A Feasibility Study of CAMA

for Apartment and Commercial Property

By

Cecilia M. Fruitman

and

Robert J. Gloudemans

Arizona Department of Revenue
Division of Property Valuation and Equalization
Research and Equalization Section
Computer Assisted Appraisal Unit

1600 W. Monroe, Phoenix AZ 85007

Prepared for

Contemporary Problems in Assessment and Appraisal

Third Annual Technical Seminar

Sponsored by

Lincoln Institute of Land Policy
and
International Association of Assessing Officers

Cambridge, Massachusetts
August 6 - 7, 1988

I. Introduction

Apartment and commercial properties are most often appraised by the cost approach. However, the appraisal profession recognizes that when adequate data are available, the income and sales comparison approaches are preferable. (See, for example, the IAAO Standard on Mass Appraisal of Real Property, page 9.) Use of the cost approach has drawn increased fire since the Tax Reform Act of 1986, based on the contention that it does not respond to changing market conditions. This paper presents the results of a study designed to explore the feasibility of automated income and market models for the appraisal of apartment and commercial properties.

The State of Arizona has used multiple regression analysis (MRA) for the appraisal of the large majority of residential properties since 1973 with generally excellent results. Statewide coefficients of dispersion (COD) for the 1987 tax year were 9.9 percent for single family homes (81,795 sales) and 8.7 percent for condominiums (18,526 sales). In contrast, CODs were 18.3 percent for apartments (827 sales) and 31.1 percent for commercial properties (1817 sales). Like most other jurisdictions, the State uses the cost approach for the appraisal of apartment and commercial properties. The current cost system is outdated and in the process of being replaced. At the same time, however, the State is exploring the use of automated income and market approach applications for these types of properties, the preliminary results of which are presented here.

This paper seeks to address the following questions:

1. Can mass appraisal performance results for apartment and commercial property be improved through use of the use of income and market models?

2. What type of models are most successful?

3. How necessary are income and expense data? Can satisfactory models be developed from property characteristics alone? If income data are required, can they be estimated for parcels with unreported figures?

4. What model specifications and variables are most important in the models?

II. Methodology

The database used in the study is apartment and commercial property in Pima County (Tucson), Arizona. The County has approximately 270,000 parcels, including some 1,400 apartment properties and over 10,000 commercial properties. Sales data were obtained from the Arizona Department of Revenue's Affidavit of Property Value, which is required to be filed at the time of recording a deed for the transfer of real property. All sales used in the study were screened by county and state personnel as being arms'-length, open-market transfers. No attempt was made, however, to adjust the sales for financing or personal property (sales with large amounts

of personal property were excluded during the sales screening process). The sales occurred in January, 1985 or later and were time-adjusted to December, 1987. In all, 402 sales were available for the analysis: 94 apartment sales and 308 commercial sales.

Property characteristics were obtained from files maintained by the county assessor's office. The county generally does a thorough, professional job of data collection and commercial sales analysis.

Income data were obtained from the publication, COMPS of Arizona, which is a monthly report of commercial, apartment, and other selected sales for Pima County and other metropolitan areas in the southwestern United States. Among other things, the publication reports income and sales data when available from a party to the transfer. In the present case, gross income data were available for 81 sales and net income for 80 sales.

The sample was randomly divided into two groups, with approximately two-thirds of the data used for model development and one-third used as a control group to gauge the accuracy of the models, with the constraint that all sales with income data were used for modeling because of their limited number.

Both test and control groups were subject to several edits. The following sales were excluded: sales with sales ratios less than .25 or greater than 2.00; properties with an unusually high percent of value attributable to land (.85 or more for warehouses and .67 or more for all other property types); sales prices less than $40,000 or greater than $4,000,000; mixed use parcels; and sales with incomplete data. This resulted in groups of 62 test and 22 control parcels for apartments and 159 test and 86 control parcels for commercial and industrial properties.

The same property characteristics were used for all models, although there were some variations in variable specifications, for example, size was sometimes subject to a logarithmic transformation. Exhibit 1 shows the property characteristics and variables used in the models. An initial equation was built for each model, then parcels with extreme values (studentized residuals of less than -2.00 or greater than 2.00) were deleted from analysis and the equations re-run. This served to normalize the data and remove any atypical parcels that would have an undue influence on the model.

