

University of Wisconsin-Whitewater, Department of Economics

AND



## **FISCAL AND ECONOMIC RESEARCH CENTER**

# **UNIVERSITY OF WISCONSIN-WHITEWATER**

## **STUDENT OFF-CAMPUS HOUSING SURVEY**

by

Russell D. Kashian, Ph.D.

Fiscal and Economic Research Center  
University of Wisconsin-Whitewater  
800 W. Main Street, Carlson 4003  
Whitewater, WI 53190

June 2009

Staff Paper 09.3

## Contributors

**Principle Researcher**  
Russell Kashian, Ph.D.

**Data Administration and Auditing**  
Christie Kornhoff, Academic Department Associate

**Data Collection and Entry**  
Paige Peterson

**Research Associate, Coordination, & Editing**  
Joseph D. Carroll Jr.

**Report Preparation**  
Joseph D. Carroll Jr.  
Justin Kasper

**Focus Group Coordinator**  
Ronald (Bud) Gayhart

## **CONTENTS**

Introduction.....	4
Executive Summary.....	4
Student Housing Survey Results .....	5
Estimating Rental Demand .....	12
Data Collection and Analysis.....	14
Conclusion .....	20
References.....	21
Appendix A, Technical Report.....	23
Appendix B, Additional Tables.....	24

## **INTRODUCTION: Off-Campus Student Housing Survey**

The City of Whitewater Off-Campus Student Housing Survey was designed to gather information from current students who live both on and off campus to help assess the student's view of student housing. The survey questionnaire was designed by the University of Wisconsin-Whitewater's Center for Fiscal and Economic Research, with input from the Whitewater Student Government, the University of Wisconsin-Whitewater, and the City of Whitewater. The study was also financed by these three groups. Survey sponsors were interested in the determinants of demand for student rental property offered through landlords of off-campus student housing. Understanding students' views of demand and utilization is considered critical for planning continual housing issues in the City of Whitewater.

Rental housing and apartments have long comprised an important component of UW-Whitewater students' off-campus living conditions. What leads these students into choosing which housing option they will pursue becomes a critical tool in guiding the spatial direction student housing takes in the City of Whitewater.

To better understand the attributes that determine a UW-Whitewater students' off-campus housing decision, the Fiscal and Economic Research Center located in the University of Wisconsin-Whitewater College of Business and Economics, has conducted a survey to addresses some of the important factors concerning the determinants of rent. Approximately 10,000 UW-Whitewater students were emailed the survey with a letter describing its importance. From this pool, 543 students completed the survey. This resulted

in a response rate just under six percent. The survey sponsors were interested in the students housing decision and which factors led them to make their decision. Conclusions drawn from the results of the survey address the areas of rental demand determination.

This paper examines the economic determinants that lead UW-Whitewater students into making off-campus housing decisions. The intent is to provide an opportunity to develop a demand curve for student housing and determine the significant variables in UW-Whitewater students' rent making decision. The research that the Fiscal and Economic Research Center has explored will establish the relationship between several groups of factors that determine UW-Whitewater students' willingness to pay for off-campus housing.

## **Executive Summary**

The Executive Summary focuses on a few of the major issues that will be later explored in the Off-Campus Student Housing Survey Analysis. This report is comprised two major sections. The first section deals with the current and future off-campus housing residents. The second looks at these issues by regressing the rent paid against the determinants of rent. To a limited degree, these approaches help identify, in regards to off-campus housing, the wants and needs of students at the University of Wisconsin Whitewater. This executive summary identifies the current state of the housing demand and those components of demand for housing that exists.

- a. The majority of respondents live between one and two blocks away from campus. This suggests that off-campus students prefer to live at a close proximity to campus.
- b. The average amount paid in annual rent by a UW-Whitewater student is variable due to inconsistent factors of demand.
- c. The most popular type of off-campus housing is a designed multiple dwelling

- structure. This includes all respondents, regardless of primary residence location.
- d. A majority of property owners include some utility costs within their lease contracts with the tenants.
  - e. Parking is a major issue for both on-campus and off-campus residents at UW-Whitewater. A majority of off-campus

The Student Housing Rent Survey also focuses on issues for next year's off-campus housing circumstances. Further analysis will show that most respondents believe that their payments for rent and utilities will be similar to this year's.

- f. Respondents agreed that knowing the landlord's reputation was a high priority in choosing their off-campus housing residence for next year. Nearly 66% of respondents agreed on this point.
- g. A majority of the respondents strongly agreed that having their own bedroom was a high priority in choosing their off-campus housing residence for next year; 65% of respondents strongly agreed on this point.
- h. The majority of respondents indicated that they anticipate paying \$3000 to \$4999 for off-campus housing next year, during the academic year. This amount reflects the current cost of rentals in Whitewater.
- i. A majority of respondents, 51%, indicated that they only saw 1 to 2 housing units before signing their lease. This suggests

housing property owners charge their residents for parking. A majority of landlords charge \$180 to \$199 annually to park in their units.

that the respondents already had an off-campus housing unit in mind based.

The third section of the Student Housing Rent Survey focuses on general information about the respondent.

- j. The primary mode of transportation to get to campus for off-campus respondents is walking. This suggests that many respondents chose off-campus housing based on the ability to walk to campus instead of having to use another mode of transportation.

The second portion of the Student Housing Rent Survey focuses on the determinants of demand for student housing in an attempt to develop a demand curve.

- k. When the survey results are evaluated with a hedonic regression, it is found that landlord reputation is not a significant component of rental demand. Early in the process, the Whitewater Student Government expressed interest in the components of demand for student housing. A focus group was conducted (headed by Ronald Gayhart of the Small Business

Development Center) to determine the components of the survey tool; this revealed the single most desired characteristic of landlords: responsiveness to repairs.

