative and qualitative factors. Each of the factors are described below, as well as the reasons for their inclusion:

Quantitative Factors

Quantitative variables used in this study include:

- *Age*
The property's age (in years) should have an inverse relationship with a property's ability to produce revenue. Generally, newer apartment complexes tend to have nicer amenity packages, newer appliances, etc.—all of which contribute to a competitive advantage. However, age can also be deceptive, as it is quite possible that a relatively old complex has recently undergone a thorough renovation while a property that is moderately old has yet to experience such a renovation.

- *Square Footage*
The size of the apartment unit (as measured by reported square footage[8]) should have a positive influence on rental rates. But here too the figures can be misleading as the "feel" of the unit can be affected by its design/layout, the use of natural light, the colors of painted and/or wall-papered walls, etc.—all in addition to the actual square footage.

- *Number of Baths*
The demand for an apartment unit should increase with the number of bathrooms. Fractional numbers reveal something less than a full bathroom. For example, the designation 1.50 indicates one full bathroom plus one "half bath" (i.e., without tub or shower stall), while 1.75 designates one full bathroom plus a bathroom with a shower, but without a tub. Where the same apartment complex has different bathroom configurations, these instances are separately identified (e.g., Hoffman Ridge No. 1 and Hoffman Ridge No. 2).

  The newer apartment complexes with 2.00 bathrooms often possess two-bedroom designs known as "splits" where each of the two bedrooms and bathrooms are identical (or nearly so). These units appeal to unrelated, platonic roommates who often can afford more expensive apartments.

• *Number of Units*
It is hypothesized that the number of two-bedroom units may have an indirect bearing on a property's attractiveness. Like other factors, the number of units may send mixed signals. On one hand, tenants may tend to favor projects with fewer units (which are often perceived to offer better ambiance—quaint, peace and quiet, know your neighbor, etc.—and customer service); on the other hand, landlords can offer bigger and better amenity packages if they are able to amortize their costs over a larger number of apartment units. The landlord also faces the problem of unit-type plethora. If a project is oversupplied with a particular unit type, the landlord may have to cut the rental rates on these units in order to lease them.

• *Heat Source*
Generally speaking, each tenant is responsible for his/her electrical expenses related to appliances and cooking. Less standardized is the type of heat and who (landlord v. tenant) pays for it. However, the way people tend to value uncertainty[9] may have a strong bearing upon the impact this variable has on overall effective rents.

Most buildings are heated with a centralized gas source (using either forced air or a hot water/baseboard system). In these cases, the landlord is generally responsible for the cost. This is designated with a zero in Exhibit 1. If the tenant is responsible for this cost (most often in cases of individualized HVAC packages installed in each unit), then this is designated with a one.

Less often, buildings are heated with an electrical source (e.g., with heat coils embedded in concrete flooring or with individualized electrically generated forced air systems). Generally, the tenant is responsible for the cost of the electric heat. This is designated with a one in Exhibit 1. If not, it is designated by a zero. In either event, electrical heat is typically more expensive than natural gas. Of course, if the landlord is to pay for the cost of heat this benefit to the tenant should be, to some extent, reflected in the rental rate.

• *Building Height*
The customer (or potential tenant) may perceive differences in value between building heights, generally categorized in one of three ways: subterranean, garden, or mid-rise. Subterranean buildings are defined as those with some units located partially below ground level. Garden units are two- and three-storey walk-up buildings without elevators. Mid-rise buildings are elevator buildings of three or more stories. For purposes of our modelling, a dummy variable of 1, 2 or 3 was assigned, respectively, to these three building types.

• *Covered Parking*
In climates like Chicago's, covered parking can be a substantial marketing advantage. While this study modelled covered parking with a simple binary dummy variable (0=no covered parking, 1=covered parking), in practice covered parking ranges from little more than tin-shanty, open-air carports to individual masonry garages.

Rather than attempting to rank the quality of these various parking shelters, the monthly cost of the covered parking was added to the rental rate.Thus, the value that tenants place on covered parking is measured in the context of the tenant's overall rental decisionmaking process. This alleviates the problem of landlords shifting the cost of covered parking between apartment rent and parking rent.

- *Security System*
For purposes of this study, a security system was defined to be a sentry-like station at the entrance of the apartment complex. While the level of security can vary, a simple binary variable (0=no security, 1=security) was utilized.

- *Reduced Security Deposit*
As a rental inducement, some apartment complexes will offer to reduce the tenant's security deposit beneath the market standard of one month's rent. Again, this was modelled with a binary variable (0=no reduction in security deposit, 1=reduced security deposit). This is seen as part of a larger trend to reduce the tenant's total move-in costs.

