

**AN ANALYSIS OF THE DURATION AND INCIDENCE  
OF VACANCIES IN MULTIFAMILY RESIDENTIAL PROPERTIES**

by

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## ABSTRACT

Recent studies (Vandell and Riddiough [1991] and Belsky[1992]) have indicated the importance of rental vacancy rates in the analysis of risk and return in local real estate markets. Algebraically, the rental vacancy rate can be decomposed into its *incidence* of vacancy and *duration* of vacancy components. In this study, we analytically model and empirically derive the incidence and the duration components of residential vacancy rates, so as to gain greater insights into the determinants of vacancy rate fluctuations. The analysis employs new intermetropolitan and time-series data from the Bureau of Labor Statistics which enable calculation of the incidence and duration of vacancy measures.

Results of the analysis indicate substantial variation in the incidence and the duration of rental vacancies across metropolitan areas and over time. For instance, New York City has the lowest vacancy measures, as well as the lowest incidence and duration of vacancy; whereas Houston has relatively high levels of all three measures. Estimates of vacancy duration appear to be largely invariant to the length of the time period over which those estimates are derived. Further, research findings indicate that some rental units are more likely to experience spells of vacancy, probably due to local area economic and demographic characteristics as well as those of the units themselves. Comparison of the research findings with data contained in the American Housing Survey lend credence to the research approach and demonstrate the apparent undercounting of short vacancy durations associated with more traditional rental vacancy datasets.

## I. INTRODUCTION

In the wake of the ongoing weakness in multifamily rental markets in many metropolitan areas, real estate market professionals—including developers, lenders, appraisers, and public and private analysts—have sought to better evaluate risk and return to residential investment properties. Many academic and professional analyses, including evaluations of real estate market impacts of RTC asset dispositions, employ vacancy rates in a characterization of local real estate market conditions. In fact, a recent study by the RTC pointed to the fundamental importance of vacancy rate measures in an assessment of real estate market fluctuations. According to Census Bureau releases for the first quarter of 1995, multifamily rental vacancy rates remained well in excess of so-called “normal” or equilibrium levels in some metropolitan areas, suggesting continued damped rates of return to investors in those properties as well as continued risks to multifamily lending and construction.

Although the real estate market and regulatory implications of vacancy rate fluctuations continue to attract attention in both business and governmental circles—and despite reference to this indicator in virtually all market analyses of income-producing properties--there exists little systematic research concerning the derivation, forecasting, or market implications of this indicator. Previous studies (see, for example, Blank and Winnick [1953], Rosen and Smith [1984], Gabriel and Nothaft [1988], and Mueller [1991]) have focused on estimation and evaluation of equilibrium (or “natural”) vacancy rates for rental housing markets. The natural vacancy rate is defined as that which is associated with a constant level of real rents; accordingly, increases (decreases) in real rents over time reflect

excess demand (supply) for rental housing as indicated by actual (or observed) vacancy rates below (in excess of) their equilibrium levels. Empirical research has supported this view of the price adjustment process for rental housing. Those studies also have produced useful results concerning the determinants of intermetropolitan variation in equilibrium vacancy rates; such information is critical to foretelling the effect on investment property values and rental housing affordability of various economic and regulatory events. To date, however, research in this field has not progressed beyond those analyses, and has not attempted to glean insights which may be associated with the decomposition of rental vacancy rates into their incidence and duration components.

In a manner akin to analyses of the unemployment rate, residential vacancy rates may be expressed as the product of the incidence of vacancy and duration of vacancy components (see, for example, Leighton and Mincer [1982] and Johnson and Layard [1986]). Incidence of vacancy is the probability that a housing unit becomes vacant, whereas duration of vacancy is the length of time that a unit remains in vacant status.<sup>1</sup> For particular rental property types, the incidence measure is useful in indicating variation over time and across metropolitan areas in the proportion of the stock that experiences a spell of vacancy, whereas the duration measure may be used to provide insight into systematic variations over time and space in the length of time that a unit remains vacant.<sup>2</sup> Phenomena that cause the incidence

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<sup>1</sup>The Bureau of the Census defines a vacant unit as an unoccupied unit that is available for sale or rent. Accordingly, a rental vacancy duration starts when a unit becomes vacant (either because an occupant moves out of an existing unit or because the unit enters the market) and ends when the unit ceases to be for rent (either because someone rents the unit or because it is removed from the market).