- l. A second primary concern expressed by the students was the availability of their own bedroom and the housing unit's geographical relationship to campus.

## I. Student Housing Survey Results and Descriptive Statistics

Throughout this report, questions will be evaluated in two fashions. The first is "how did the students respond in the current time frame. In essence, the question asks how much rent the respondent is currently paying. Due to the fact that 43% of the respondents currently live on-

campus, they are not included in the initial half of the survey. However, the second half of the survey asks the students about their future housing decisions. All respondents had the opportunity to answer these questions.

The initial question asked whether the students lived in on-campus housing or off-campus housing. The 57.2% who answered "yes" were then prompted to the next question. The remaining 42.8% were prompted to the later section regarding next year's housing plans.

Do you currently live in on-campus housing		
	Count	Percent
No	237	42.8%
Yes	317	57.2%

### Current Off-Campus Respondents

While the majority of UW-Whitewater students live in the City of Whitewater, the determinants of student rent also include students residing in different communities.

Do you live in the City of Whitewater		
	Count	Percent
No	92	29.5%
Yes	220	70.5%

Those students who live in the City of Whitewater tend to group themselves relatively close to campus (1 to 4 blocks away from Campus).

How many blocks from campus do you live		
	Count	Percent
1 - 2	142	64.5%
2 - 4	45	20.5%
5 +	33	15.0%

Disregarding location of primary residence, the majority of respondents live in an apartment complex.

What type of building do you currently live in		
	Count	Percent
House	43	18.1%
Duplex	41	17.3%
Apartment	153	64.6%

Disregarding location of primary residence, the majority of respondents live in housing units with 2 to 3 occupants.

How many people currently live in the rental

	Count	Percent
Live Alone	39	16.6%
1 Roommate	86	36.6%
2 Roommates	48	20.4%
3 Roommates	21	8.9%
4 Roommates	18	7.7%
5+ Roommates	23	9.8%

Disregarding location of primary residence, the majority of property owners do not include parking expenses within their lease contracts.

Is parking included at no additional charge		
	Count	Percent
No	131	54.6%
Yes	109	45.4%

Disregarding location of primary residence; there was no apparent difference in the amount paid for parking between respondents when parking was not included as part of the lease.

What is the amount you spend on parking?  
(Annual Total)

	Count	Percent
\$20 - \$99	34	26.6%
\$100 - \$179	29	22.7%
\$180 - \$199	45	35.2%
\$200+	20	15.6%

There were no respondents who did not have a lease. The most common type of lease for off-campus housing is a 12 month lease.

**What is the term of your current lease**

	<b>Count</b>	<b>Percent</b>
Monthly	9	3.8%
Semester	31	13.1%
9-Month	23	9.7%
12-Month	174	73.4%

Property owners offer two types of leases to the students. According to the respondents, semester rent payments are more common.

**How often are your lease payments**

	<b>Count</b>	<b>Percent</b>
Monthly	82	34.6%
Semester	155	65.4%
9-Month	0	0.0%
12-Month	0	0.0%

A majority of respondents do not plan to remain in the same unit for next year's residence.

**Do you plan on living in the same unit next year**

	<b>Count</b>	<b>Percent</b>
No	154	65.0%
Yes	83	35.0%

Property owners have the option to include or exclude utilities cost for their rent payments. A majority, by a slight margin, of respondents indicated that utilities are included within their rent payments.

**Are utilities included in your lease payments**

	<b>Count</b>	<b>Percent</b>
No	115	48.5%
Yes	122	51.5%

From the respondents who indicated that their utilities are included within their rent payments, we wanted to know precisely which utilities were included in their rent. A majority of respondents indicated that

electricity was not included within their rent payments.

**Is electricity included in your lease payments**

	<b>Count</b>	<b>Percent</b>
No	95	77.9%
Yes	27	22.1%

A majority of respondents indicated that water was included within their rent payments.

**Is water included in your lease payments**

	<b>Count</b>	<b>Percent</b>
No	7	5.7%
Yes	115	94.3%

A majority of respondents indicated that cable television services were not included within their rent payments.

**Is cable TV included in your lease payments**

	<b>Count</b>	<b>Percent</b>
No	96	78.7%
Yes	26	21.3%

A majority of respondents indicated that internet services were actually included within their rent payments.

**Is internet included in your lease payments**

	<b>Count</b>	<b>Percent</b>
No	36	29.5%
Yes	86	70.5%

If electricity is not included as part of the lease payments Utility cost can vary from residence to residence so it was very intriguing to find that the majority of respondents pay between \$20-39 per month for electricity use.

**How are your electric payments**

	<b>Count</b>	<b>Percent</b>
Included	35	14.8%
\$1-\$19	17	7.2%
\$20-\$39	55	23.2%
\$40-\$59	51	21.5%
\$60-\$79	31	13.1%
\$80+	48	20.3%

While the vast majority of respondents indicated that water was included within their rent payments; it is intriguing to find out that the majority who do not have water included in their rent payments have to pay between \$20-39 a month for water use.

How much are your water payments		
	Count	Percent
Included	140	59.1%
\$1-\$19	22	9.3%
\$20-\$39	46	19.4%
\$40-\$59	20	8.4%
\$60-\$79	8	3.4%
\$80+	1	0.4%

A vast majority of respondents indicated that they natural gas was included within their rent payments, but the majority who does not have natural gas included within their rent payments have to pay between \$40-59 a month to heat their unit.

How much are your natural gas payments		
	Count	Percent
Included	162	68.4%
\$1-\$19	10	4.2%
\$20-\$39	17	7.2%
\$40-\$59	25	10.5%
\$60-\$79	10	4.2%
\$80+	13	5.5%

While the majority of respondents indicated that cable television was included within their rent payments; those who do not have the cable TV included within their rent payments usually pay between \$20-39 a month for cable.

