Exploring Capitalization Rate Differentials Across Property Types

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The understanding of how asset market behavior differs across property types is important for institutional investors contemplating property-type diversification strategies.

Introduction

This article presents the results of analytical work intended to empirically identify differences in transaction-based capitalization rates across office, warehouse, retail, and apartment properties during the period of 1986-1996. Three types of differences in capitalization rates across these property types are investigated: *first*, differences in their fixed (time-invariant) component; *second*, differences in the persistence of their time trends or the speed by which they adjust in response to changes in market conditions; and *third*, differences in the pattern of their intertemporal variations.

The understanding of how asset market behavior differs across property types is important for institutional investors contemplating property-type diversification strategies. An intelligent formulation of such strategies requires assessment of the differential return prospects of each property type. Such return prospects are determined in both the space (tenant) market, in which the time path of vacancies and rents is shaped, and the asset market, in which property prices are set. Capitalization rates are important determinants of the latter. A better understanding, therefore, of how they differ across property types can help investors better assess differential return prospects across property types.

Although existing empirical studies have detected fixed differences in capitalization rates across property types, they have neither accounted for differential persistence nor examined differences, if any, in time trends.[1] Examining aspects of such differential asset market behavior in an integrated fashion will set the platform for more accurate estimates of the different effects.

The second section of this article focuses on the empirical methodology employed in exploring the issue at hand. The third section elaborates on the analysis results and advances

potential explanations for the sources of the empirically identifiable differences in capitalization rates across property types. Finally, the fourth section summarizes the conclusions of the article and discusses potential avenues for future research.

THE EMPIRICAL FRAMEWORK

Recent metro-specific data from the *National Real Estate Index* (NREI) point to non-trivial cross-section and temporal differences in transaction-based capitalization rates across four property types: retail, office, warehouse, and apartments. A cursory examination of capitalization rate patterns across these property types is insufficient in evaluating their statistical significance and magnitude. Thus, a simple empirical model, similar in spirit to models used to examine the differential behavior of vacancy rates, price appreciation, and real estate returns, has been formulated to help validate the statistical significance of the observed differentials.[2]

Following the aforementioned modeling framework, the capitalization rate for a given property type at any point in time t can be decomposed into a fixed property-type specific component, a_i, and a random fluctuation around this component, ε_{it}:

Equation 1

$$C_{it} = a_i + \varepsilon_{it}$$

The fixed component represents *that* component of return that compensates the marginal investor for each property type's idiosyncratic risk characteristics.[3] The random term, also allowed to vary across property types, reflects deviations from this fixed component due to market-based income growth expectations, as well as additional market-driven risk premia. Random market movements generate time variations in such income growth expectations and risk premia, thereby influencing the capitalization rate required by investors. For given rents, such new capitalization rates are established through adjustments in asset prices. Such asset price adjustments, however, may be hampered by several asset market inefficiencies. The latter include high transaction and adjustment costs; lengthy institutional decision-making processes that may prevent investor entry/exit; and informational inefficiencies hampering the buyer-seller matching process, especially in heterogeneous asset markets. It may thus take more than one period before transaction-based capitalization rates fully reflect the effect of random market movements. As a result, a fraction, ρ, of each period's random deviation from a_i may persist into the next. The random component of the capitalization rate, ε_{it}, can thus be expressed as in *Equation 2*, where both, $F_i(t)$, denoting the random time trend, and ρ_i, obeying $0=<\rho_i<=1$, are allowed to vary across property types.

Although existing empirical studies have detected fixed differences in capitalization rates across property types, they have neither accounted for differential persistence nor examined differences, if any, in time trends.[1]

Equation 2

$$\varepsilon_{it} = F_i(t) + \rho_i \varepsilon_{it-1} + \upsilon_{it}$$

Combining *Equations 1 and 2* yields the empirical formulation in *Equation 3* which sets the appropriate platform for analyzing potential differences in the behavior of capitalization rates across property types.

Equation 3

$$C_{it} = a_i + F_i(t) + \rho_i \varepsilon_{it-1} + \upsilon_{it}$$

SOURCES OF VARIATIONS IN CAPITALIZATION RATES ACROSS PROPERTY TYPES

The underlying premise of this study is that the components embedded in *Equation 3* that is, fixed effects, persistence, and random time trends, vary across property types. In what follows, an effort is made to discuss some of the potential sources of these variations in order to help rationalize the empirical specification adopted and the tests performed.