The above data are maintained on the Department of Revenues's mainframe computer and were downloaded to a personal computer for analysis. SPSS/PC+ V2.0 (the PC version of the Statistical Package for the Social Sciences) was used to run the analyses.

III. Income and Expense Analysis

A common problem in applying the income approach in mass appraisal is the inability to obtain income and expense data on all properties. In the present case, these data were available for only 80 of the 309 properties: 46 apartments and 34 commercial properties. Accordingly, models were developed to estimate

potential gross incomes and expense ratios based on property characteristics.

Exhibit 2 shows the results of the potential gross income (PGI) models. The apartment model (Part A), based on 32 cases after data edits and deletion of outliers, produced extremely good results, with an adjusted R^2 of .999 and a COV (standard error of the estimate expressed as a percentage of the mean) of 3.70%. The model was dominated by size and, to a lesser extent, add items, although several of the market area variables were also significant. Importantly, the results indicate that one can reliably predict typical PGIs for apartments based on property characteristics data.

The results of the commercial properties were also very good, as indicated by the adjusted R^2 of .994 and a COV of 14.0. The model (Part B of Exhibit 2) shows substantial variation in PGIs based on type of property, with industrial parks and warehouses producing less income per square foot than other property types. Again, the add item variable and several of the market area variables were significant. Interestingly, the effective age variable (EFFAGE) failed to enter either model.

Expense ratios were computed as net operating income (NOI) divided by effective gross income (EGI). Model results are shown in Exhibit 3. For apartments (Part A), expense ratios varied with size and market area. The R^2 is much lower than in the gross income model, but the COV is good (16.6%).

Expense ratios for commercial properties showed much greater variance than for apartments. Hence, the adjusted R^2 is much higher (.966 versus .319), although the COV is slightly higher (20.5% versus 16.6%). A number of property types and market areas were significant in the model (Part B of Exhibit 3). In addition, PERGOOD (percent good) emerged as the most significant predictor; in general, the older the property, the higher the expense ratio.

Overall, the results indicate that one can predict typical expense ratios with statistical reliability, although a careful review of the estimated NOIs appears warranted.

IV. Gross Income Multiplier Model

Models were developed to predict gross income multipliers (GIMs) for apartment and commercial properties. GIM was computed as the sales price divided by the gross income. Exhibit 4 shows the results of these models. For apartments (Part A), the GIM is estimated as 7.111 plus adjustments for size, age, and market area. The negative coefficient for the age variable (AGESF) indicates that, as expected, older properties tend to have larger multipliers than newer properties. The constant is highly significant with a low standard error, which explains the low adjusted R^2 (.566) in conjunction with the small COV (11.5%).

The commercial model results (Part B) are similar. The mean GIM is higher than for apartments (7.44 versus 6.63) and varies primarily

by market area, although the variable for industrial parks is also significant. The model results indicate that, like gross incomes, GIMs can be predicted with high reliability.

V. Overall Rate Model

Overall rates (OARs) were modeled as the ratio of NOI to the sales price. Exhibit 5 shows the results. For apartments (Part A), the model produced a base OAR of .098 with certain adjustments for size, the ratio of add items to square feet, and market areas. The negative coefficient for the add items variable indicates that properties with more amenities per square foot command lower OARs. As expected, the adjusted R^2 is low because of the natural homogeneity of ratio data, while the COV is very good (9.8%).

The commercial model (Part B) includes a wide variety of variables. Among other things, the results indicate that OARs tend to be lower when properties are large and in good condition. In general, OARs are lower in relatively desirable, high value areas. The overall fit of the model is extremely good, with a COV of 5.4%.

VI. Direct Sales Comparison Models

Of particular interest to assessors is whether market values for income-producing properties can be estimated directly without the use of income and expense data. Both additive and multiplicative MRA models were used to evaluate this question. Exhibits 6 shows the results of the additive models. Because properties without income data could be used in the analysis, separate models were developed for small apartments (Part A), large apartments (Part B), commercial properties (Part C), and industrial properties (Part D). In all cases the variables have the expected signs and adjusted R^2s are high, as expected given the wide variance in sales prices. The COVs are good for the apartment and industrial properties (warehouses and industrial parks), but large for the commercial properties, probably because of their heterogeneous nature.

