

# **Determinants of Rental Rates in Major Cities in the United States**

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## **Abstract:**

The focus of this paper is to determine variables that contribute to rental rate pricing. Using U.S. Census data pertaining to all cities in the United States with populations over 100,000 in 2005, this paper furthers a study of inter-city rent determinants within New York City provided by Marco (2008) using additional variables provided by Gilderbloom and Pan (2002) in their inter-city study. This report studies the impact of variables, including vacancy rates, median family income, population growth rate, and average housing costs. The population variable will be manipulated so that it represents density, which provides an accurate representation of each city.

JEL Classification: R21, R32

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## 1.0 INTRODUCTION

The markets for real estate and rental units are considered to be two of the most difficult to analyze. No two properties of real estate are the same. Without standardization, each property is considered to be unique and thus is priced differently. Synonymous with this idea is the fact that there are a multitude of variables that can influence real estate and rental rates. One important facet of this phenomenon that often gets overlooked is the fact that cities of different sizes have importance on different variables. For example, where a city such as New York may have rates dependent on income, rates in Houston may tend to look at population density when establishing prices.

Many economists have set out to determine factors that contribute to rental rate fluctuations. Some economists, such as Hansen (1996) believe that income is a factor when looking at rental rate fluctuations between different areas. Wilson and Frew (2007) are strong supporters of population rates having an impact on rental rates within cities. Gallin (2008) noted that housing prices can be an indicator of rental rates since they are related in many aspects. Economists such as Gilderbloom and Appelbaum (1988) even attributed changes in climate to rental rate fluctuation. The variables pertaining to rental rate fluctuations are vast, but have rarely been evaluated on a national scale.

This study aims to enhance understanding in the real estate rental market by furthering the studies performed by Marco (2008) so that the model used can be adapted to cities of different sizes within the United States. By using United States Census Bureau data from 2005, cities with populations over 100,000 inhabitants will be analyzed. A total of 242 cities around the United States are analyzed in this study, which gives a decent representation of the country as a whole. The focus of this paper will be on average monthly apartment rental rates (dependent variable) and how crime rates, average apartment size, household income, number of units within the city, poverty rates, population density, and real estate purchase value (independent variables) impact the fluctuations that occur in the real estate rental market. By using the newly adapted model, determinants of rental rates in the United States will be discovered.

From a policy perspective, this analysis is important because it gives policymakers the ability to influence the real estate market, which could be beneficial in times of crisis when real estate prices are unaffordable. This area of study is very limited in terms of true statistical data and

is heavily reliant on theoretical assumptions. By having clear evidence of rental rate determinants, policymakers will be able to analyze trends in local economies and enact regulation that can stabilize this often shaky market.

This paper was guided by three research objectives that differ from other studies: First it provides a statistical approach to uncovering determinants of rental rates. Normal analysis tends to be hypothetical with a small basis of support. Second, it expands on previous studies by using data that is more representative of the United States rental market. Finally, this analysis can be used to control rental rates within the United States.

The rest of the paper is organized as follows: Section 2 gives a brief literature review. Section 3 outlines the empirical model. Data and estimation methodology are discussed in section 4. Finally, section 5 presents and discusses the empirical results. This is followed by a conclusion in section 6.