<sup>2</sup>Alternatively put, the annual average duration of vacancy can be viewed as the nominal vacancy rate normalized by the annual incidence of vacancy. To the extent that the incidence of vacancy is stable, the nominal vacancy rate and the duration of vacancy become equivalent indicators of a given rental

of vacancy to be higher or the duration of vacancy to be longer will also lead to a higher level of the vacancy rate. Decomposition of vacancy rates into their incidence and duration components accordingly provides new information as to the source of fluctuations in the overall indicator; such information may be of critical importance to developers, regulators, and others requiring analyses of that market segment. Further, those incidence and duration measures may themselves be the focus of separate modeling and forecasting exercises, so as to evaluate systematic determinants of cross-sectional and time-series fluctuations in the vacancy rate indicator.

Unfortunately, there has been no previous study that measures the contribution of the incidence and the duration of vacancy to observed vacancy rates for a cross-section of U.S. metropolitan areas.<sup>3</sup> This void can be attributed in part to a lack of data appropriate to the decomposition of the vacancy rate into its duration and incidence components. For example, rental apartments included in the American Housing Survey are revisited biennially by the survey takers, and include information on the duration of vacancy of those units vacant as of the survey date. However, virtually nothing is known about the incidence or duration of vacancy for the entirety of the rental stock (including units occupied as of the survey date) between survey dates, and the estimation of duration is truncated since the termination date of the vacancy is never observed. Accordingly, the ideal data set would survey the individual rental units with a high frequency and also include information on the occupancy

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housing market. As is indicated in our empirical estimates, however, the incidence of rental vacancies exhibits considerable cross-MSA variation.

<sup>3</sup>In an early study using data from the Housing Assistance Supply Experiment, Rydell (1978) estimates the duration of vacancy and the turnover of units for housing in St. Joseph County and Brown County, Indiana.

status of that unit between enumerations.

This paper provides analytical modeling and empirical derivation of the duration and incidence of vacancies in multifamily rental properties. As a first step, the analysis undertakes to separately estimate and examine the incidence and duration of vacancy series for major MSAs in the United States. Subsequently, those series are recombined to calculate the overall vacancy rate. Calculations of the vacancy rate in individual metropolitan area markets as derived from the product of the incidence and duration of vacancy estimates are then compared to Census Bureau vacancy rate estimates. In so doing, the study indicates the extent to which variation in residential vacancy rates across metropolitan areas and over time is due to differences in vacancy incidence, vacancy duration, or both.

Results of the analysis indicate substantial variation in the incidence and the duration of rental vacancies across metropolitan areas and over time. For instance, New York City has the lowest vacancy measures, as well as the lowest incidence and duration of vacancy; whereas Houston has relatively high levels of all three measures. Comparison of the research findings with data contained in the American Housing Survey lend credence to the research approach and demonstrate the apparent undercounting of short spells of vacancy duration associated with more traditional rental vacancy datasets.

The plan of the paper is as follows. The following section describes the data and the decomposition of vacancy rates into their incidence and duration components. Section III presents results of the empirical analysis. Finally, section IV discusses conclusions of the research.

## II. DATA AND EMPIRICAL ANALYSIS

**The CPI Housing Sample.** The CPI housing sample is the source of information on changes in the price of housing services for the CPI's two principle shelter indexes--the residential rent index and the owners' equivalent rent index. The current CPI housing sample was initiated in January 1987 at the time of the last revision of the overall index. Up until the time of the next major revision of the CPI, which is scheduled for 1998, the housing sample remains a stratified cluster sample of approximately 40,000 rental units and 20,000 owner units.<sup>4</sup> In order to ensure that the CPI housing sample remains current, the BLS augments the dataset based on building permit data obtained from the Census Bureau and from canvassing of areas not requiring building permits. The overall sample is divided into six panels with rental units surveyed every six months. Thus there is a "January – July" rental panel which is surveyed in each of those months; a "February – August" panel; a "March – September" panel; and so on, resulting in two data collections per year per apartment in the sample. In general, only half of the owner units are surveyed in each of the panel survey months, resulting in the collection of owner data only once during the year (e.g., half of the owner units in the "January – July" panel are surveyed in January and the other half in July).