The multiplicative MRA models involved a regression of the natural logarithm of sale price on logarithms of the continuous variables (e.g., SQFEET and ADDRATIO) and on dummy variables for property type and for market area. Exhibit 7 shows the results. Estimated sale price (ESP) in the apartment model (Part A) is computed as follows:

```
ESP = antilog(5.191+.842*LNSQFEET+.052*LNADDRAT+.121*LNSITUSF
      -.289*MARKET06-.458*MARKET10)

                              .842          .052          .121
ESP = exp(5.191) * SQFEET     * ADDRATIO    * SITUSFAC

                    MARKET06              MARKET10
      * exp(-.189)          * exp(-.458)
```

$$ESP = 179.65 * SQFEET^{.842} * ADDRATIO^{.052} * SITUSFAC^{.121} * .827^{MARKET06} * .633^{MARKET10}$$

The value of 10,000 square foot apartment with $25,000 of add items and a situs factor of 1.20 in market area 06 would be computed as:

$$ESP = 179.65 * 10{,}000^{.842} * 2.50^{.052} * 1.20^{.121} * .827$$

$$ESP = 179.65 * 2333 * 1.049 * 1.022 * .827 = 371{,}598$$

This is a value of $37.16 per square foot. The other models are interpreted in a similar manner, although one should understand that the exponential of a positive number is a number greater than 1.00. In Part B, for example, the coefficient of .611 for MARKET03 is equivalent to a multiplier of 1.842 (exponential of .611). Multiplicative models have the advantage that the coefficients take the form of multipliers and powers, so that their impact is in percentage rather than absolute terms.

When compared to the additive models (Exhibit 6) the multiplicative models had lower COVs for the larger apartments (Part B) and commercial properties (Part C) but higher COVs for the smaller apartments (Part A) and industrial properties (Part D).

VII. Application to Control Group

The GIM, OAR, and direct additive and multiplicative models were used to predict values for the control group, which included 22 apartments and 86 commercial parcels. The gross income and expense ratio models were used to obtain predicted gross incomes and NOIs for use in the GIM and OAR models. The predicted values were then divided by sales price, and summary statistics computed (ratios of predicted to actual value of less than 0.25 or greater than 2.00 were again excluded). Exhibit 8 summarizes the results.

The GIM model worked well for apartments but not for commercial properties. Not only were the COV and ratio of predicted to actual value large, but 23 outliers were deleted before these statistics were calculated. This reflects the difficulty in estimating incomes for commercial properties, a highly heterogeneous group.

The OAR models failed to improve on the GIM models. This is undoubtedly due, in part, to the fact that actual net incomes were not available. Nevertheless, as shown previously (Part B of Exhibit 2), expense ratios tend to be consistent and predictable, suggesting that knowledge of expenses and thus NOIs is not crucial in automated

applications of the income approach.

The direct additive and multiplicative models performed about equally well for the control group, just as they did for the test group. In both cases the results were marginally good for apartments but disappointing for commercial properties. The additive model, in particular, was unstable for commercial properties, requiring the deletion of 15 outliers to obtain a COD of 35.7.

VIII. Conclusions

Automated application of the income and sales comparison approaches to apartments and commercial properties holds promise but requires good data and careful analysis. In terms of property types, it appears much easier to obtain satisfactory results for apartments than for commercial properties. The availability of gross income data should yield particularly satisfying results, although good models can also be developed directly from property characteristics data. Net income data does not appear to be essential, meaning that assessors can expect to achieve almost as good results without expending efforts in the collection of expense data.

Commercial and industrial properties appear to present a more difficult challenge. Because of their heterogeneity, one requires either reliable income/expense data or detailed property characteristics data. The present study would have benefited from data on construction quality, physical and locational amenities, and more specific situs data. In addition, stratification by property type may often be necessary to achieve adequate results. In our case, results were improved considerably by separating industrial property (warehouses and industrial parks) from other commercial properties.