How much are your cable TV payments		
	Count	Percent
Included	89	37.6%
\$1-\$19	21	8.9%
\$20-\$39	37	15.6%
\$40-\$59	35	14.8%
\$60-\$79	29	12.2%
\$80+	26	11.0%

Most respondents indicated that internet services are actually included within their rent payments, but for those who actually do have to pay for internet pay between \$20-39 a month for internet usage.

How much are your internet payments		
	Count	Percent
Included	134	56.5%
\$1-\$19	21	8.9%
\$20-\$39	44	18.6%
\$40-\$59	29	12.2%
\$60-\$79	8	3.4%
\$80+	1	0.4%

According to respondents, a majority of them currently enjoy living in their own bedroom off-campus.

Do you have a private bedroom		
	Count	Percent
No	31	13.1%
Yes	206	86.9%

Listed in Table B.1 are the answers to the question asked respondents if certain amenities were included within their unit or within the building, in which the unit resides. Listed in Table B.2 are the answers to the question asked respondents which additional amenities were included in their lease.

## Next Years Off-Campus Respondents

The next series of questions were designed to collect data on next year's off-campus residents. The majority of respondents currently plan on living off-campus next year.

Do you plan on living off-campus next year		
	Count	Percent
No	269	48.6%
Yes	284	51.4%

From the respondents who indicated that they plan on living off-campus next year a majority

have actually signed the lease for the unit they plan on living in next year.

Do you plan on living off-campus next year		
	Count	Percent
No	90	31.7%
Yes	194	68.3%

The following series of questions prompts respondents into indicating what were some of the major influences in choosing off-campus housing for next year. In making a decision to live off-campus a majority of respondents indicated that they strongly agree that having their own bedroom was a major factor in deciding what unit they would live in.

Having your own bedroom is a high priority for choosing off-campus housing next year

	Count	Percent
Strongly Disagree	15	5.3%
Disagree	9	3.2%
Neutral	37	13.0%
Agree	39	13.7%
Strongly Agree	184	64.8%

A majority of respondents agree on the amount they would have to pay in rent for a housing unit next year was a major factor in their decision to choose the unit in which they will live in.

Amount paid in rent is a high priority for choosing off-campus housing next year

	Count	Percent
Strongly Disagree	23	8.1%
Disagree	18	6.3%
Neutral	55	19.3%
Agree	100	35.1%
Strongly Agree	89	31.2%

The majority of respondents strongly agree that knowing the property owner's reputation was a major factor in choosing what off-campus housing unit they would reside in next year.

Landlord reputation is a high priority for choosing off-campus housing next year

	Count	Percent
Strongly Disagree	23	8.1%
Disagree	18	6.3%
Neutral	55	19.3%
Agree	100	35.1%
Strongly Agree	89	31.2%

The majority of respondents strongly agreed that the distance their future housing unit is to campus is a major factor in choosing which housing unit they would reside in next year.

Proximity to campus is a high priority for choosing off-campus housing next year

	Count	Percent
Strongly Disagree	27	9.5%
Disagree	19	6.7%
Neutral	43	15.1%
Agree	89	31.3%
Strongly Agree	106	37.3%

The availability for parking their vehicles was a strongly agreed upon by respondents as a majority reason for choosing their off-campus housing unit for next year.

Parking availability is a high priority for choosing off-campus housing next year

	Count	Percent
Strongly Disagree	13	5.8%
Disagree	13	5.8%
Neutral	38	17.0%
Agree	19	8.5%
Strongly Agree	141	62.9%

The distance to restaurants and downtown bars was strongly agreed upon by a majority of respondents as a factor in making their off-campus housing decision for next year.

Proximity to downtown restaurants is a high priority for choosing off-campus housing next year

	<b>Count</b>	<b>Percent</b>
Strongly Disagree	19	6.7%
Disagree	29	10.2%
Neutral	79	27.8%
Agree	76	26.8%
Strongly Agree	81	28.5%

From the respondents who indicated that they did sign a lease for next year the majority of respondents indicated that they signed a yearlong lease for their unit.

What is your lease term for next year

	<b>Count</b>	<b>Percent</b>
Monthly	9	5.3%
Semester	15	8.8%
9-Month	11	6.4%
12-Month	136	79.5%

The majority of respondents plan to make rent payments by semester next year for their unit.

How often are your lease payments next year

	<b>Count</b>	<b>Percent</b>
Monthly	92	38.0%
Semester	145	59.9%
9-Month	0	0.0%
12-Month	5	2.1%

The average lease payment according to a majority of respondents next year will be between \$3000-4999.

How much is your total academic year lease payment

	<b>Count</b>	<b>Percent</b>
\$0-\$2,999	14	5.8%
\$3,000-\$4,999	148	61.2%
\$5,000-\$6,999	63	26.0%
\$7,000+	17	7.0%

The next question asks respondents which utilities are included within their rent payments for next year.

What utilities are included in next year's lease

	No	%	Yes	%
Electric	206	85	36	15
Water	115	48	127	52
Natural Gas	131	54	111	46
Cable Television	199	82	43	18
Internet	141	58	101	42

Respondents indicated by majority that electricity will be included next year within their rent payments, but for those who have to pay for electricity the majority will pay between \$20-39 a month for electricity.

What do you anticipate to pay for electricity next year

	<b>Count</b>	<b>Percent</b>
Included	51	21.1%
\$1-\$19	11	4.5%
\$20-\$39	68	28.1%
\$40-\$59	44	18.2%
\$60-\$79	17	7.0%
\$80+	51	21.1%

Next year the a majority of respondents indicated that water was included within their rent payments, but for those who have to pay for water the majority will pay between \$20-39 a month for water usage.