In any given month, the BLS field representatives visit that month's housing panel and gather information on, among other items, the tenure status of the dwelling unit (owner

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<sup>4</sup>For additional information, see U.S. Department of Labor, BLS Handbook of Methods, Bulletin 2414, "Chapter 19: The Consumer Price Index" (1992).

or rental), current occupancy status (vacant or occupied), duration in months of occupancy (if occupied), and, for rental units, the rent level. The resulting dataset is well suited to the analysis of vacancy, including the estimation of the incidence and the duration of vacancy, because of its high sampling frequency and the detail of information collected over the between-survey period. The analysis undertaken in this paper uses the CPI housing sample over the January 1987 to December 1994 period.

In general, the rental vacancy rates by metropolitan statistical area (MSA) as estimated from the BLS dataset are comparable to the rates obtained from the vacancy survey conducted by the Census Bureau. Table 1 depicts the annual vacancy rates in ten metropolitan areas from the BLS dataset and from Census reports over the 1987-93 period; the “H” and “L” indicate years in which both datasets register the “highest” and “lowest” vacancy rates during that time period. Perhaps most striking is the fact that the vacancy rate trends are fairly similar over time and across metropolitan areas in the two datasets, especially for the larger markets. In five of the markets, the peaks and troughs of the vacancy rate fluctuations coincide. A ranking of the areas by mean vacancy rate gives a similar ordering: the Tampa-St. Petersburg-Clearwater, Atlanta, and Nashville MSAs have the highest mean vacancy rates according to both datasets, whereas the Minneapolis-St. Paul and New York metropolitan areas have the lowest mean rates. Furthermore, the mean vacancy rates from the two datasets are generally within a standard deviation of one another.

**Derivation of the Incidence of Vacancy and the Duration of Vacancy.** The overall (observed) vacancy rate fails to indicate whether a sizable proportion of the rental stock experiences a short spell of vacancy (on average) or whether a relatively small proportion of

the rental stock bears a sizable portion of the vacancy burden by encountering relatively long spells of vacancy. In that regard, an equivalent vacancy rate would be computed for a particular period when a certain proportion of the rental housing stock is vacant for an average of one month or when only a quarter of that proportion is vacant for an average period of four months. The ability to differentiate between these two possibilities allows for more complete explanations of intertemporal and intermetropolitan variation in vacancy rates and accordingly facilitates the analysis of the effects of governmental policies or economic forces on the rental housing market.

The decomposition of the vacancy rate into its incidence and duration components can be illustrated as follows. Let  $M_i$  represent the number of months during a given period, say, one year, that the  $i^{\text{th}}$  apartment is vacant for rent;  $V_i$  the number of spells of vacancy entered into by the  $i^{\text{th}}$  rental unit that year ( $M_i$  and  $V_i$  will equal zero for an apartment occupied all year long); and  $H$  is the rental housing stock each month during the year (vacant and occupied). Then the market vacancy rate for the year is

$$\sum_i M_i / 12 * H$$

while the *incidence* (or likelihood) of an apartment being vacant at some time during the year is

$$\sum_i V_i / H$$

and the *average duration* of a vacancy spell is (in months)

$$\sum_i M_i / \sum_i V_i$$

or, expressing vacancy duration as a fraction of a year,

$$\sum_i M_i / 12 * \sum_i V_i$$

Clearly, the vacancy rate is the product of incidence and duration:

$$\text{Vacancy Rate} = \text{Incidence} * \text{Average Duration}$$

$$\sum_i M_i / (12 * H) = (\sum_i V_i / H) * (\sum_i M_i / (12 * \sum_i V_i))$$

While this derivation assumes, for simplicity, a constant rental housing stock over the period, it is straightforward to extend the analysis to incorporate additions or deletions from the rental stock. For instance, defining  $H_i$  to be the number of months during the year that the  $i^{\text{th}}$  dwelling unit is in the rental stock (either as an occupied unit or as a vacant apartment for rent), then the average monthly rental stock,  $H$ , is  $\sum_i H_i / 12$  and the above decomposition can be rewritten as