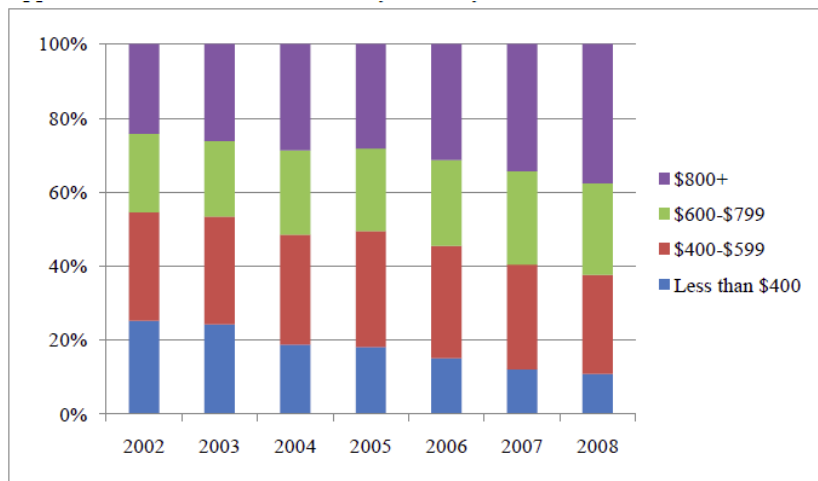
## **2.0 TRENDS**

Since 2000, renters have been paying 50% more of their real income in order to rent. Figure 1 shows that rates have steadily become more expensive. From mid 2008 to late 2009, the percentage of vacant rental units with rents of \$1,500 or more increased from 7.6% to 9.3%. Furthermore, the percentage of vacant rental units with rate less than \$400 fell from 10.8% to 9.3%. The JCHS noted this increase in price has been associated with the addition of “excess single-family homes, condos, and vacation homes for rent (that) are generally higher-quality units that provide little relief to the large and growing number of low-income renters who to struggle to afford even marginal housing” (Collinson, 2010). In sum, rental units are becoming of higher quality, which makes it harder for those who cannot afford monthly housing payments to rent housing units.

Since 1971, the rental vacancy rates in the United States have slowly increased as well. Measurements from 1977 show that vacancy rates for one unit rentals were at an all-time low at a mere 3.5%. Since then, the vacancy on these units has increased to about 10% in 2009. This contradicts regular supply and demand characteristics. Normally, an increase in the supply of rental units would cause prices to decrease, which is the opposite of what is occurring now. Figure 2 shows the increase in these 1-unit rentals, as well as similar increases in 2 and 3-unit rentals.

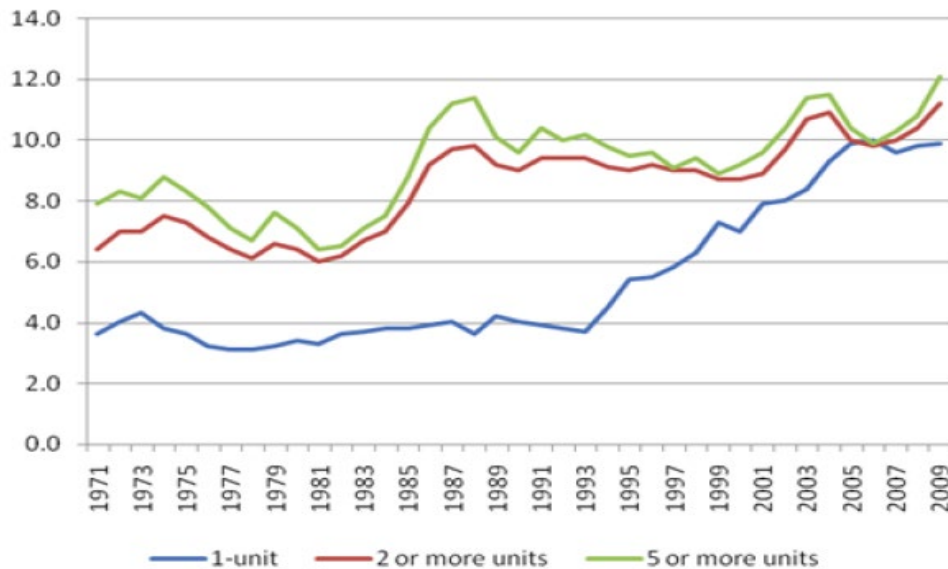
(Collinson, 2010) This graph furthers the assumption that rental units are increasing in price due to their increased quality, which limits those unable to afford the higher payments.