What do you anticipate to pay for water next year

	<b>Count</b>	<b>Percent</b>
Included	141	58.3%
\$1-\$19	7	2.9%
\$20-\$39	38	15.7%
\$40-\$59	34	14.0%
\$60-\$79	13	5.4%
\$80+	9	3.7%

According to respondents, next year their lease payments will contain natural gas usage, but for those who still have to pay the majority will pay between \$20-39 a month to heat their unit.

**What do you anticipate to pay for natural gas next year**

	<b>Count</b>	<b>Percent</b>
Included	164	67.8%
\$1-\$19	6	2.5%
\$20-\$39	28	11.6%
\$40-\$59	23	9.5%
\$60-\$79	9	3.7%
\$80+	12	5.0%

The majority of respondents indicated that next year cable television will be contained within their lease payments, but for those who have to pay the majority indicated that they will pay between \$80 and above for cable television next year.

**What do you anticipate to pay for cable TV next year**

	<b>Count</b>	<b>Percent</b>
Included	99	40.9%
\$1-\$19	13	5.4%
\$20-\$39	29	12.0%
\$40-\$59	37	15.3%
\$60-\$79	18	7.4%
\$80+	46	19.0%

According to respondents, the majority have internet included within their rent payments, but for those who still have to pay they anticipate it costing them between \$20-39 a month for internet usage.

**What do you anticipate to pay for internet next year**

	<b>Count</b>	<b>Percent</b>
Included	129	53.3%
\$1-\$19	15	6.2%
\$20-\$39	39	16.1%
\$40-\$59	26	10.7%
\$60-\$79	8	3.3%
\$80+	25	10.3%

Respondents indicated that the amount they will pay for parking is included already within their lease payments, but for those who have to

pay, the majority anticipates it costing between \$60-79 per semester next year.

**What do you anticipate to pay for parking next year**

	<b>Count</b>	<b>Percent</b>
Included	165	68.2%
\$1-\$19	0	0.0%
\$20-\$39	8	3.3%
\$40-\$59	10	4.1%
\$60-\$79	46	19.0%
\$80+	13	5.4%

The majority of respondents indicated they will be living by themselves or with an additional person next year.

**How many occupants will be living in the unit next year?**

	<b>Count</b>	<b>Percent</b>
1-2 Persons	120	49.6%
3-4 Persons	85	35.1%
5-6 Persons	27	11.2%
7 + Persons	10	4.1%

The majority of respondents indicated that they visited just one or two housing units before signing their lease for next year.

**How many housing units did you visit before signing your lease for next year**

	<b>Count</b>	<b>Percent</b>
1-2 Units	124	51.9%
3-4 Units	65	27.2%
5-6 Units	35	14.6%
7 + Units	15	6.3%

## **General Information for Respondents**

The primary mode of transportation according to the respondents is walking to campus.

**What is your primary mode of transportation to campus**

	<b>Count</b>	<b>Percent</b>
Walk	198	69.7%
Bicycle	8	2.8%
Vehicle	78	27.5%

Many of the off-campus respondents currently do not have on-campus parking permits.

Do you currently have an on-campus parking permit

	<i>Count</i>	<i>Percent</i>
No	176	62.0%
Yes	108	38.0%

The majority of respondents indicated that they expected to earn or actual earn an annual income for 2008 between \$0-5999.

What was your total annual income for 2008

	<i>Count</i>	<i>Percent</i>
\$0-\$5,999	124	51.9%
\$6,000-\$10,999	65	27.2%
\$11,000-\$15,999	35	14.6%
\$16,000+	15	6.3%

The majority of respondents indicated that they did not receive any funding in the form of grants for 2008-2009 school year.

How much did you receive in grants for 2008-2009

	<i>Count</i>	<i>Percent</i>
\$0	211	74.3%
\$1-\$3,999	46	16.2%
\$4,000-\$6,999	16	5.6%
\$7,000+	11	3.9%

The majority of respondents did not receive any financial aid for 2008-2009 school year.

How much did you receive in financial aid for 2008-2009

	<i>Count</i>	<i>Percent</i>
\$0	151	53.2%
\$1-\$3,999	39	13.7%
\$4,000-\$6,999	41	14.4%
\$7,000+	53	18.7%

The majority of respondents indicated that they did not take out student loans to help pay for the 2008-2009 semester.

How much did you receive in student loans for 2008-2009

	<i>Count</i>	<i>Percent</i>
\$0	157	55.3%
\$1-\$3,999	28	9.9%
\$4,000-\$6,999	53	18.7%
\$7,000+	46	16.2%

The majority of respondents are not interested in participating in an off-campus focus group.

Are you interested in participating in an off-campus focus group

	<i>Count</i>	<i>Percent</i>
No	235	82.7%
Yes	49	17.3%

## II. Estimating the Rental Demand Function for Off-Campus College Housing in Whitewater Wisconsin: A Hedonic Analysis

Provided an emphasis on homeownership, it is not surprising that the research regarding the variation in apartment rents is limited relative to the vast literature on the price of single family housing. However, in light of the recent turmoil in the single family market and the movement away from home ownership, research into apartment rents may become more relevant. This paper combines this relevance in timing with the timeless relevance of off-campus housing, a product that exists in a segmented market. In regards to location, off-campus housing research retains some fondness to the idea of land pricing in the monocentric city. In Von Thunen's monocentric model of land prices, land closest to the city center has the highest value. This paper seeks to substitute the traditional city center with a student renter/campus relationship.

With urban sprawl and the demise of the "city center", urban congestion, failures in public education and crime have led to a diminution of the idea of the monocentric city and its realistic relevance in the United States. However, by using a student housing demand

function, locational models can look at this niche markets in which distance from a central market can have an impact on the value of housing.