$$\sum_i M_i / (12 * H) = \sum_i V_i / H * \sum_i M_i / (12 * \sum_i V_i)$$

Because of the high survey frequency of the CPI rental housing sample (every six months) and the information collected on length of occupancy, the number of spells of vacancy,  $V_i$ , can be tabulated for each rental apartment. The tabulation method is illustrated in Tables 2a and 2b. Table 2a applies to the case where the observation period is six months (two consecutive surveys of rental units) and the apartments are in the rental stock at both survey dates. In this situation, there are five cases, only the first of which represents a case where there is no spell of vacancy. In the first case, the apartment is continually occupied (because the unit is occupied at both survey dates, and because the tenant reported living there over the six month period as of the second enumeration). Each of the remaining cases reflects the apartment having a spell of vacancy at some time over the six month period. For instance, the second row depicts the case where the unit is occupied at both survey dates, but the tenant at the second date reported residing in the apartment less than six months; here we

assume that the apartment experienced a spell of vacancy when the tenant turnover occurred. Table 2b illustrates the method for the more complex case of a twelve-month observation period (three consecutive surveys of rental units); in this case there are thirteen alternative combinations which follow a logic comparable to that in Table 2a.

Once the vacancy spells are tabulated and the average rental housing stock computed, the calculation of incidence is simply the resulting quotient. Average duration can then be computed as the vacancy rate divided by the incidence, as indicated in the above decomposition. The calculation of vacancy rate, incidence, and duration for the CPI housing sample over the various observation period lengths is shown in Table 3. The rate at which incidence and duration of vacancy increase as the period of observation is lengthened indicates the degree of persistence of vacancy or its converse, the degree of turnover among the vacant units. The degree of persistence observed in the data may be due to positive serial correlation in the probability of a particular rental unit experiencing vacancy, or to heterogeneity in the probability of experiencing vacancy across units, or both.

The analysis is based on the first five survey dates of each panel in the dataset; for example, for the January - July panel, the survey dates are January 1987, 1988, and 1989, and July 1987 and 1988. An observation period length of six months is shown in the first four rows, a twelve-month length in the next two rows, and a twenty-four month interval in the bottom row. The first period refers to the dates of the first two surveys of an apartment (e.g., January and July 1987), the second period to the second and third survey dates (e.g., July 1987 and January 1988), and so on. The fifth row represents calculations over the first twelve-month period of each panel and, as such, should yield a vacancy rate between the

values computed for the first two rows, as it does. Finally, the bottom row covers the first twenty-four months of each panel, and yields a vacancy rate between the high and low of the individual six-month periods, as it should.

Table 3 reveals several interesting findings. First, as the vacancy rate edged up over the first four six-month periods, incidence changed very little; the increase in vacancy rates was largely attributable to phenomena that increased the duration of vacancy, not the frequency of vacancy. Second, average duration estimates generally lie between 1.5 to 2.0 months, which is an intuitively plausible range of estimates. Third, there is a great deal of tenant mobility and apartment turnover; over six-month intervals approximately 30 percent of apartments experience a vacancy spell, or, in other words, 70 percent of units remain continuously occupied (right-most column). The proportion of apartments continuously occupied declines as the observation-period length increases, as one might expect, but the decline is not as rapid as indicated in the six-month estimates. For instance, if there was “complete turnover” in those units experiencing a vacancy, so that those apartments vacant in one six-month interval are never vacant in any other six-month interval over our total observation period, then the proportion of units continuously occupied through a twenty-four month interval would be about one-fourth ( $= (0.70)^4$ ). If “complete persistence” in vacancy is defined to mean that it is the same group of apartments that experience vacancy spells over and over, then the proportion continuously occupied over twenty-four months would remain at 0.70. Since the actual figure, 0.40, is between these two extremes, it indicates that a significant degree of persistence coexists with a great deal of turnover. In other words, some rental units are more susceptible to vacancy spells, probably because of local economic and

demographic characteristics, as well as characteristics of the apartments themselves.