Fixed Differentials (a_i)

Potential sources of fixed differences in capitalization rates across property types may involve factors systematically differing across property types and eliciting *typical* risk premia. The latter may include, but not be limited to, the following:

Lease characteristics: Lease length may vary across property types, with office, warehouse, and retail properties normally being characterized by longer leases than multi-family residential properties. Short-term leases characterizing such residential properties may be a source of greater uncertainty regarding future cash flows. Such greater uncertainty may invite a greater premium to compensate for this risk.[4]

Adjustment costs: Typically office properties require higher capital expenditure for accommodating tenant turnover. Office investors may thus require a risk premium to compensate for such greater adjustment costs.

Investment size: The probability of overbuilding may be perceived as greater in the case of office than other property types due to the lumpiness of office investments. Consequently, office investors may require a greater risk premium to compensate for this greater business risk.[5]

Tenant sensitivity: The cash flow of certain property types may be subject to idiosyncratic risks stemming from their reliance on specific tenants. The investment performance of retail properties, for example, may heavily rely on the presence of tenants that are critical to the realization of shopping externalities and, hence, the maximization of sales revenues and investment returns. The risk of not being able to easily replace critical tenants who relocate may warrant a compensatory premium.

Information availability and cost: Investors may invariably rely on information inputs necessary for investment performance monitoring, management, and hold-sell decisions. They may thus require a risk premium when investing in retail properties, information on which may be scarcer and more costly to obtain.

Investor familiarity with product type: Institutional investors may be more familiar with certain product types, such as office and retail, because they are part of their everyday lives. As a result, they may perceive those types as less risky than other types, such as warehouse.

Locational substitutability: Some product types may be more vulnerable to competition because of greater locational substitutability. As such, these product types may be deemed more risky. Large warehouses, for example, are used by tenants that are more footloose because they serve greater geographic areas. As such, they may be facing greater competition than neighborhood and community centers or office space used by tenants serving local markets.

Possibility of conversion to other uses: Certain property types, such as warehouses and distribution centers, may be more difficult to convert to other commercial uses, largely due to their special design and/or location in more isolated or outlying areas. As such, they may be perceived by investors as more risky.

Time Trends

Movements in market conditions, and hence the random time trend, may similarly differ across property types. Such differences may be due to varying asset market sensitivities to random shocks in national capital market factors (e.g., interest rates, expected inflation or stock returns). They may also be due to differences across property types in their demand and supply drivers that may be subject to different unexpected random shocks, thereby shaping different paths of time-variant risk premia or income growth expectations.

Focusing on demand shifters, these may include FIRE and service employment growth in the case of the office market; industrial output and retail consumption in the case of the warehouse market; and demographics and income growth in the case of the retail and apartment markets. Focusing on supply shifters, these may include costs, expected revenues, and capital availability. To the extent these supply shifters are subject to different random shocks across property types, similar differences in random fluctuations may be present in capitalization rate time paths.

Persistence

The persistence of time trends may vary across property types due to differences in factors that hinder asset price adjustments:

Investment capital requirements: Transaction capital requirements may vary across property types due to differences in the average size of investments. Larger capital, for example, is required in the case of office and retail ventures. If such larger capital is more difficult to secure, capital flows and asset price adjustments may be slower.

Information inefficiencies: Information inefficiencies may vary across property types because of differential information availability, which may in part be due to differences in product heterogeneity. Information availability, for example, is greater for office properties, which are also less heterogeneous than residential or retail properties.

THE DATA

The empirical analysis utilizes semi-annual metro-specific data on capitalization rates obtained from the *National Real Estate Index* (NREI),

a CB Commercial publication. The NREI primarily reports data on transactions that involve about 150 of the nation's largest real estate buyers and sellers. The latter include pension plans, Real Estate Investment Trusts (REITs), banks, savings and loan associations, commercial brokerage companies, and investment program sponsors.