Thus, it should be apparent that even the quantitative factors can be somewhat ambiguous in their impact on the expected rental rates of properties. This ambiguity increases the difficulty of determining the appropriate rental rate. Nevertheless, their inclusion adds substantially to the explanatory power of the data.

Qualitative Factors

Since these factors are subjective, each of the characteristics was ranked on a scale of 1 (least favorable) to 10 (most favorable) for each property.

- *Location/Visibility/Access*
The old saw about real estate's three most important ingredients goes "location, location, location." In an edge city such as Schaumburg, it is important to qualitatively measure locational advantages in distance from a set location. In these edge cities, there are a number of important demand generators,[10] some of which are important to one group of tenants and not so important to other tenant groups. Therefore, a property's competitive advantage with regard to location, visibility and accessibility must be scored on a subjective scale. This study has aggregated these three aspects of site superiority—location (or, proximity to demand generators combined with site ambiance), visibility and accessibility, because they are integrally related to one another.

- *Management Quality*
While the quality of a property management firm is difficult to assess, it seems apparent that a strong property management firm is more likely to retain tenants. This increased retention ratio (i.e., the percentage of tenants choosing to renew their leases upon expiration) means that fewer new leases have to be written. In turn, this may suggest that these properties can raise their rental rates because they have fewer apartments that need to be absorbed by the market place.

For our purposes, management quality is defined to include the level and quality of tenant services. Sirmans and Sirmans (1991) examined professional designations (IREM, CPM, NAA, etc.) as a proxy for management quality and found that higher rental rates were linked to those property management firms with professional designations. In the Woodfield submarket, at least, professional designations are seldom advertised or recognized.

- *Amenity Package*

Properties with bigger and better amenity packages should outperform—as measured by rental rates (but not necessarily return on equity)—those properties with lesser amenity packages.

- *Curb Appeal*

Curb appeal is the impression the property makes as you first see it from the street or parking lot. Accordingly, this judgment involves the visceral feelings invoked by a project's image created at curbside.

Since some projects combine all or a part of their amenity package into the leasing "presentation" (e.g., a fully equipped recreation facility with adjacent pool and tennis courts may act as the leasing reception area), there may be an overlap between the ranking of curb appeal and the amenity package.

- *Construction/Sound Transmission*

Noisy neighbors can be a source of severe tenant frustration. The noisy neighbor problem is partly determined by the quality of the project's tenancy and partly by the quality of the project's design and construction. Other sources of tenant frustration include broken appliances, leaking roofs, etc., all of which follow from the project's design and construction, as well as its age and upkeep. Accordingly, design and construction can have a significant bearing on a tenant's long-term happiness. In turn, such happiness effects the lease retention ratio and, as noted before, impacts the ability of the business manager to institute rental rate increases.

The qualitative factors clearly allow plenty of room for judgment. However, this subjectivity notwithstanding, these factors do add significantly to the model's ability to explain the appropriate rental rate.

Appendix 2
Summary of Regression Results by Functional Form

Arithmetic Form										
Regression Statistics	Using All Independent Variables		Using All Except Management Quality		Using Only Significant (90%) Variables		Exclude All Qualitative Factors		Exclude All Qualitative Factors but Management Quality	
R-Squared	82.32%		79.89%		67.42%		66.53%		76.67%	
Adjusted R-Squared	70.80%		68.16%		63.58%		54.57%		67.17%	
Standard Error	42.78		44.67		47.77		53.36		45.36	
F-Statistic	7.14		6.81		17.59		5.57		8.07	
Independent Variables	Coefficients	*t*-Statistics	Coefficients	*t*-Statistics	Coefficients	*t*-Statistics	Coefficients	*t*-Statistics	Coefficients	*t*-Statistics
Intercept	387.29	4.27	412.86	4.42	315.54	5.17	448.53	4.24	384.26	4.18
Age	−3.45	−1.66	−3.98	−1.85			−6.74	−3.13	−4.43	−2.27
Square Footage	.21	2.49	.23	2.51	.14	1.85	.27	2.73	.23	2.64
Number of Baths	49.14	2.32	43.05	1.97	41.45	1.97	39.25	1.61	42.32	2.04
Number of Units	−.11	−1.26	−.08	−.93			−.02	−.24	−.10	−1.17
Heat Source: Gas	−16.22	−.91	−36.48	−.69			7.76	.15	−18.03	−.41
Heat Source: Electric	15.91	.67	19.52	.80			21.90	.77	11.88	.49
Location/Visibility/Access	−1.97	−.89	−4.41	−.76						
Quality of Management	9.52	1.78			12.17	2.38			14.56	3.43
Amenity Package	−4.09	−.73	−2.76	−.47						
Curb Appeal	18.12	2.57	23.19	3.45	9.91	1.76				
Building Height	−21.48	−1.09	−33.40	−1.72			−9.52	−.46	−8.74	−.50
Covered Parking	32.66	1.41	42.84	1.83			44.34	1.69	24.89	1.08
Construction/Sound Transmission	−4.10	−.70	−1.73	−.29						
Security System	22.02	1.04	16.45	.75			18.62	.73	25.89	1.18
Reduced Security Deposit	−17.07	−.86	−23.81	−1.16			−41.23	−1.96	−22.33	−1.19