While the estimates of duration are similar by observation-period length, the duration estimates do tend to be somewhat higher as interval length increases. This may reflect the method used to count vacancy spells, in which we assume that an apartment that is vacant at its initial observation is a new spell of vacancy, whereas the spell began at an earlier date. Any bias that this introduces into the incidence calculation is diminished by increasing the observation-period length. Thus, the duration estimates in the fifth and sixth rows of Table 3 are similar to the estimate in the last row. In the remainder of this paper, we compute the incidence and the duration of vacancy using twelve-month intervals.

### **III. AN ANALYSIS OF INCIDENCE AND DURATION BY METROPOLITAN AREA MARKET**

The rental housing market is quite dynamic. While the large majority of apartments remain in the rental stock for extended periods of time, some units are removed from the stock (either through conversion to owner use or due to demolition), whereas other units are added to the stock as previously owner-occupied units become available for rent or because new units are constructed. Accordingly, the size of the rental stock varies over time.

Table 4 provides estimates of the incidence and the duration of vacancy for five major markets. For each market, estimates are shown for apartments that are observed to be in the rental stock for three consecutive periods (labeled “In-In-In”) and for apartments that are in the stock for only two consecutive periods (labeled “Out-In-In” and “In-In-Out” if missing the first or third survey period, respectively). In addition to the reasons cited above, some units are designated as “Out” in our analysis because of incomplete field reviews.

Interestingly, a relatively high percentage of apartments remain in the rental housing stock over time (right-most column of table). Also, note that apartments that are removed from the rental stock have noticeably higher vacancy rates, incidence, and duration. This is consistent with the notion that units withdrawn from the rental stock may be subpar and, thus, harder to keep fully rented. Also, units that are difficult to rent may be converted to owner-occupied use. Our remaining analysis includes units that are in the rental stock for only two consecutive periods; those units provide a more complete description of rental market conditions in the various markets.

Table 5 illustrates the decomposition of vacancy rates into the incidence of vacancy and the duration of vacancy for five markets over three different periods. There is substantial variation in the incidence and duration of vacancy across metropolitan areas and over time. New York City has the lowest vacancy rates, as well as the lowest incidence and duration of vacancy estimates. Houston is at the high end of all three measures. The significant variation suggests that future attempts to statistically evaluate the determinants of those measures should prove successful.

Table 6 presents estimates of the distribution of the duration of vacancy from the AHS and BLS datasets. For this analysis, units from the BLS dataset were used if they were surveyed for five consecutive times in each panel. The distribution of duration is similar in the two datasets, although the AHS reports more units with long vacancy durations (24 months or more) and higher vacancy rates. The right-most column shows the duration of vacancy spells over the prior year, including the duration (to date) of currently vacant apartments and *completed* vacancy spells over the prior twelve-month interval. Clearly,

short spells of duration are undercounted if one uses the AHS dataset, illustrating the problems of using the AHS to decompose vacancy rates into their incidence and duration components. In that regard, duration estimates derived from the AHS will be too high, and estimates of incidence too low, when compared with actual behavior in the rental housing market.

#### **IV. CONCLUSIONS**

This study provides analytical modeling and empirical derivation of the duration and incidence of vacancies in multifamily rental properties. Subsequent to the estimation of the incidence and duration of vacancy series, they are recombined to compute the overall vacancy rate. Calculation of the overall vacancy rate in individual metropolitan area markets as derived from the product of the incidence and duration of vacancy estimates are then compared to Census Bureau vacancy rate estimates. In so doing, the study indicates the extent to which variation in residential vacancy rates across metropolitan areas and over time is due to differences in vacancy incidence, vacancy duration, or both.

Results of the analysis indicate substantial variation in the incidence and the duration of rental vacancies across metropolitan areas and over time. For instance, New York City has the lowest vacancy measures, as well as the lowest incidence and duration of vacancy; whereas Houston has relatively high levels of all three measures. Estimates of vacancy duration appear to be largely invariant to the length of the time period over which those estimates are derived; however, estimates of the duration of vacancy tend to be somewhat higher as the interval length increases. Further, research findings indicate that some rental units are more likely to experience vacancy spells, probably due to local area economic and

demographic characteristics as well as those of the units themselves. Comparison of the research findings with data contained in the American Housing Survey lend credence to the research approach and demonstrate the apparent undercounting of short spells of vacancy duration associated with more traditional rental vacancy datasets.