Based on arms-length transactions, the aforementioned area-specific capitalization rates reflect average ratios of actual NOI over the transaction price. The transaction-based prices entering the calculation of the capitalization rate circumvent problems of systematic biases associated with the use of appraised values.[6] Moreover, although these transaction-based prices are not quality-adjusted through hedonic techniques, they do control, to some extent, for quality, as they refer to properties that conform to certain norms. These properties, for example, represent modern structures characterized by lease and vacancy rates that are not substantially different from their close substitutes within the same metropolis.

The data span over the period 1986-1996. The time period of analysis is dictated by the length of time series available but complies with Marston's (1985) two criteria: first, this time period must be short enough so that the fixed capitalization rate components, a_i, do not change throughout the entire period; second, this time period must be long enough so that any random component in place at the beginning of the period is fully reflected on prevailing capitalization rates by the end of this period. Otherwise, part of this random component will be present over the entire period and can incorrectly be captured by a_i.

THE EMPIRICAL RESULTS

Two variants of the empirical function presented in *Equation 3* were estimated. The first, *Model 1, (presented in Table 1),* is intended to explore average national differences across property types, thus assuming no differentiation in estimated parameters across metropolitan locations. The second, *Model 2, (presented in Table 2),* focuses on differences in capitalization rate components across property types at the metropolitan level of analysis.

National Differentials in Capitalization Rate Components across Property Types

Table 1, presenting *Model 1's* results, displays the estimated fixed capitalization rate components in the beginning of the study period, random time effects, and persistence in time trends for each property type. The results of joint and pairwise equality tests of these parameters are also presented in the same table. *Figures 1 and 2* highlight the magnitude of the various capitalization rate components.

Differentials in Fixed Components

The analysis of fixed effects and differences in such effects across property types lends support to the following conclusions:

1). Fixed effects for all property types are highly statistically significant. Furthermore, such fixed effects are not jointly equal across property types. This conclusion is consistent with the hypothesis that each property type has inherent idiosyncratic traits that elicit differential risk premia.

2). Pairwise tests of equality also indicate that the office fixed component is statistically different from the fixed component of the warehouse, retail, and apartment capitalization rates. As indicated by *Figure 1-A*, the overall risk premium typically required by investors for office seems to be statistically smaller than those required for warehouse, retail, and apartment properties. This is consistent with the smaller degree of heterogeneity of office structures, the greater availability of detailed market information for office than for any other property type, and the greater familiarity of institutional investors with such a property type. The lower risk premium office commands compared to apartments may also stem from its three-to-five-year lease contracts that lower the uncertainty of its cash flows compared to the one-year lease contracts typically associated with apartments. Finally, the lower risk premium that office properties command compared to retail may be due to the smaller sensitivity of their cash flows to a particular tenant. Overall, the results suggest that these relative advantages of office (in terms of risk) outweigh its relative disadvantages such as the higher adjustment costs and the greater probability of overbuilding.

3). The warehouse fixed component is statistically different from the respective apartment component, but not statistically different from the respective retail component. These results indicate that the risk premium typically required by investors for warehouse is greater than the one required for apartments. This may be due to the fact that institutional investors may be more familiar with apartment properties than with warehouse properties. Furthermore, warehouses may be located at more isolated locations where conversion to other uses may not be economically feasible. Such properties may also be subject to greater locational substitutability compared to apartments.

Table 1

Model 1 - Estimation Results[1]

DIFFERENCES IN CAPITALIZATION RATES AND PERSISTENCE ACROSS PROPERTY TYPES

A. Estimation Results	Office	Warehouse	Retail	Apartments
Fixed Effects, a	7.46**	9.07**	8.83**	8.63**
	(16.68)	(63.78)	(37.84)	(42.17)
Persistence, ρ	0.94**	0.77**	0.91**	0.80**
	(65.64)	(17.64)	(42.24)	(22.16)
b_{1987}	0.01	-0.08*	-0.09**	0.03
	(0.37)	(-1.79)	(-2.80)	(0.50)
b_{1988}	-0.03	-0.09**	-0.08**	-0.01
	(-0.63)	(-2.01)	(-2.15)	(-0.12)
b_{1989}	0.02	-0.06	0.01	0.01
	(0.51)	(-1.21)	(0.35)	(0.21)
b_{1990}	0.20**	0.05	0.10**	0.13**
	(4.79)	(1.26)	(3.50)	(2.31)
b_{1991}	0.18**	0.15**	0.22**	0.22**
	(5.23)	(3.06)	(6.58)	(3.67)
b_{1992}	0.29**	0.26**	0.18**	0.50**
	(7.06)	(4.19)	(5.09)	(4.53)
b_{1993}	0.13**	0.19*	0.08 *	0.17 *
	(2.84)	(1.77)	(1.68)	(1.72)
b_{1994}	0.01	0.01	-0.03	0.03
	(0.21)	(-0.08)	(-0.67)	(0.29)
b_{1995}	0.05	0.04	0.02	0.01
	(0.86)	(0.89)	(0.60)	(0.15)
b_{1996}	0.23**	-0.10	-0.06	-0.20**
	(3.92)	(-1.57)	(-1.25)	(-2.74)