**Figure 1: Vacant Units for Rent by Monthly Rent**



Source: U.S. Housing Vacancy Survey

**Figure 2: Rental Vacancy Rate 1970-2009**

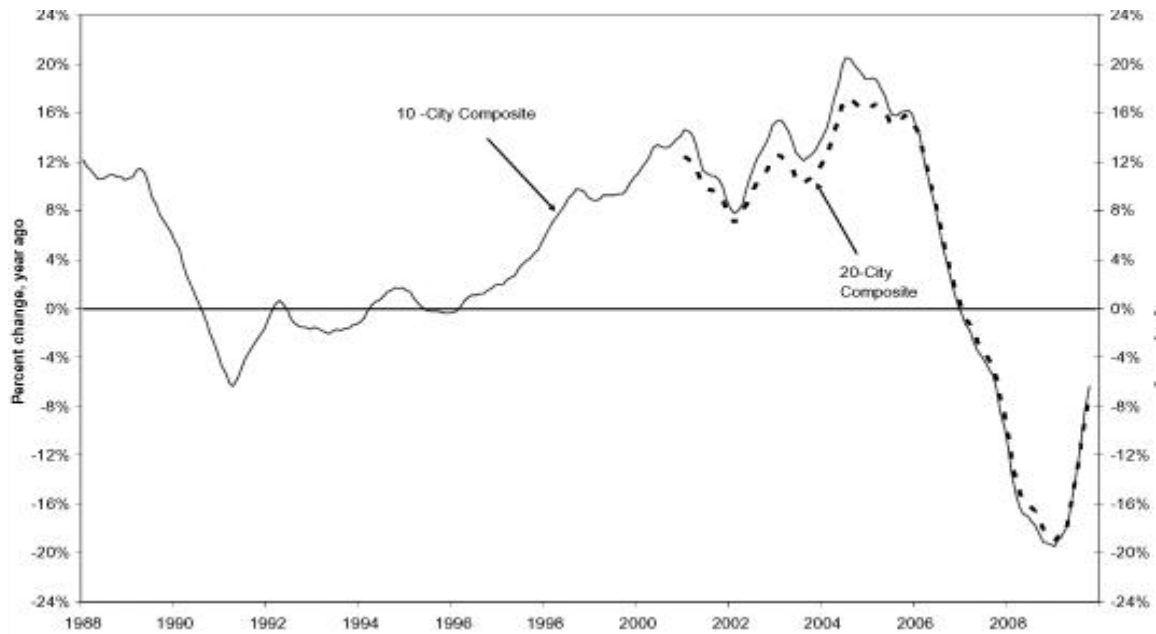


Source: US Census Housing Vacancy Survey

Furthermore, data from the Current Population Survey (CPS) show that overall, the average household size increased by 0.4% from March 2008 to March 2009. This is viewed as an alternative to paying high rental rates, though it is found that the data was not statistically relevant in terms of rental rate determination. (Bureau, 2009)

The housing bubble and subsequent financial collapse in the United States has caused great volatility in the housing market. Figure 3 shows the average housing prices in the United States as conjugated by the S&P/Case-Shiller Home Price Index. The index measures the residential housing market, tracking changes in the value of the residential real estate market in 20 metropolitan regions across the United States. Since 1995, there has been a positive increase in the average prices of houses, even after economic shocks in 2001 and 2003. The “housing bubble” burst in late 2004, which eventually led to a steep decrease in housing prices. Between 2006 and 2008, housing prices decreased by an average of 25%. However, housing prices are climbing almost as rapidly as they fell. (S&P, 2010)

**Figure 3: S&P Case-Shiller Home Price Indices (October 2009)**



*Source: S&P Case-Shiller Home Price Indices*

## 2.1 LITERATURE REVIEW

Economists have offered a multitude of variables that have been contributed to rental rate fluctuations. Through extensive empirical research, three main groups of variables have been attributed to rental rate changes. Simple supply and demand criteria cannot explain the disparities in rental rates. Large cities such as New York have high wages and many attractions, yet different parts of the city have different rental rates. In order to grasp a true idea of the determinants of rental rates, many other variables have to be considered, such as income, population, locations, physical characteristics, demographics, and market influences.

Many economists attribute rent fluctuations with changes in income. For example, it has been determined through elasticity studies that cities whose inhabitants had higher incomes often paid higher rental rates (Hansen et al, 1996). To further this claim, Ogur (1973) also mentioned that cities with college campuses often had higher rental rates. Ogur assumed that the individuals attending college who could afford rental units had higher incomes as well. Ogur noted that cities that are focused on manufacturing, such as Detroit have lower rental rates compared to cities focused in other industries that are less laborious. These industries have generally produced higher incomes as well.

Population characteristics also have had a significant impact on rent. Wilson and Frew (2007) touched upon population density, noting that cities that are more densely populated often are associated with higher rental rates. They also noted that cities with higher yields to growth rates often resulted in higher percentage growths in rental rates as well. As more people are in cities, the demand for housing increases. Malpezzi and Ozanne (1987) viewed that houses with more people living per room often paid less for housing, which shows a trend of compensation. Rather than paying higher rent, renters have opted to live in tighter housing arrangements.