Table 1  
Rental Vacancy Rates in Various Metropolitan Areas, 1987-1993

Metropolitan Area	1987	1988	1989	1990	1991	1992	1993	Mean	Standard Deviation
Atlanta MSA	L				H				
BLS	5.3	8.9	9.7	13.6	15.6	14.5	10.6	11.2	3.4
Census	6.4	9.7	12.5	11.6	12.9	11.2	9.6	10.6	2.2
Baltimore MSA									
BLS	6.9	6.9	6.8	6.8	6.0	8.5	8.0	7.1	0.8
Census	8.3	5.4	4.9	5.2	7.4	7.0	8.5	6.7	1.5
Chicago <sup>1</sup>	L					H			
BLS (CMSA)	4.6	5.8	6.1	6.5	6.4	6.6	6.6	6.1	0.7
Census(PMSA)	6.1	6.8	6.4	6.6	7.3	8.4	7.3	7.0	0.8
Los Angeles- Long Beach MSA	L						H		
BLS	3.8	5.6	5.2	5.9	6.2	6.7	8.5	6.0	1.3
Census	4.4	5.5	5.8	6.2	6.7	8.2	9.5	6.6	1.7
Minneapolis- St.Paul MSA									
BLS	3.1	4.6	5.5	4.7	4.0	5.9	3.2	4.4	1.0
Census	5.3	6.5	6.3	6.5	6.7	5.5	5.2	6.0	0.6
Nashville MSA				H					
BLS	6.1	7.0	9.2	9.2	8.6	9.0	6.2	7.9	1.3
Census	8.0	8.4	11.2	11.3	8.8	4.3	4.9	8.1	2.7
New York <sup>2</sup>	L					H			
BLS (city)	1.4	2.9	2.5	2.8	3.9	4.2	3.9	3.1	0.9
Census(PMSA)	2.4	2.8	3.3	4.7	5.1	5.5	5.0	4.1	1.2
San Diego MSA	L					H			
BLS	4.1	5.4	5.9	5.2	6.3	8.5	7.3	6.1	1.3
Census	6.2	8.5	6.6	6.9	6.3	8.3	7.8	7.2	1.0
Tampa-St.Peters- burg-Clearwater									
BLS	5.7	9.0	11.6	11.5	15.2	13.2	14.1	11.5	3.0
Census	11.3	13.3	11.3	10.4	10.6	8.8	9.0	10.7	1.5
Washington DC- MD-VA MSA									
BLS	2.2	4.2	4.6	6.7	7.1	6.3	5.5	5.2	1.6
Census	4.8	4.6	5.8	6.7	7.9	8.8	8.4	6.7	1.7

<sup>1</sup> The Chicago CMSA includes the Chicago PMSA, Aurora-Elgin PMSA, Gary-Hammond PMSA, Joliet PMSA, Kenosha PMSA, and Lake County PMSA.

<sup>2</sup> The New York PMSA includes New York City and Westchester, Rockland, and Putnam Counties.

Source: Housing Vacancies and Homeownership, Annual Statistics: 1993, Current Housing Reports (H111/93A), Table 5.

Table 2a  
 Tabulation of Vacancy Spells During a Six-Month Interval

<u>First Observation</u>	<u>Second Observation</u>		<u>Number of Spells of Vacancy</u>
<u>Occupancy Status</u>	<u>Occupancy Status</u>	<u>Length of Occupancy</u>	
Occupied	Occupied	6 months or more	0
Occupied	Occupied	Less than 6 months	1
Occupied	Vacant	N/A	1
Vacant	Occupied	N/A	1
Vacant	Vacant	N/A	1

Note: N/A is “not applicable”