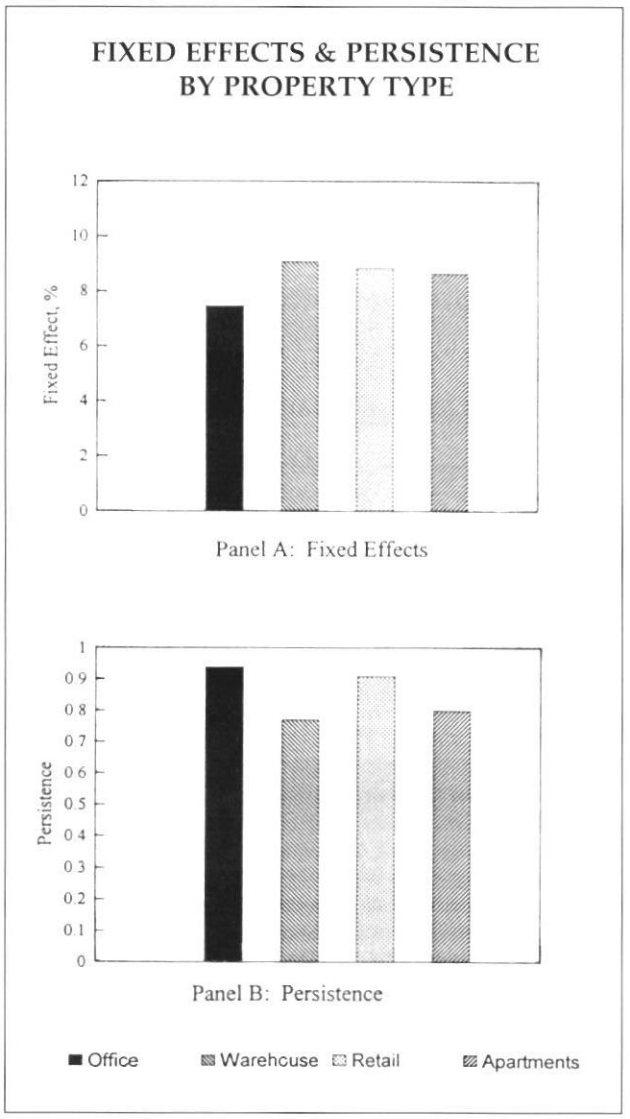
B. Tests of the equality of fixed effects	x^2 - statistic	P - value[2]
Null Hypothesis:		
$a_{office}=a_{warehouse}=a_{retail}=a_{apartment}$	17.93	0.00
$a_{office}=a_{warehouse}$	16.32	0.00
$a_{office}=a_{retail}$	8.73	0.00
$a_{office}=a_{apartment}$	9.41	0.00
$a_{warehouse}=a_{retail}$	0.84	0.36
$a_{warehouse}=a_{apartment}$	5.80	0.02
$a_{retail}=a_{apartment}$	0.52	0.47

C. Tests of the equality of persistence		
Null Hypothesis:		
$\rho_{office}=\rho_{warehouse}=\rho_{retail}=\rho_{apartment}$	24.15	0.00
$\rho_{office}=\rho_{warehouse}$	14.05	0.00
$\rho_{office}=\rho_{retail}$	0.97	0.33
$\rho_{office}=\rho_{apartment}$	12.82	0.00
$\rho_{warehouse}=\rho_{retail}$	8.44	0.00
$\rho_{warehouse}=\rho_{apartment}$	0.33	0.57
$\rho_{retail}=\rho_{apartment}$	6.75	0.01

Notes:

1. t-statistics are in parenthesis below the coefficients; one and two asterisks denote significance at the 10% and 5% levels, respectively
2. If the P-value is less than 0.1, then there is evidence to reject the null hypothesis at the 10% level of significance

Figure 1



4). Finally, the retail fixed component is not statistically different from the apartment fixed component. This is not necessarily an indication that there are no risk premia that are idiosyncratic to each of these property types. It may simply mean that their idiosyncratic risk premia add up to the same fixed component.