Semi-Logrithmic Form										
Regression Statistics	Using All Independent Variables		Using All Except Management Quality		Using Only Significant (90%) Variables		Exclude All Qualitative Factors		Exclude All Qualitative Factors but Management Quality	
R-Squared	81.41%		79.45%		70.71%		65.94%		76.35%	
Adjusted R-Squared	69.29%		67.47%		67.26%		53.77%		66.71%	
Standard Error	0.069		0.071		0.071		0.0841		0.072	
F-Statistic	6.71		6.63		20.52		5.42		7.92	
Independent Variables	Coefficients	*t*-Statistics	Coefficients	*t*-Statistics	Coefficients	*t*-Statistics	Coefficients	*t*-Statistics	Coefficients	*t*-Statistics
Intercept	4.486	4.82	4.316	4.53	4.264	5.76	3.876	3.63	4.366	4.76
Age	−.071	−1.92	−.072	−1.89	−.062	−2.74	−.113	−2.86	−.086	−2.51
Square Footage	.301	2.23	.328	2.38	.318	2.84	.415	2.71	.325	2.45
Number of Baths	.101	2.04	.087	1.73	.080	1.76	.081	1.45	.091	1.91
Number of Units	−.005	−.27	−.001	−.03			.007	.30	−.008	−.43
Heat Source: Gas	−.072	−.82	−.050	−.57			.018	.20	−.033	−.44
Heat Source: Electric	.015	.37	.025	.61			.033	.69	.007	.17
Location/Visibility/Access	−.004	−.51	−.005	−.51						
Quality of Management	.013	1.56							.022	3.45
Amenity Package	−.007	−.75	−.005	−.49						
Curb Appeal	.028	2.43	.035	3.31	.023	3.62				
Building Height	−.032	−1.01	−.050	−1.65			−.012	−.37	−.010	−.38
Covered Parking	.049	1.36	.061	1.69			.055	1.35	.031	.88
Construction/Sound Transmission	−.006	−.61	−.002	−.21						
Security System	.034	1.01	.025	.73			.023	.57	.037	1.09
Reduced Security Deposit	−.029	−.89	−.039	−1.18			−.070	−2.03	−.036	−1.17

Notes

[1]The statistical analysis used in this study was performed entirely on Microsoft EXCEL for Windows.

[2]For a more thorough discussion of these improvements, see Russo and Schoemaker (1989).

[3]That is, one-bedroom apartments almost universally have one bathroom while three-bedroom apartments almost universally have two bathrooms.

[4]As specific apartment projects have been identified, "stale" data has been purposefully used to avoid placing owners, borrowers and/or property managers under a harsh light.

[5]For this purpose, the submarket consists of the following suburbs: Arlington Heights, Hoffman Estates, Palatine, Rolling Meadows, and Schaumburg. Sometimes referred to as the Woodfield market, the submarket is named for the Woodfield Shopping Center, which at one time was the largest in the world.

[6]According to Garreau (1991, pp. 425, 428), the definition of an "edge city" consists of:

- five million square feet of leasable office space or more,
- six hundred thousand square feet of retail space or more,
- a population that increases at 9 A.M. on workdays,
- a local perception of a single end destination for mixed use, and
- a history in which, thirty years ago, the site was by no means urban—it was overwhelmingly residential or rural in character.

[7]Please see description of horse-race handicappers in an unpublished paper, "Behavioral Problems of Adhering to a Decision Policy," by Paul Slovic and Barnard Corrigan—as reported in Russo and Schoemaker (1989).

[8]It should be noted that figures are as reported by the on-site leasing agents. These figures are often notoriously overstated, since, unlike commercial real estate, apartments are leased by the unit not by the square foot and tenants often lack the sophistication and/or motivation to perform the measurements themselves. However, to the extent that the overstatement is fairly uniform across all properties, this exaggeration will tend to "wash."