Aside from data requirements, however, the statistical problems involved in the mass appraisal of apartments and commercial properties can be adequately dealt with. This, along with good data collection and edit procedures, should produce models that reflect the market and contribute to overall equity in mass appraisal.

Exhibit 1
Independent Variables Used in the Study

Property	Variable	Variable Definition
Property Type	STORES	Dummy variable for use as a store
	OFFICES	Dummy variable for use as an office
	MEDICAL	Dummy variable for medical office
	RESTRNTS	Dummy variable for use as restaurant
	HMOTEL	Dummy variable for hotel/ motel use
	INDUSPRK	Dummy variable for industrial park
	INDWARHS	Dummy variable - indust'l warehouse
	BIG	Dummy variable for large apartment complexes (25 or more units)
Size	SQFEET	Sum of square footage for all improvements
	LNSQFEET	Natural log of SQFEET
	SQFEET11	Square feet of stores
	SQFEET15	Square feet of offices
	SQFEET21	Square feet of medical offices
	SQFEET20	Square feet of restaurants
	SQFEET45	Square feet of hotel/motels
	SQFEET30	Square feet of industrial parks
	SQFEET37	Square feet of warehouses
Effective Age	EFFAGE	(1988 - construction year) x condition weight (.70 for "good" condition, 1.00 for "average" condition, and 1.30 for "poor condition)
	AGESF	EFFAGE x SQFEET
	PERGOOD	1 - EFFAGE/100
	LPERGOOD	Natural log of PERGOOD
"Add" items	ADDS	sum of the dollar value of all "add" items (features not included in base specifications) for all improvements
	ADDRATIO	(ADDS/SQFEET)/(average ADDS/SQFEET)
	LNADDRAT	Natural log of ADDRATIO
Location	MARKETxx	Dummy variables for the county's 16 market areas
	SITUS	Parcel land value less average land value by type and market area (this measures locational desirability <u>within</u> market area)
	SITUSFAC	Ratio of parcel's actual land value to average land value by type and market area
	LNSITUSF	Natural log of SITUSFAC

Exhibit 2
Gross Income Model Results
(Parcels with reported income data)

Part A - Apartments:

Variable	Interpretation	Coefficient	t-value
SQFEET	Square feet	4.98	24.22 (.00)
ADDS	Add items	0.42	4.60 (.00)
MARKET03	Market Area 03 (0,1)	19353	3.39 (.01)
MARKET05	Market Area 05 (0,1)	-9223	-3.96 (.01)
MARKET07	Market Area 07 (0,1)	-5981	-2.29 (.03)
MARKET91	Market Area 91 (0, 1)	23149	1.89 (.07)

Part B - Commercial:

Variable	Interpretation	Coefficient	t-value
SQFEET	Square feet	8.81	27.34 (.00)
SQFEET30	Sq. ft. - indust'l parks	-7.72	-1.93 (.07)
SQFEET37	Sq. ft. - warehouses	-5.82	-19.00 (.00)
ADDS	Add items	0.38	4.62 (.01)
MARKET04	Market Area 04 (0,1)	33271	1.77 (.10)
MARKET07	Market Area 07 (0,1)	19810	1.40 (.18)
MARKET08	Market Area 08 (0,1)	-25845	-1.39 (.18)
MARKET91	Market Area 91 (0, 1)	-30181	-2.53 (.03)
CONSTANT		2165	0.36 (.73)

Overall results:

	Apartments	Commercial
n	32	25
Adj R^2	.999	.994
Std Error	5164	17734
Mean GI	139645	126335
COV	3.70%	14.0%

Exhibit 3
Expense Ratio Model Results
(Parcels with reported income data)

Part A - Apartments:

Variable	Interpretation	Coefficient	t-value
BIG	Large apartments	.049	2.58 (.02)
MARKET06	Market Area 06 (0,1)	.054	2.22 (.04)
MARKET10	Market Area 10 (0,1)	.047	1.56 (.13)
MARKET51	Market Area 51 (0,1)	.209	3.75 (.01)
CONSTANT		.291	23.42 (.00)