Differences in Persistence

Focusing now on the speed by which capitalization rates adjust in response to random market fluctuations, the results support the conclusion that there is statistically significant persistence in the time trends of all property types. This suggests that transaction-based capitalization rates for all property types do not change instantly to reflect changes in market conditions. As indicated by the joint equity test, such persistence is not statistically equal across property types *(see Table 1)*. This result reveals the presence of different degrees of asset market inefficiencies across property types. It furthermore suggests that even if all property types experience the same random shocks, their capitalization rate time paths should exhibit some differences because of differences in the persistence of random market movements.

Pairwise equality tests highlight specific differences in the speed of capitalization rate adjustment across property types:

1). The speed of adjustment of office capitalization rates is statistically different from both the warehouse and apartment adjustment speeds. In particular, as *Figure 1-B* shows, office capitalization rates appear to have greater persistence (ρ) or smaller adjustment speed ($1-\rho$) than warehouse and apartment capitalization rates. This may be due to the larger investment capital required for the realization of office as opposed to warehouse and apartment transactions. Such greater capital requirements may slow down capital flows and the decision-making process. The size of the investment may, in addition, render office property owners more reluctant to dispose their properties at a time when market conditions are unfavorable.

2). The persistence of the retail capitalization rate is statistically different from both the warehouse and the apartment capitalization rate persistence. More specifically, as *Figure 1-B* indicates, the speed of adjustment of the retail capitalization rate seems to be lower than the adjustment speed of the warehouse and apartment capitalization rates. These differences may be explained by the same factors cited for office.

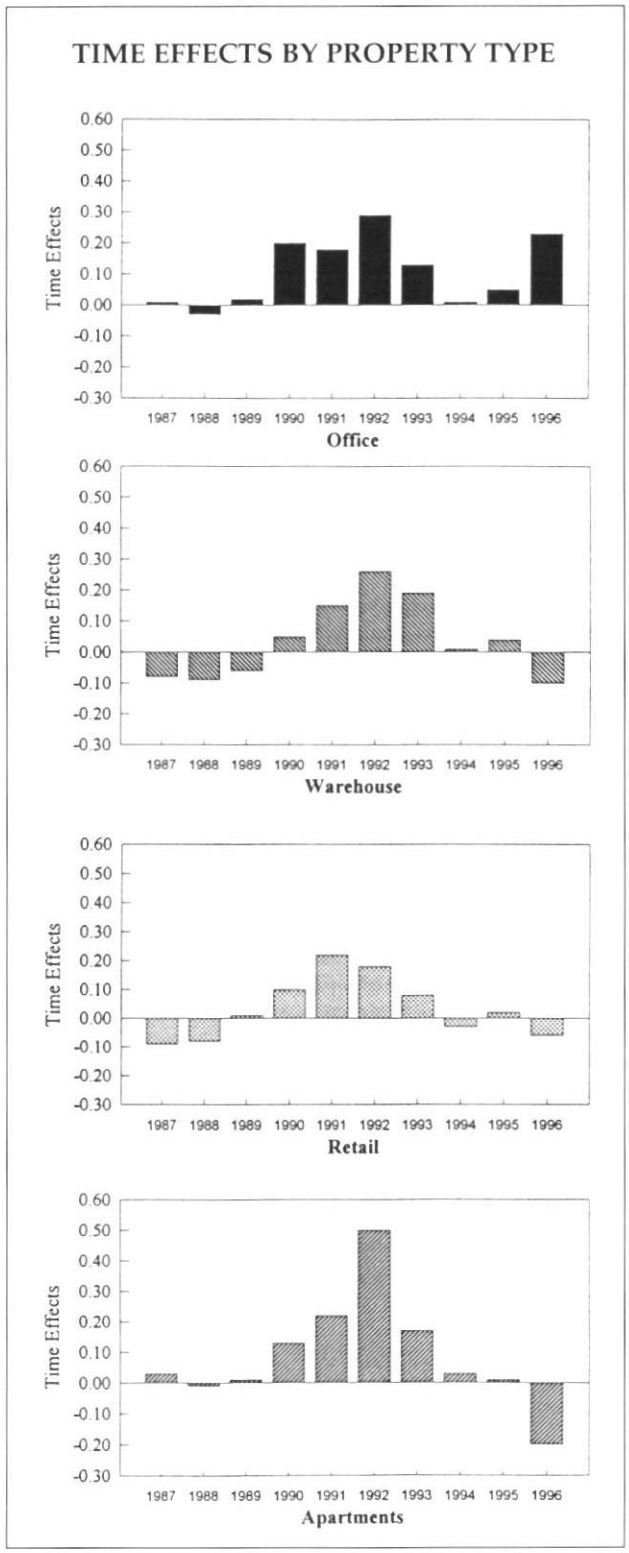
3). No statistically significant differences are detected in capitalization rate persistence between office and retail and between warehouse and apartment properties.