To explain the determination of this demand function regarding the market rent paid by student's for off-campus housing, this paper will rely on a hedonic analysis. While there is limited research regarding student housing, there is some sociological research that focuses on the concentrated and non-competitive markets in student housing, there is a rich mix of research in single family housing as well as considerable interest in rental housing. As a result, this paper recognizes that the literature examines market rent according to the ideas of amenities, locational factors, lease terms, and the characteristics of the tenants. The rental market literature is well documented in Sirmans and Benjamin (1991). While this analysis is somewhat dated, recent literature expands upon the historic concepts by exploring specific markets. For example, Benjamin, Chinloy, and Sirmans (2000) use many of these ingredients to determine the return to accepting subsidized tenants using housing vouchers.

In addition to building upon the research regarding rental housing, this research contributes to the literature by examining off-campus student housing according to hedonic and spatial techniques. While, location has always been an important determinant of a property's value, it is extremely critical when relating to students in a small college town, where mass transit is non-existent. As noted earlier, while lacking the econometric techniques present in much of the hedonic analysis, the related literature in student housing analysis comes out of the historic sociological literature developed in Great Britain. In those studies, student housing is considered a niche market such that the supply of which has been adapted to meet the specific needs of the student population. This niche market research has been explored in Manchester and Edinburgh as covered by Rugg, et al (2002). Rugg et al (2002) and

Christie, et al subsequently expanded this research. This literature, while comprehensive in regards to explaining the impact of concentrated but steady student housing, did not explain the attributes of housing demanded by students.

This primary goal of this paper is to accomplish the task of identifying these attributes and challenges with recognition of the existence of student housing as a niche market. It seeks to build upon early work conducted by Ogur (1973) and Jaffe and Bussa (1975) which focused on apartment rents in markets influenced by the demand for off-campus housing. The issue of submarkets was then further explored by MT Allen, TM Springer, NG Waller (1995). However, the academic literature exploring this submarket is limited. As a result, the historic methods of modeling and analysis come from the general theory of hedonic analysis and the remaining research into apartment rents.

## Literature Review

The literature for housing argues that a given housing unit is best characterized as a bundle of attributes which describe the structure itself, the land upon which it is built, and the relevant locational characteristics. Claims of valuation comparisons which ignore the differences between these units ignore the unique bundle of attributes. Since rental housing is a heterogeneous product, with apartments, houses, duplexes and other types of units occupying the market, it is hypothesized that these differences contribute to the variation in rents paid by students. In addition, proximity to the campus and amenities such as air-conditioning and cable television are also part of the housing bundle's attributes. At any given time, there exists a given distribution over space of the supplies of these attributes, since the housing stock alters only slowly over time and the attributes are perfectly inelastic in supply (Brown and Pollakowski, 1977).

When forming policy, hedonic analysis provides decision makers the ability to explore

the implicit prices of indivisible goods. While the physical environment helps guide supply issues, obtaining the demand curve requires knowledge of the prices that consumers are willing to pay. With marketed goods, prices are observable. However, since a tenant is incapable of purchasing the right to a dishwasher without renting the apartment, these amenities are nonmarketed. As a result, researchers must use other techniques to obtain the prices. One example of a nonmarketed good would be a dishwasher or central air-conditioning. Since it is almost impossible to purchase a central air-conditioning without renting an apartment, hedonic analysis extracts the contribution of the amenity to the price of the marketed good.

The effect of location and amenities on housing prices uses hedonic analysis as a technique in the study of differentiated product markets. While the concept begins prior to the Great Depression (Waugh, 1928), it evolved quickly following the work of Grillches (1971), Lancaster (1971) and Rosen (1974). Hedonic prices are the implicit prices of attributes rather than the observed prices of differentiated products. Econometrically, implicit prices are estimated by a reduced form multivariate regression model. In terms of rental housing, hedonic values are the result of a model of equilibrium housing rent differentials. This model hypothesizes that renters maximize their net utility by trading changes in price for changes in housing attributes. These attributes are varied. While the range of research regarding rental housing is limited, it can be augmented by the literature regarding single family housing.

With regards to the effect of the physical characteristics of an apartment on rents, Des Rosiers and Theriault (1994), Sirmans, et al (1990), Guntermann and Norrbin (1987), Jud and Winkler (1991), Ozanne and Malpezzi (1985), Sirmans et al. (1989), Sirmans, Sirmans and Benjamin (1990), and Smith and Belloit (1987) include factors such as number of bedrooms, number of bathrooms, characteristics of parking and utilities on the level of rent. The literature on these hedonic issues extends into the area of rental concessions, in which many of these items are provided to the tenant as an enticement on top of the amenities offered. While these variables are important, Allen, Springer and Waller (1995) argue that aggregation of submarkets create circumstances that reduce the effectiveness of hedonic analysis.

In reaction to this criticism, it is important to consider the issue of student housing as a niche market and include locational variables. While there is no direct research on the issue of location and the demand for student housing, there is a wealth of literature in the area of rent determination and location. Much of the literature uses neighborhood characteristics as proxies for location. These variables include such issues as crime (Benjamin, Sirmans, and Zietz, 1999), accessibility (Smith and Kroll, 1988) and (Hoch and Waddell, 1993), distance from city center, employment center and university campus (Jud and Winkler, 1991; Jaffe and Bussa, 1977; Ogur, 1973) and overall neighborhood quality (Marks, 1984). Wheaton and Nechayev (2005) looked at various rental markets to evaluate their locational effects on rent.

## Data Collection and Analysis

When first creating the model for the determinants of off-campus rent, sample selection is a critical component. For the purposes of our model, only those who lived in Whitewater and paid rent were included in the model. Thus, this eliminated all commuters and people renting in a nontraditional fashion from their parents (based on user responses).