Part B - Commercial:

Variable	Interpretation	Coefficient	t-value
PERGOOD	Percent good	.227	12.97 (.00)
STORES	Stores (0,1)	-.109	-4.35 (.01)
OFFICES	Offices (0,1)	.081	3.78 (.01)
INDUSPRK	Industrial parks (0,1)	-.066	-2.14 (.05)
MARKET03	Market Area 03 (0,1)	.055	1.34 (.20)
MARKET04	Market Area 04 (0,1)	.099	2.33 (.04)
MARKET07	Market Area 07 (0,1)	.050	1.67 (.12)
MARKET21	Market Area 21 (0, 1)	-.135	-3.29 (.01)
MARKET51	Market Area 51 (0, 1)	-.055	-2.02 (.07)

Overall results:

	Apartments	Commercial
n	40	23
Adj R^2	.319	.966
Std Error	.054	.038
Mean Exp Ratio	.325	.185
COV	16.6%	20.5%

Exhibit 4
Gross Income Multiplier Results
(Parcels with reported income data)

Part A - Apartments:

Variable	Interpretation	Coefficient	t-value
BIG	Large apartments	-1.257	-3.43 (.01)
AGESF	Depreciation / square foot	-0.00000057	-1.98 (.06)
MARKET03	Market Area 03 (0,1)	1.073	1.99 (.06)
MARKET07	Market Area 07 (0,1)	1.060	2.79 (.01)
MARKET10	Market Area 10 (0,1)	-1.3222	-2.31 (.03)
MARKET12	Market Area 12 (0,1)	1.615	1.99 (.06)
MARKET21	Market Area 21 (0,1)	0.968	1.70 (.11)
MARKET51	Market Area 51 (0,1)	-1.687	-2.14 (.05)
CONSTANT		7.111	36.25 (.00)

Part B - Commercial:

Variable	Interpretation	Coefficient	t-value
INDUSPRK	Industrial parks (0,1)	1.316	2.21 (.04)
MARKET03	Market Area 03 (0,1)	-1.502	-1.88 (.08)
MARKET05	Market Area 05 (0,1)	1.182	2.01 (.06)
MARKET06	Market Area 06 (0,1)	-1.800	-4.02 (.01)
MARKET07	Market Area 07 (0,1)	-1.559	-2.66 (.02)
MARKET51	Market Area 51 (0, 1)	-1.302	-2.88 (.01)
CONSTANT		7.895	36.15 (.00)

Overall results:

	Apartments	Commercial
n	37	26
Adj R^2	.566	.579
Std Error	.76	.77
Mean GIM	6.63	7.44
COV	11.5%	10.3%

Exhibit 5
Overall Rate Model Results

Part A - Apartments:

Variable	Interpretation	Coefficient	t-value
BIG	Large apartments	.0208	5.52 (.00)
ADDRATIO	Ratio of adds/sq. ft.	-.0131	-3.84 (.01)
MARKET03	Market Area 03 (0,1)	-.0213	-3.50 (.01)
MARKET05	Market Area 05 (0,1)	-.00641	-1.51 (.15)
MARKET07	Market Area 07 (0,1)	-.00721	-1.59 (.13)
MARKET21	Market Area 21 (0,1)	-.0128	-1.92 (.07)
MARKET91	Market Area 91 (0,1)	.0221	2.30 (.03)
CONSTANT		.0980	33.53 (.00)
Part B - Commercial:			
SQFEET	Square Feet	-.000000118	-1.39 (.19)
SITUSFAC	Situs Factor	.00183	1.72 (.11)
STORES	Store (0,1)	.0138	3.33 (.01)
PERGOOD	Percent Good	-.0446	-3.86 (.01)
MARKET03	Market Area 03 (0,1)	.0161	2.33 (.04)
MARKET04	Market Area 04 (0,1)	.0414	6.51 (.00)
MARKET05	Market Area 05 (0,1)	-.00772	-1.56 (.14)
MARKET06	Market Area 06 (0,1)	.00592	1.34 (.20)
MARKET07	Market Area 07 (0,1)	.0103	2.16 (.05)
MARKET51	Market Area 51 (0, 1)	.0157	4.06 (.01)
CONSTANT		.1366	13.31 (.00)