Table 2b  
 Tabulation of Vacancy Spells During a Twelve-Month Interval

First Observation	Second Observation		Third Observation		Number of Spells of Vacancy
Occupancy Status	Occupancy Status	Length of Occupancy 6 months or more	Occupancy Status	Length of Occupancy 6 months or more	
Occupied	Occupied	6 months or more	Occupied	6 months or more	0
Occupied	Occupied	6 months or more	Occupied	Less than 6 months	1
Occupied	Occupied	6 months or more	Vacant	N/A	1
Occupied	Occupied	Less than 6 months	Occupied	6 months or more	1
Occupied	Occupied	Less than 6 months	Occupied	Less than 6 months	2
Occupied	Occupied	Less than 6 months	Vacant	N/A	2
Occupied	Vacant	N/A	Occupied	N/A	1
Occupied	Vacant	N/A	Vacant	N/A	1
Vacant	Occupied	N/A	Occupied	6 months or more	1
Vacant	Occupied	N/A	Occupied	Less than 6 months	2
Vacant	Occupied	N/A	Vacant	N/A	2
Vacant	Vacant	N/A	Occupied	N/A	1
Vacant	Vacant	N/A	Vacant	N/A	1

Note: N/A is “not applicable”

Table 3  
Effect of Interval Length on Incidence and Duration Estimates

Interval Length and Time Period	Vacancy Rate	Vacancy Incidence	Duration		Proportion Continuously Occupied
			Fraction of Period	Months	
<i>Six-month interval</i>					
First period	.063	.302	.208	1.45	.698
Second period	.076	.296	.256	1.79	.704
Third period	.078	.310	.252	1.77	.690
Fourth period	.080	.293	.272	1.90	.707
<i>Twelve-month interval</i>					
First and second	.067	.523	.128	1.67	.567
Third and fourth	.079	.523	.150	1.95	.564
<i>24-month interval</i>					
First through fourth	.072	.970	.074	1.86	.402

Note: Analysis uses housing units continuously observed in rental market for first five survey dates; time frame is January 1987 through June 1989 and sample size is 23,895 rental units.

Table 4  
Effect of Changes in Rental Stock Status on Vacancy and Incidence Rates

Metropolitan Area	Rental Stock Status	Vacancy Rate	Incidence	Duration		Proportion Continuously Occupied	Sample Size
				Percent of Period	Months		
New York City	In-In-In	3.5	29.8	11.8	1.5	75.2	1122
	Out-In-In	3.3	38.4	8.6	0.6	61.6	62
	In-In-Out	8.6	23.5	36.6	2.6	76.5	47
Los Angeles City	In-In-In	9.7	56.8	17.1	2.2	52.5	1325
	Out-In-In	15.5	46.5	33.3	2.3	53.5	94
	In-In-Out	12.8	38.2	33.5	2.3	61.8	71
Chicago, IL-IN-WI	In-In-In	6.7	39.3	17.0	2.2	64.2	1091
	Out-In-In	0.2	14.7	1.4	0.1	85.3	60
	In-In-Out	24.9	50.4	49.4	3.5	49.6	57
Washington, DC-MD-VA	In-In-In	6.5	49.3	13.1	1.7	59.8	469
	Out-In-In	0.0	35.5	0.0	0.0	64.5	27
	In-In-Out	16.9	41.5	40.7	2.8	58.5	32
Houston, TX	In-In-In	11.5	62.4	18.5	2.4	47.5	528
	Out-In-In	11.1	20.4	54.2	3.8	79.6	34
	In-In-Out	31.7	61.6	51.4	3.6	38.4	37

Note: Analysis uses housing units observed in rental market during 13th-15th survey dates (time frame is January 1993 through June 1994).

Table 5  
Decomposition of Vacancy Rate into Incidence and Duration

Metropolitan Area	Time Period	Vacancy Rate	Incidence	Duration		Proportion Continuously Occupied	Sample Size
				Percent of Period	Months		
New York City	1/87-6/88	2.3	34.1	6.6	0.9	72.3	1070
	1/90-6/91	2.7	41.4	6.4	0.8	68.4	1245
	1/93-6/94	3.6	30.9	11.7	1.5	74.5	1231
Los Angeles-Long Beach City	1/87-6/88	4.6	44.9	10.1	1.3	64.1	1146
	1/90-6/91	5.7	48.8	11.7	1.5	59.5	1336
	1/93-6/94	9.9	57.1	17.4	2.3	53.0	1490
Chicago, IL-IN-WI	1/87-6/88	5.9	41.4	14.1	1.8	64.6	1284
	1/90-6/91	7.1	43.1	16.6	2.2	61.4	1191
	1/93-6/94	7.1	40.0	17.7	2.3	64.4	1208
Washington, DC-MD-VA	1/87-6/88	3.2	42.3	7.5	1.0	64.6	531
	1/90-6/91	7.8	51.1	15.2	2.0	59.0	542
	1/93-6/94	6.6	49.7	13.2	1.7	59.9	528
Houston, TX	1/87-6/88	20.4	74.8	27.3	3.5	41.2	567
	1/90-6/91	16.8	64.1	26.2	3.4	44.9	629
	1/93-6/94	12.0	61.9	19.4	2.5	49.0	599