[9]The following example has been adapted from Kahneman and Tversky (1979). Assume that an individual is offered a coin toss where he/she wins $10,000 for tails but wins nothing for heads or, as an alternative, the individual can accept a certain win of $5,000. Most people would accept the certain $5,000. Conversely, assume the same individual is offered a coin toss where he/she pays $10,000 for tails but pays nothing for heads or, as an alternative, the individual can pay $5,000. Most people accept the coin toss. It is said, therefore, that most people treat risk asymmetrically (i.e., their pricing of risk differs based upon the direction of the consequences).

The question of tenant-paid v. landlord-paid heat may be analogous to the coin toss example involving a loss (or payment): Assume the tenant had a chance to rent one of two units that are identical in every aspect but for who (tenant v. landlord) pays for the heat, and further assume that the tenant-paid-heating unit rents for less money (i.e., the loss is smaller) than does the landlord-paid-heating unit by an amount exactly to the expected cost of the heat. Then, it would be consistent with the coin-toss analogy for the renter to accept the lower cost unit, even though the total expected cost of each unit, heat cost included, is identical. In other words, tenants might consistently underprice the cost of tenant-paid heat in their renter's calculus, due to their asymmetrical risk-taking.

[10]In the case of the Woodfield submarket, important demand generators would include: Woodfield Shopping Center, Arlington Race Track, O'Hare International Airport, Chicago's central business district, and the headquarters of Sears, Ameritech, Motorola. In addition, because of the area's traffic congestion, proximity to the on/off ramps of Route 53 and Interstate 90 are also important.

References

Benjamin, J. D., G. D. Jud and A. A. Okoruwa, Forecasting the Stock of Retail Space Using the Koyck Distributed Lag Model, *Journal of Property Research,* 1993, 10, 185–92.

Black, F., Return and Beta, *Journal of Portfolio Management,* Fall 1993, 8–18.

Blettner, R. A., Mass Appraisals Via Multiple Regression Analysis, *Appraisal Journal*, October 1969, 513–21.

Case, F. E., New Decision Tools for Appraisers, *Appraisal Journal,* January 1967, 21–27.

Colwell, P. F., Vacancy Management, *Journal of Property Management,* May-June 1991, 42–44.

Dilmore, G., Appraising Houses, *Real Estate Appraiser,* July–August 1974, 21–32.

Emerson, F. C., Valuation of Residential Amenities: An Economic Approach, *Appraisal Journal,* April 1972, 268–78.

Fama, E. F., Efficient Capital Markets: II, *Journal of Finance,* December 1991, 1575–1617.

Gabriel, S. A. and F. E. Nothaft, Rental Housing Markets and the Natural Vacancy Rate, *AREUEA Journal,* 1988, 16:4, 419–29.

Garreau, J., *Edge City: Life on the New Frontier,* New York: Doubleday, 1991.

Hanford, L. D., Jr., The Market Data Approach and Investment Property Appraisal, *Real Estate Appraiser,* December 1966, 2–9.

Harris, J. C., Natural Vacancy Rates in Apartment Markets, Technical Report of the Real Estate Center at Texas A&M University, November 1991.

Kahneman, D. and A. Tversky, Prospect Theory: An Analysis of Decision Under Risk, *Econometrica,* March 1979, 263–91.

Miles, W. P., Applied Multiple Regression Analysis, *Real Estate Appraiser,* September–October 1975, 29–33.

Read, C., Advertising and Natural Vacancies in Rental Housing Markets, *AREUEA Journal,* Winter 1988, 16:4, 354–63.

Rosen, K. T. and L. B. Smith, The Price-Adjustment Process of Rental Housing and the Natural Vacancy Rate, *American Economic Review,* September 1983, 73, 779–86.

Russo, J. E. and P. J. H. Schoemaker, Decision Traps: The Ten Barriers to Brilliant Decision-Making and How to Overcome Them, New York: *Fireside,* 1989, 132–42.

Shenkel, W. M., Cash Flow and Multiple Regression Techniques, *Journal of Property Management,* November–December 1969, 264–76.

Sirmans, G. S. and J. D. Benjamin, Determinants of Market Rent, *Journal of Real Estate Research,* 1991, 6:3, 357–79.

Sirmans, G. S. and C. F. Sirmans, Property Manager Designations and Apartment Rent, *Journal of Real Estate Research,* 1991, 7:1 91–98.

—— and J. D. Benjamin, Apartment Rent, Concessions and Occupancy Rates, *Journal of Real Estate Research,* 1994, 9:3, 299–312.

Webb, J. R., Valuation of Multifamily Residential Portfolios, *Research in Real Estate,* 2, 1982, 159–83.

Whaley, J. W., Scanning for Retail Development Opportunities, *Real Estate Review,* 1990, 19:4, 43–49.

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