Overall results:

	Apartments	Commercial
n	38	25
Adj R^2	.566	.779
Std Error	.0089	.0058
Mean OAR	.091	.108
COV	9.8%	5.4%

Exhibit 6
Direct Additive Model Results

Part A - Small Apartments:

Variable	Interpretation	Coefficient	t-value
SQFEET	Square feet	21.22	6.28 (.00)
ADDS	Add Items	4.05	3.86 (.01)
SITUS	Situs	0.70	3.10 (.01)
MARKET05	Market Area 05 (0,1)	92616	3.49 (.01)
MARKET06	Market Area 06 (0,1)	-52417	-2.36 (.03)
MARKET07	Market Area 07 (0,1)	105133	1.98 (.06)
MARKET10	Market Area 10 (0,1)	-84600	-3.26 (.01)
MARKET21	Market Area 21 (0,1)	78333	1.62 (.12)
CONSTANT		96153	3.59 (.01)

Part B - Large Apartments:

Variable	Interpretation	Coefficient	t-value
SQFEET	Square Feet	28.70	3.61 (.01)
ADDS	Add Items	2.84	1.32 (.21)
SITUS	Situs	1.45	1.87 (.09)
AGESF	Depreciation/Sq. Ft.	-1.09	-4.11 (.01)
MARKET12	Market Area 12 (0,1)	9929641	2.26 (.05)
CONSTANT		607991	3.40 (.01)

Overall results:

	Small Apartments	Large Apartments
n	39	20
Adj R^2	.918	.951
Std Error	45794	461249
Mean Price	222866	2745161
COV	20.5%	16.8%

Exhibit 6, continued
Direct Additive Model Results

Part C - Commercial:

Variable	Interpretation	Coefficient	t-value
SQFEET	Square feet	61.07	16.63 (.00)
SQFEET11	Square feet - Stores	-6.35	-2.20 (.03)
ADDS	Add Items	0.89	1.51 (.14)
SITUS	Situs	0.59	4.24 (.01)
AGESF	Depreciation/Sq. Ft.	-0.73	-9.56 (.00)
MARKET04	Market Area 04 (0,1)	-67298	-2.22 (.03)
MARKET05	Market Area 05 (0,1)	59432	2.08 (.05)
MARKET10	Market Area 10 (0,1)	-62352	-2.58 (.02)
MARKET11	Market Area 11 (0,1)	173020	2.24 (.03)
MARKET12	Market Area 12 (0,1)	-118309	-1.35 (.19)
MARKET80	Market Area 80 (0,1)	108305	1.36 (.18)
MARKET89	Market Area 89 (0,1)	-123414	-3.06 (.01)
CONSTANT		88743	4.18 (.01)

Overall results:

	Commercial
n	94
Adj R^2	.947
Std Error	73912
Mean Price	271509
COV	27.2%

Exhibit 6, continued
Direct Additive Model Results

Part D - Industrial:

Variable	Interpretation	Coefficient	t-value
SQFEET	Square Feet	31.29	18.18 (.00)
SQFEET30	Square Feet - Indus'l Park	-27.22	-3.94 (.01)
ADDS	Add Items	0.56	1.44 (.16)
SITUS	Situs	1.05	6.92 (.00)
AGESF	Depreciation/Sq. Ft.	-0.63	-6.59 (.00)
MARKET03	Market Area 03 (0,1)	1784657	7.02 (.00)
MARKET07	Market Area 07 (0,1)	-204718	-3.02 (.01)
MARKET31	Market Area 31 (0,1)	-39486	-1.24 (.22)
MARKET51	Market Area 51 (0,1)	34201	2.39 (.03)
CONSTANT		108097	7.88 (.00)

Overall results:

	Industrial
n	56
Adj R^2	.980
Std Error	42668
Mean Price	249250
COV	17.1%

Exhibit 7
Direct Multiplicative Model Results

Part A - Small Apartments:

Variable	Interpretation	Coefficient	t-value
LNSQFEET	Natural log of square feet	.842	7.59 (.00)
LNADDRAT	Natural log of Add Ratio	.052	1.39 (.18)
LNSITUSF	Natural log of Situs Factor	.121	1.66 (.01)
MARKET06	Market Area 06 (0,1)	-.289	-2.25 (.04)
MARKET10	Market Area 10 (0,1)	-.458	-3.09 (.01)
CONSTANT		5.191	5.09 (.00)

Part B - Large Apartments:

Variable	Interpretation	Coefficient	t-value
LNSQFEET	Natural log of square feet	1.085	15.84 (.00)
MARKET03	Market Area 03 (0,1)	.611	4.53 (.01)
MARKET05	Market Area 05 (0,1)	.659	3.77 (.01)
MARKET07	Market Area 07 (0,1)	.387	2.45 (.04)
MARKET12	Market Area 12 (0,1)	.677	3.41 (.01)
MARKET21	Market Area 21 (0,1)	.318	1.99 (.08)
MARKET51	Market Area 51 (0,1)	.519	2.53 (.03)
CONSTANT		2.305	2.90 (.02)

Overall results:

	Small Apartments	Large Apartments
n	41	18
Adj R^2	.813	.953
Std Error	50009	287944
Mean Price	185907	2132915
COV	26.9%	13.5%

Exhibit 7, continued
Direct Multiplicative Model Results

Part C - Commercial:

Variable	Interpretation	Coefficient	t-value
LNSQFEET	Natural log of square feet	.622	14.62 (.00)
LPERGOOD	Natural log of Percent Good	.732	6.89 (.00)
LNSITUSF	Natural log of Situs Factor	.249	6.45 (.00)
STORES	Stores	-.256	-3.88 (.01)
MEDICAL	Medical Offices	-.276	-1.82 (.08)
RESTRNTS	Restaurants	-.101	-1.44 (.16)
MARKET03	Market Area 03 (0,1)	.294	2.24 (.03)
MARKET05	Market Area 05 (0,1)	.381	4.04 (.01)
MARKET10	Market Area 10 (0,1)	-.283	-3.67 (.01)
MARKET11	Market Area 11 (0,1)	.437	1.77 (.09)
MARKET89	Market Area 89 (0,1)	-.695	-5.25 (.00)
CONSTANT		7.619	19.88 (.00)

Part D - Industrial:

LNSQFEET	Natural log of square feet	.609	9.54 (.00)
INDUSPRK	Industrial Park	-.462	-3.95 (.01)
LNSITUSF	Natural log of Situs Factor	.266	4.60 (.00)
LPERGOOD	Natural log of Percent Good	.695	2.10 (.05)
MARKET03	Market Area 03 (0,1)	1.035	3.47 (.01)
MARKET08	Market Area 08 (0,1)	.628	2.08 (.05)
CONSTANT		7.314	12.26 (.00)

Overall results:

	Commercial	Industrial
n	93	58
Adj R^2	.923	.916
Std Error	48036	39848
Mean Price	200988	169566
COV	23.9%	23.5%

Exhibit 8
Control Group Results

Model	Apartments	Commercial
Gross Income Multiplier		
Median Residual Predicted from Actual Price	77,184	50,479
COD Predicted Residual	16.9%	36.3%
Mean Ratio Predicted to Actual Price	.92	1.20
Median Ratio Predicted to Actual Price	.93	1.18
N	22	63
Overall Rate		
Median Residual Predicted from Actual Price	106,726	55,776
COD Predicted Residual	23.6%	35.5%
Mean Ratio Predicted to Actual Price	1.07	1.22
Median Ratio Predicted to Actual Price	1.04	1.22
N	22	59
Additive		
Median Residual Predicted from Actual Price	83,109	73,798
COD Predicted Residual	20.6%	35.7%
Mean Ratio Predicted to Actual Price	1.01	1.08
Median Ratio Predicted to Actual Price	.93	1.09
N	21	71
Multiplicative		
Median Residual Predicted from Actual Price	112,490	40,028
COD Predicted Residual	20.7%	31.4%
Mean Ratio Predicted to Actual Price	.97	1.15
Median Ratio Predicted to Actual Price	.93	1.13
N	22	81