Differentials in Time Effects

The time trends of capitalization rates for each property type are captured by the annual dummies. The coefficients presented in *Table 1* and portrayed in *Figure 2* represent each year's time effect relative to 1986 (the default year), net of any persistence effects that are idiosyncratic to each property type. The results suggest the following with respect to capitalization rate movements:

1). There are indeed random time fluctuations in capitalization rates across all four property types. Such fluctuations are validated by the statistical significance of a number of time dummies. The results, for example, show a statistically significant deviation of the office capitalization rate from its

Figure 2



fixed component in five years, that is, during the recessionary period of 1990-1993 and in 1996.

2). It is interesting to note that a statistically significant time effect can be observed during the recessionary period of 1990-1993, for all property types.

3). Contrary to office and apartments, warehouse and retail exhibit statistically significant components in 1987 and 1988 but not in 1996.

DIFFERENCES IN CAPITALIZATION RATE COMPONENTS ACROSS METROPOLITAN LOCATIONS

The estimation results of *Model 1* suggest that capitalization rates exhibit differences in fixed effects and persistence across property types on the national level. Similar tests have also been performed at the metropolitan level of analysis based on the estimation results of *Model 2*. The estimates and relevant tests are presented in *Table 2*. The results of these tests indicate universal differences in fixed effects across property types. Of the 20 metropolitan areas included in the sample, fixed effects across property types are jointly statistically different in 16 of them. Differences in adjustment speeds across property types are also validated at the metropolitan level. Such differences, however, are not as common as differences in fixed effects. In particular, such differences are statistically significant in only eight out of the 20 metropolitan areas included in the sample. This may suggest that there are powerful idiosyncratic metropolitan characteristics, such as spatial structure and location diversity, whose effect on real estate space and asset market adjustments may span across all property types.

CONCLUSIONS

This study suggests that capitalization rates across property types differ along three dimensions: in the magnitude of their fixed, time invariant component; in the pattern of their time trends; and in the persistence of these time trends. Potential explanations on the sources of such differences have been advanced, but further empirical work is required to substantiate or contradict these explanations. To this end, the estimated models should be reformulated to account for potential fixed and time-variant determinants of differentials in capitalization rates across property types. Such analysis will set the stage for uncovering specific sources of differential asset market behavior and assessing their relevant importance.

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NOTES

1. See, for example, Ambrose, Brent and Hugh Nourse: "Factors Influencing Capitalization Rates," *Journal of Real Estate Research*, Volume 8, Number 2, 1993, pp. 221-237.
2. See Marston, R.: "Two Views of the Geographic Dispersion of Unemployment," *Quarterly Journal of Economics*, Volume 100, 1985, pp. 57-79; Voith, R. and T. Crone: "National