Once this data was collected, the dependent variable selected was monthly rent payments. Though this was not a variable

surveyed for, it was calculated based on user responses. Respondents listed aggregate rental payments based on their lease, this allowed us

to calculate what amount would be paid monthly if the lease format was change with no increase in lease total. Factoring in both semesters, and including the time over winter break, the total amount was divided by ten months. This represented the monthly amount of rent paid by the tenant. It should also be noted that the length of time the aggregate rental payments were divided by has no impact on the significance of coefficients.

When creating the model, due to multicollinearity, we were not able to use all of the variables in the same model. The models were based on student concerns from a student-based focus group on off-campus

Table-1: Variable Descriptions Model 1

Variable	Description
BlocksTCampus	Represents the number of blocks the respondent lives from campus (based on respondent interpretation)
ApartUn	The number of units that are within the same building the respondent lives in
Roommates	The number of people the respondent lives within the same rental unit
ElecInclu	Whether the respondent's Landlord pays for electricity or not
IntlInclu	Whether the respondent's Landlord pays for internet or not
PrivBed	Whether the respondent has a private bedroom or not
Dishwash	Whether the respondent has a dishwasher in their apartment or not
WashMach	Whether the respondent has a washing machine or not
Pets	Whether the respondent is allowed to have pets in their apartment or not
M2M	Whether the respondents lease agreement is on a month to month agreement or not
S2S	Whether the respondents lease agreement is on a semester to semester agreement or not
9Month	Whether the respondent has a 9 month lease agreement or not
BlockTPark	Represents the number of blocks the respondent lives from campus and whether they pay for parking or not
BlockTPark^2	Represents the rate of change in the number of blocks the respondent lives from campus and whether the respondent pays for parking or not

The  $\beta_1 - \beta_{14}$  are the estimated coefficients that measure the effect the respective independent variable has on  $RentPMT$ , where  $RentPMT$  is the calculated amount spent on rent each month by an individual. The  $\epsilon$  represents the error in the equation from measurement, omitted variables, and other

housing run by Ronald Gayhart. The first model created modeled the current amount of rent paid by a student,

$$RentPMT = \beta_0 + \beta_1 BlocksTCampus + \beta_2 ApartUn + \beta_3 Roommates + \beta_4 ElecInclu + \beta_5 IntlInclu + \beta_6 PrivBed + \beta_7 Dishwash + \beta_8 WashMach + \beta_9 Pets + \beta_{10} M2M + \beta_{11} S2S + \beta_{12} 9Month + \beta_{13} BlockTPark + \beta_{14} (BlockTPark)^2 + \epsilon$$

These variables will be collectively referred to as the independent variables and each was measured on an individual basis in the year 2009, a list of variable descriptions is in Table-1.

factors, and  $\beta_0$  represents the constant that assumes any expected value of the error term and the value of monthly rent paid if none of the variables had an effect on  $RentPMT$ . The results of the Robust Standard Errors Regression on Model 1 are listed in Table-2.

Table-2: Model 1

	Calculated Monthly Rent Payment		
	Coefficient	(S.E.)	(t)
(Constant)	356.566	(30.782)	(11.584)
Number of blocks from campus **	-10.960	(5.251)	(-2.087)
Number of apartment units in building	-1.766	(1.560)	(-1.132)
Number of roommates living with *	-7.411	(4.027)	(-1.841)
Electricity is paid by the landlord	2.634	(20.842)	(0.126)
Internet is paid by the Landlord	20.835	(16.084)	(1.295)
Have your own private bedroom ***	63.050	(18.384)	(3.430)
Dishwasher is in the apartment	-1.765	(16.562)	(-0.107)
Washing machine is in the apartment	-19.289	(13.737)	(-1.404)
Pets are allowed in the apartment	-6.889	(13.322)	(-0.517)
Lease is a month to month agreement	-7.576	(20.671)	(-0.366)
Lease is a semester to semester agreement	-22.882	(15.740)	(-1.454)
Lease is a nine month agreement	-4.157	(39.468)	(-0.105)
Blocks from campus and parking included *	-15.140	(8.664)	(-1.747)
Blocks from campus and parking included squared **	2.129	(0.903)	(2.357)

  

Fit Statistics	
R-Square	0.1403
F-Statistic [P-Value]	3.840 [0.000]

\*\*\* Coefficient is significant, with less than a 0.01 probability of a Type-I Error

\*\* Coefficient is significant, with between 0.01 and 0.05 probability of a Type-I Error

\* Coefficient is significant, with between 0.05 and 0.10 probability of a Type-I Error

The first noticeable result is that the term of the rental agreement has no significant impact on the amount of rent paid. The reference group for the results is a 12-month lease. A problem with college towns, as noted by town-and-gown, is the seasonal demand in the local economy. Therefore, it would be expected that any lease term that runs apportioned with the demand cycle would include a premium compared to a 12-month lease that will run from the end of one demand cycle to the end of the next.

On an aggregated basis, we could find no evidence that amenities such as having an in unit dishwasher, washing machines, or allowing pets has an effect on the amount of calculated monthly rent payment holding all other independent variables constant. This is surprising due to the convenience these amenities bring to the renter, and thus may

have an impact on rent for certain individuals, but not for the sample as a whole.

With the results from this sample in this model, we could find no evidence that whether the landlord paid for electricity or not or whether the landlord paid for internet or not had any effect on the amount of calculated monthly rent payment; holding all other independent variables constant. Also, whether the building the rental unit was located in had many more units or if it was just a single family home, we could find no evidence that the number of units located within the same building had an effect on the amount of calculated monthly rent payment; holding all other independent variables constant.

However, from this model you can expect your calculated monthly rent payment to decrease by \$10.96 for every block you are further away from campus; holding all other independent variables constant. Due to the

demand for access to the campus, landlords are able to use price discrimination based on the tenant's desired location to the campus. This result is significant on a 3.8% level.