Many economists have stressed location as a factor to rental rates as well. A study by Asabere and Huffman (1996) noted that apartments closer to transportation arteries (i.e. Subways, bus stations, taxi routes) are associated with higher rent. The rationale behind this claim is that inhabitants who are renting often do not have their own form of transportation and are willing to pay more rent to offset the time and energy spent traveling. Furthermore, Gallin (2008) stated that houses farther from the central part of the city often charged less for living space. He also mentioned that locations with declines in neighborhood quality actually attributed to higher rental

rates. Smith and Belloit (1987) counter this claim with their study, which concluded that poor neighborhoods naturally charged less money for its inhabitants to live there. They also noted that apartments that were located in areas of inconvenience, such as near hospitals or around sewerage centers, charge less from their inhabitants. Finally, Gilderbloom and Appelbaum (1988) attributed areas with warm climates likely to have expensive rent.

Many economists have attributed demographic statistics as reasons for rental rate changes. Gilderbloom and Appelbaum (1988) attributed diversity as a reason for rental rate changes. They found that places with a high percentage of non-whites were more likely to have lower rental rates than areas with white inhabitants. Age was also a factor and was noted Sirmans and Benjamin (1990). As tenants grew older, their landlords often reduced the real rental rates.

Market influences have also been a factor in setting rental rates. Marshall and Guasch (1987) studied that lower rental rates have been attributed to discounts set forth by the owner. These have been done as incentives for renters who have been favored by the landlord as a way to keep good tenants around longer. Taxes have also been a factor in rental rates, with higher taxes being attributed to higher rent. If there is a lease agreement however, rental rates are negatively affected, since renters are the ones who pay the taxes. Another study concluded that rent is attributed by the number of days that the apartment is on the market as well as the number of properties listed by a given real estate agent. (Palmon, et al. 2009) The prices of houses have also been a factor in deciding market rent. As documented by Gallin (2008), an increase in housing prices is synonymous with increases in rental rates.

Finally, physical characteristics have been a major determinant of apartment rates and are often considered to be the deciding factor by renters. Almost all economists can agree that the more bedrooms within an apartment, the more likely the apartment will cost. They also agree that an apartment with more amenities (i.e. newer kitchen, access to a gymnasium, better views) is a strong contributor to higher rental rates.



### 3.0 DATA AND EMPIRICAL METHODOLOGY

#### 3.1 Definition of variables

$$\text{Model:} \quad \text{RENT} = \alpha + \beta (\text{CRIME}) + \beta (\text{HSIZE}) + \beta (\text{INCOME}) + \beta (\text{UNITS}) + \beta (\text{POV}) + \beta (\text{COST}) + \beta (\text{POPD}) + \mathbf{E}$$

The endogenous variable used in the regression analysis is RENT, which is the median monthly rent in each city. The median housing rent is used because it eliminates the possibility of having a false representation due to outliers in the data (i.e. Units that are rent free, rent-controlled units). Independent variables consist of eight variables obtained from various sources.

Appendix A and B provide data source, acronyms, descriptions, expected signs, and justifications for using the variables. HSIZE (average household size) represents the number of people living within each rental unit and is a measure of density. CRIME (felony crime rate) is a measure of the average number of violent and property crimes within a year. Third, INCOME (mean household income) is a measure of the total money generated by tenants living within a household. UNITS (number of units) represent the number of rent-occupied units in a given area and are a measure of total rental units available. This number is a good representation because there is a natural rate of non-occupied units that are consistent with all areas. POV (poverty rate) measures the percentage of individuals below the poverty line of \$20,000 (in terms of income). COST (average household cost) represents the average cost that houses in the area cost. POPD (population density) measures the number of people living within a square mile. There is also a variable dedicated to errors in the data (**E**) as well as a variable which considers other factors not mentioned in the regression analysis ( **$\alpha$** ).

#### 3.2 Data

The data was taken from the 2005 demographic survey performed by the United States Census Bureau. Crime rates were taken from ratings provided by the Federal Bureau of Investigation and are from 2005. Both pieces of data are taken at a single point in time. The cities used in the data were selected because their total populations were higher than 100,000 inhabitants. Summary statistics are provided in Table 1 (next page).