Table 2

Model 2 - Estimation Results

CAPITALIZATION RATES: FIXED EFFECTS AND PERSISTENCE ACROSS PROPERTY TYPES BY METROPOLITAN AREA

Metropolitan Area	Fixed Effects				Testing for the Equality of Fixed Effects ($a_o = a_w = a_r = a_a$)		Persistence				Testing for the Equality of Persistence ($\rho_o = \rho_w = \rho_r = \rho_a$)	
	Office	Warehouse	Retail	Apartments	x^2-Statistic	P-value[1]	Office	Warehouse	Retail	Apartments	x^2-Statistic	P-value[1]
Atlanta	8.29	9.25	8.73	8.58	105.01	0.00	0.29	0.18	0.64	0.39	8.73	0.03
Baltimore	8.01	9.29	8.61	8.68	29.89	0.00	0.83	0.58	0.84	0.75	3.26	0.35
Boston	7.08	9.03	8.44	7.83	92.81	0.00	0.76	0.77	0.72	0.87	1.82	0.60
Charlotte	8.38	9.40	9.09	8.67	100.13	0.00	0.32	0.58	0.71	0.50	8.14	0.04
Chicago	7.00	9.09	8.48	8.62	15.32	0.00	0.89	0.78	0.81	0.46	4.31	0.23
Dallas	8.81	9.31	9.27	9.03	15.26	0.00	0.68	0.54	0.63	0.78	3.11	0.37
Houston	4.46	9.42	9.74	9.13	1.00	0.81	0.97	0.79	0.75	0.85	5.54	0.13
Los Angeles	5.36	8.74	8.49	8.18	9.63	0.50	0.96	0.70	0.93	0.80	5.54	0.22
Minneapolis	8.41	9.62	9.17	8.74	83.82	0.00	0.64	0.40	0.80	0.53	4.00	0.25
Orange	5.36	8.74	8.49	8.18	9.63	0.00	0.96	0.70	0.93	0.80	5.54	0.02
Orlando	8.39	9.24	8.83	8.76	21.81	0.00	0.57	0.65	0.74	0.19	9.89	0.02
Philadelphia	8.11	9.37	9.12	8.70	34.90	0.00	0.81	0.58	0.78	0.75	2.86	0.41
Phoenix	9.01	9.04	9.11	8.89	0.83	0.84	0.45	0.64	0.68	0.38	4.91	0.18
Riverside	8.57	9.03	8.63	8.55	0.56	0.90	0.82	0.76	0.88	0.73	4.19	0.24
Sacramento	8.22	9.11	8.62	9.29	16.19	0.00	0.47	0.64	0.88	0.55	6.89	0.07
San Diego	7.68	8.84	8.50	8.48	10.50	0.01	0.83	0.71	0.90	0.76	3.58	0.30
San Francisco	6.41	8.90	8.29	7.38	13.26	0.00	0.91	0.82	0.88	0.89	1.08	0.77
Seattle	7.93	8.92	7.79	8.94	33.47	0.00	0.63	0.24	0.88	0.49	9.69	0.02
Tampa	8.58	9.39	9.24	8.80	32.07	0.00	0.53	0.48	0.75	0.45	9.36	0.02
Washington	6.77	9.43	8.23	7.79	32.33	0.00	0.83	0.64	0.91	0.91	6.51	0.08

Note:

1. If the P-value is less than 0.1, then there is evidence to reject the null hypothesis at the 10% level of significance

Vacancy Rates and the Persistence of Shocks in the U.S. Office Markets," *AREUEA Journal*, Volume 16, 1988, pp. 437-458; and Gyourko, J. and R. Voith: "Local Market and National Components in House Price Appreciation," *Journal of Urban Economics*, Volume 32, 1992, pp. 52-69.

3. The implicit assumption here is that market conditions rather than idiosyncratic property traits determine income growth expectations. However, certain property-specific traits, such as lease length, may affect in some way expectations for income growth.
4. Lease length differentials may also induce differential expectations for income growth, as longer leases may be associated with smaller rental changes. On the other hand, however, short term leases, may allow investors to easily take advantage of rent increases dictated by improving market conditions.
5. Furthermore, such greater probability of overbuilding may be associated with lower rent growth expectations. The effect of investment size on income growth expectations is unclear as supply side sluggishness can also prolong undersupply and strong rental growth increases.
6. See Wheaton, William and Ray Torto: "Income and Appraised Values: A Reexamination of the FRC Returns Data," *AREUEA Journal*, Volume 17, 1989, pp. 439-449. These authors suggest that appraised values may reflect systematic biases, as they appear to consistently incorporate erroneous expectations regarding future growth in rental incomes.

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