From this model, we are able to interpret, for every additional roommate that you live with the expected amount of the calculated monthly rent payment would decrease by \$7.41; holding all other independent variables constant. In these situations landlords are able to amortize the amount of sunk costs for an individual apartment unit, features like kitchens and bathrooms, over a greater number of people versus one person have to bear the cost alone. This result is significant on a 6.7% level.

By far the most significant determinant of calculated monthly rental payment is whether or not the tenant has a private bedroom. If the tenant has a private bedroom, versus sharing a bedroom, you can expect the amount of calculated monthly rent to increase by \$63.05; holding all other independent variables constant. This result is significant on a 0.07% level.

Another significant determinant of rental demand is whether or not a parking space is included, however, the relationship between whether or not a parking space is included and the rental unit's proximity to campus also become a significant factor. A reaction variable between whether or not a parking space was included and the number of blocks the unit was from campus, was created. From this model, if a parking space was included in the lease, you can expect the calculated monthly rent payment to decrease by \$15.14 for every block further away from campus the unit is; holding all other independent variables constant. Thus if you lived 2 blocks from campus and had a parking space included in the lease you can expect your calculated monthly rent payment to be \$30.28 lower than someone similarly situated that does not have a parking space included. This result is significant on a 8.2% level.

However, when examining the rate of change that exists in this cost, by squaring the variable, we see that the amount the calculated

monthly rent payment decreases at a decreasing rate, until it reaches a point such that if a parking space is included in your lease, you can expect to pay more than if one was not. From this model we see that if a parking space is included you can expect the calculated monthly rent payment to increase by \$2.12 for every block squared you are from campus; holding all other independent variables constant. Thus, in actuality, if you lived the same 2 blocks from campus and had a parking space included in the lease, you can expect your calculated monthly rent payment to be \$21.76 lower than someone similarly situated that does not have a parking space included.

At approximately 7 blocks from campus, the results change. If you lived 8 blocks from campus and had a parking space included in the lease, you can expect your calculated monthly rent payment to be \$15.13 higher than someone similarly situated that does not have a parking space included. A result like this is expected, because the further you are away from campus the more you are going to demand the use of a vehicle to drive to campus. Similarly the closer you live to campus, the more you are able to walk and not have a need for a vehicle. This result is significant on a 1.9% level.

The second half of the survey was forward looking for next year. Due to the early designation of leases for the coming academic year, we were able to survey respondents about their intentions for the coming year. The second model for the coming year and the second half of the survey questions was based more on the concerns and wants of the student population than, as requested by the purveyors of the study.

$$\begin{aligned} RentPMT = & \delta_0 + \delta_1 ProxTCamp + \\ & \delta_2 Roommates + \delta_3 ElecInclu + \\ & \delta_4 IntInclu + \delta_5 PrivBed + \delta_6 UnitsVisit + \\ & \delta_7 M2M + \delta_8 S2S + \delta_9 9Month + \\ & \delta_{10} LLRep + \varepsilon. \end{aligned}$$

These variables will be collectively referred to as the independent variables and each was measured in the basis year 2009.

Table 3: Variable Descriptions Model 2

Variable	Description
ProxTCamp	Represents the importance of being close to campus for the tenant
Roommates	The number of people the respondent lives within the same rental unit
ElecInclu	Whether the respondent's Landlord pays for electricity or not
IntInclu	Whether the respondent's Landlord pays for internet or not
PrivBed	Whether the respondent has a private bedroom or not
UnitsVisit	The number of rental units visited before the tenant signed a lease
M2M	Whether the respondents lease agreement is on a month to month agreement or not
S2S	Whether the respondents lease agreement is on a semester to semester agreement or not
9Month	Whether the respondent has a 9 month lease agreement or not
LLRep	Represents the importance of the Landlords reputation when renting from them

The  $\delta_1 - \delta_{10}$  are the estimated coefficients that measure the effect the respective independent variable has on *RentPMT*, where *RentPMT* is the calculated amount spent on rent each month by an individual. The  $\epsilon$  represents the error in the equation from measurement, omitted variables, and other

factors, and  $\delta_0$  represents the constant that assumes any expected value of the error term and the value of monthly rent paid if none of the variables had an effect on *RentPMT*. The results of the Robust Standard Errors Regression on Model 2 are listed in Table-4.

Table-6: Model 2 RSE Regression

	Calculated Monthly Rent Payment		
	Coefficient	(S.E.)	(t)
(Constant)	352.332	32.78	10.748
Importance of being close to campus *	29.896	17.172	1.741
Number of roommates living with ***	-15.368	4.305	-3.570
Electricity is paid by the landlord ***	64.533	24.371	2.648
Internet is paid by the Landlord	-6.292	19.642	-0.320
Have your own private bedroom **	38.269	17.191	2.226
Number of units visited before signing lease	-2.598	4.21	-0.617
Lease is a month to month agreement ***	-72.736	26.701	-2.724
Lease is a semester to semester agreement **	-48.144	19.474	-2.472
Lease is a nine month agreement	-7.951	24.481	-0.325
Importance of Landlord reputation	12.61	18.559	0.679

  

Fit Statistics		
R-Square	0.1179	
F-Statistic [P-Value]	5.128	[0.000]

\*\*\* Coefficient is significant, with less than a 0.01 probability of a Type-I Error

\*\* Coefficient is significant, with between 0.01 and 0.05 probability of a Type-I Error

\* Coefficient is significant, with between 0.05 and 0.10 probability of a Type-I Error

For the second model, a different sample was selected than the first. The same rental requirements were used for the second model, the reason for the differences between the two groups is the natural decay from people graduating, and the entrance of current students that lived in the residence halls currently and will be living in an apartment for next year; the new incoming leasee's represent 67% of the total sample size. Several of the question in this section of the survey were likert scale questions. For reason to incorporate these questions into the regression model, the scale was change to be interpreted as 0 for not important and 1 for important. The not important level would include the statement of disagree, strongly disagree, and neutral; though these statements are not the same, the indication is that these respondents are not concerned with agreeing with the statement.