Table 6  
Duration of Vacancy

Metropolitan Area and Duration of Vacancy	Distribution of Vacant Rental Units		Percent of Vacancy Spells Over Prior Year:
	American Housing Survey	BLS	BLS
<b>Dallas</b>			
Less than 6 months	79.5	55.8	86.4
6-12 months	11.8	28.1	10.4
12-24 months	6.2	16.2	3.2 <sup>1</sup>
24 months or more	2.6	0.0	
Vacancy Rate (Sample Size)	20.0	12.3 (350)	
<b>Los Angeles</b>			
Less than 6 months	89.3	74.1	94.9
6-12 months	4.0	15.1	3.7
12-24 months	4.4	10.8	1.4 <sup>1</sup>
24 months or more	2.2	0.0	
Vacancy Rate (Sample Size)	8.2	5.1 (914)	
<b>Philadelphia</b>			
Less than 6 months	62.3	74.3	92.9
6-12 months	10.3	15.3	5.0
12-24 months	5.6	10.4	2.0 <sup>1</sup>
24 months or more	22.1	0.0	
Vacancy Rate (Sample Size)	12.1	5.8 (617)	
<b>San Francisco</b>			
Less than 6 months	88.0	90.7	96.3
6-12 months	8.0	9.3	2.9
12-24 months	2.9	0.0	0.8 <sup>1</sup>
24 months or more	0.9	0.0	
Vacancy Rate (Sample Size)	7.3	4.0 (663)	
<b>Washington, DC</b>			
Less than 6 months	83.4	83.4	95.2
6-12 months	6.5	5.5	3.4
12-24 months	0.8	11.0	1.3 <sup>1</sup>
24 months or more	9.2	0.0	
Vacancy Rate (Sample Size)	9.3	4.1 (426)	

<sup>1</sup> Duration of vacancy is 12 months or more.

Source: American Housing Survey: Current Housing Reports- H170/89-4,H170/89-7, H170/89-18, H170/89-33, and H170/89-39.

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### Appendix A Numerical Example of Derivation of Incidence and Duration of Rental Vacancies

As an example, suppose there are 20 housing units; 10 are occupied year round, while each of the other 10 experience a spell of vacancy once during the year. In this case,  $V = 10$  and  $H = 20$ . Let  $M_{vi}$  ( $i = 1, \dots, 10$ ) be the number of months the  $i^{\text{th}}$  apartment is vacant during the year:

Apartment	Month											
	1	2	3	4	5	6	7	8	9	10	11	12
1	V											
2			V									
3			V	V	V	V	V	V				
4										V	V	
5		V	V									
6										V		
7									V			
8	V	V										
9				V	V							
10							V					
total vacant units in month	2	2	3	2	2	1	2	1	1	2	1	0
monthly vacancy rate	.10	.10	.15	.10	.10	.05	.10	.05	.05	.10	.05	0

Average vacancy rate for year  $t=0.079$

In the above chart, the V's represent the months that the  $i^{\text{th}}$  rental unit is vacant. If we compute the average duration of vacancy in months, then the  $\sum_i M_{vit}/V_t = 19/10 = 1.9$  months. Recall the formula in the text indicated that the average vacancy rate for year  $t = (\text{incidence in year } t) * (\text{average fraction of the year } t \text{ spent in vacant status})$ . Using this formula,  $0.079 = (0.50) * (\text{duration of vacancy in fraction of year } t)$ ; duration equals 0.158 of a year or 1.9 months.