**Table 1: Summary Statistics**

	RENT	POV	POP	INCOME	HSIZE	CRIME	COST	UNITS
Mean	800.3512	16.56644	4459.389	44875.94	2.624835	5366.721	252857.4	64389.06
Median	742.0000	16.10441	3506.077	42304.00	2.500000	5538.974	187600.0	32203.00
Maximum	1528.000	42.63307	26847.77	93338.00	4.390000	13458.77	726700.0	2023924.
Minimum	496.0000	2.469904	44.97964	24105.00	1.990000	0.000000	60800.00	9001.000
Std. Dev.	208.2573	6.910374	3416.784	13070.92	0.425047	2283.414	175860.5	155029.0

#### **4.0 EMPIRICAL RESULTS**

Tables 2 & 3 outline the empirical results of the regression analysis, which analyzed 242 cities in total. Overall, the results of the analysis are very interesting. Of the seven variables used within the analysis, five of them were linked to changes in rental rates in major cities in the United States. Furthermore, the data follows a close trend with an R-squared of .85, proving that the trends witnessed in the results are highly likely. There are four variables considered to be true determinants of rental rates, though the last variable is not as strong as the others. The true determinants, as proven by this model, are population density, average household income, median housing costs, and number of units available for rent. The next two variables, poverty rate and average household size, are considered to be determinants of rental rates, though their strength is not as high. This may be a cause of underlying variables manipulating the validity of the variable. Finally, it is determined that crime rates are not a factor pertaining to fluctuations in rental rates and can be discarded from the results of this model.

Income seems to be a catalyst to fluctuations in rental rates, as well as housing costs. For every thousand dollars that income increases, the data shows that rental rates increase by seven dollars. The reasoning behind this proves previous results found by Hansen (1996). The possible rationale behind this relation is that individuals who work in the city often earn higher incomes. As individuals have higher incomes, they are willing to pay more for their rent. As with regular economic principles, scarce resources (in this case, rental units) will go to the highest bidder. This trend results in higher rental rates in areas where the population has higher incomes. This is similar to housing costs. For every one hundred thousand dollar increase in housing costs, rental rates

increase by an average of fifty six dollars. In sum, as income increases, the cost of living increases as well. In this case, rental rates and housing costs are part of the cost of living.

**Table 2: Results of Regression Analysis**

	Coefficient	Std. Error	t-Statistic	Prob.
POV	2.662854	1.321564	2.014926	0.0453
POP	0.008005	0.001860	4.302937	0.0000
INCOME	0.007542	0.001001	7.530600	0.0000
HSIZE	23.48109	12.11176	1.938702	0.0540
CRIME	-0.000665	0.002401	-0.276886	0.7822
COST	0.000567	4.85E-05	11.69108	0.0000
UNITS	-8.73E-05	3.34E-05	-2.618233	0.0095
C	176.2784	66.19364	2.663072	0.0084

**Table 3: Additional Information**

R-squared	0.859180	Mean dependent var	754.3122
Adjusted R-squared	0.854176	S.D. dependent var	167.8605
S.E. of regression	64.10079	Akaike info criterion	11.19703
Sum squared resid	809455.4	Schwarz criterion	11.32671
Log likelihood	-1139.696	Hannan-Quinn criter.	11.24948
F-statistic	171.7063	Durbin-Watson stat	1.636776

Another important determinant of rental rates is population density. In sum, when population density increases by one hundred per each square mile, the average rental rate will increase by a little less than a dollar (\$.80). Though this change is minimal, it explains why dense areas such as New York City pay higher rental rates than less dense areas such as neighboring Newark, NJ. A higher population density equals to a higher demand in housing. As demand for a product increases, prices often follow suit. For this reason, higher rental rates are associated with higher population densities.

It is not very surprising that an increase in the number of units available is synonymous with a negative rental rate. As the supply of rental units increases, individuals are more likely to

pay less money since the item in question is viewed as being less valuable. However, it is important to note that rental rates are highly sluggish to small changes in the number of vacant units as seen by a minimal change in rental rates when the number of housing units fluctuates. This determinant is only useful for comparing cities with extremely different rental vacancy numbers.

There are two variables that are not entirely linked to changes in rental rates and probably have underlying factors that need to be determined to prove a more accurate result. One of the variables used is poverty rates. Regardless, a percentage increase in poverty rate has such a minimal impact on rental rates (A two and a half dollar increase for every percent increase). However, it can still be concluded that higher rental rates can be marginally associated with higher rates of poverty. Another variable in question is average household size. As more people live in a house, it can almost be assumed that rental rates will increase. The data used concludes that for every person added to a rental unit, rates increase by twenty three dollars. Unfortunately there is not a high degree of confidence. This variable should be further manipulated because it doesn't take into consideration the fact that the units where more people are living in may be more expensive. It does not standardize the size of a rental unit.

There is one variable that can be discarded as being a determinant of apartment rental rates, though further analysis should be used to verify the results. Crime rates were concluded to not be related to rental rates, according to the model used. Many theories exist as to why there might not be a relation. A good theory is that authorities have a tendency to forgo documenting some crimes and exaggerating the severity of others, causing fluctuations in numbers. Also, violent crimes might be a factor for fluctuations in the numbers. By looking simply at property crimes, a more representative relation may result. Apartments in areas with high property crimes are probably less willing to attract customers, and must lower their rates to stimulate business. Another representative variable must be used in confirming this assumption, however.

## 5.0 CONCLUSION

It would be impossible to quantify every single determinant of apartment rental rates. However, using U.S. Census statistics pertaining to all of the cities in the United States with populations of at least 100,000, the variables mentioned in this paper can be used as a reference for future studies. On average, the rental rate in the United States fluctuates around \$750-800. According to the results in the model, these variables manipulate this number differently. Cities with higher incomes are associated with higher rental rates, which imply that there is a positive relationship between the two variables. The same goes for increasing housing costs and population densities, which relate to increasing rates. Poverty rates also influenced the rental market with increasing percentages equaling increasing rates.

Supply side dynamics are concluded in this study as well. In terms of units available, cities with a higher number of units available in the market experienced lower rental rates on average, proving basic economic theories of supply and demand. This is also true with housing sizes, though further evidence is needed to conclude a true determinant.

There are limitations to this study, however. This study only focuses on a few variables that are common in terms of statistical analysis. The availability of the data is a factor that must be noted with dealing with this type of research. Variables such as distances from central areas in cities require more consideration and can probably be analyzed on a local level and not on a national one. In terms of the variables used, there are clear outliers in the data which may have affected the outcome of this study. Common practices such as rent control or free housing units clearly play a role in manipulating the study. It is difficult to remove these outliers when looking at the data from a national scale. Also, when dealing with data on a national scale, it is important to note that different cities will respond to variables at different intensities, though they will generally follow the same trends overall.

These results conclude that there is clearly a structure to the apartment rental market in the United States, though more research must be done to solidify classic economic theories as it pertains to this topic. As more data becomes available, economists will be able to analyze more factors that may or may not contribute to rental rate fluctuations. Trends in the rental market will be quantitatively identified so that policymakers will be able to control this often volatile market.

Hopefully, this and any successive research can be used to implement practices that will control market prices and reduce pricing burdens to both buyers and landlords.

## 6.0 APPENDIXES

### Appendix A: Variable Description and Data Source

Acronym	Description	Data source
CRIME	Felony Crime Rate (violent crimes + property crimes)	Federal Bureau of Investigation – 2005
HSIZE	Average Household Size	United States Census Bureau – 2005
INCOME	Mean Household Income	United States Census Bureau – 2005
UNITS	Number of rent-occupied units	United States Census Bureau – 2005
POV	Poverty Rate	United States Census Bureau – 2005
COST	Median House Value	United States Census Bureau – 2005
POPD	Population Density	United States Census Bureau – 2005 (Calculated)
A	Constant	-----
E	Error	-----

### Appendix B: Variable Description and Expected Signs

Acronym	What it captures	Expected sign
CRIME	The amount of crime that occurs in the area in a given year.	-
HSIZE	The average housing size in apartments. This looks at whether or not the number of people living within an apartment affects rates.	+
INCOME	Changes in income and its effect on changes in rental rates	+
UNITS	Supply-side economics and its relation to rental rates	-
POV	Poverty levels and its relation to rental rates.	-
COST	Housing prices in the area.	+
POPD	The effects of overcrowding on rental rates	+

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