From the second model you can expect that if living close to campus is important for the tenant you can expect an increase of \$29.90 in the amount of calculate monthly rent payment, holding all other independent variables constant. As the first model established, the closer you are to campus, the greater premium you will pay. Thus if being close to campus is important to you, this will increase your willingness to pay. However, the question does not judge whether being proximate means close to campus or further away, only that this relationship matters. This result is significant on the 8.3% level.

The number of roommates that a tenant is going to live with significantly impacts the amount of calculated monthly rent payment. In this model, for each additional person you live with you can expect the amount of calculated monthly rent payment to decrease by \$15.37, holding all other independent variables constant. Thus if you and someone else were similarly situated, and the only difference between you two is that you have two more roommates than the other. Then you can expect the amount of calculate rent payment to decrease by \$30.74. This result is significant on the 0.05% level.

If the landlord pays for the electricity versus a landlord the does not, you can expect the amount of calculated monthly rent payment to increase by \$64.53, holding all other independent variables constant. This would make sense, because if the only difference between to tenants is that one has a lease agreement that includes electricity and the other does not, then the landlord has more of a cost incurred from the unit and would need to increase the amount of rent paid. This result is significant on a 0.88% level. While the electricity is a significant determinant for rent paid, we could find no evidence from this model that whether the landlord paid for internet or not had any effect on the amount of calculated monthly rent payment; holding all other independent variables constant.

Similar to the first model, if the tenant has a private bedroom, you can expect the calculated monthly rent payment to increase by \$38.27; holding all other independent variables constant. For the same reasons listed in model one, we can expect the same interpretation for private bedrooms; and thus we are able to call having a private bedroom a robust indicator between the two models. This result is significant on 2.7% level. We could find no evidence that the number of units visited before signing a lease had any impact on the calculated monthly rent payment, holding all other independent variables constant.

However, if the lease agreement was a month to month basis, you can expect to pay \$72.74 less than if it was a 12 month agreement. At the same time it should be noted that only two respondents responded that their lease agreement was on a month to month basis. Thus the sample did not collect enough variability, for this reason, even though the result is significant, we are not going to consider month to month agreements to be a determinant of calculated monthly rent payments. Nevertheless we do accurately see that if you lease is on a semester to semester basis you can expect to pay \$48.14 less than someone else similarly situated, holding all other independent variables constant. Finally,

we could find no evidence that having a 9 month lease has any affect on the calculated monthly rent payment holding all other independent variables constant.

The determinant of whether landlord reputation is a significant factor of calculated

monthly rent payments, was used in the second model, and used in the first as a forward looking model. In both circumstances we could find no evidence that landlord reputation had any effect on the calculated monthly rental payments.

## Conclusion

There are some clear patterns that emerge when we analyze the demand for student housing. In both the regression and the descriptive statistics location is paramount. One of the most interesting issues is the limited number of housing units students visit prior to their decision. The average is less than one and the mode is one. If there are any policy decisions to be made from this analysis, it could be considered helpful to require students to visit two properties prior to signing a lease. This would be the responsibility of a student housing authority. The other option would be to eliminate the use of application fees which create a “sunk cost” in the decision making process.

The other issue that is paramount is that student highly value their own bedrooms and are willing to pay for this amenity: for every additional roommate that you live with the expected amount of the calculated monthly rent payment would decrease by \$7.41. Other amenities (such as air conditioning, dishwashers, and garbage disposals), while having value to some individuals, do not rise to a statistically significant level.

Location is a very important issue for students. From the second model you can expect that if living close to campus is important for the tenant you can expect an

increase of \$29.90 in the amount of calculate monthly rent payment, holding all other independent variables constant. As the first model established, the closer you are to campus, the greater premium you will pay.

A consideration when conducting a demand based study is the recognition that current economic conditions may be driving the rent equation. Since demand curves evolve from utility curves, there may be some substitution effect and income effect in the determination of the curve. As a result, an additional study, conducted in a different economic milieu may be warranted.

## References

- Allen, M. T., et al. (1995). Implicit pricing across residential rental submarkets. *The Journal of Real Estate Finance and Economics.* 11. Pp. 137-151.
- Benjamin, J. D., et al. (1997). Security Measures and the Apartment Market, *Journal of Real Estate Research.* 14. pp. 347–58.
- Brown, G. M., Jr. and H. O. Pollockowski. (1977). Economic Value of Shoreline. *Review of Economics and Statistics,* 59. Pp. 272–78.
- Christie, H. et al. (2002). Accommodating Students. *Journal of Youth Studies,* 5, pp 209-235.
- François Des Rosiers, F and M Thériault. (1994). Implicit Prices of Rental Services: Modeling the Quebec Market, *Assessment Journal,* 1. pp 47–60.
- François Des Rosiers, F and M Thériault. (1996). Rental Amenities and the Stability of Hedonic Prices: A Comparative Analysis of Five Market Segments. *The Journal of Real Estate Research.* Pp 17-36.
- Griliches, Z. (1971). Hedonic price indexes revisited. *Price Indexes and Quality Change* (Editor). Massachusetts Harvard University Press.
- Guntermann, K. L. and S. Norrbom. (1987). Explaining the Variability of Apartment Rents, *AREUEA Journal.* 15. pp. 321–40.
- Jaffe, A. J. and R. G. Bussa. (1975). Using a Simple Model to Estimate Market Rents: A Case Study. *Appraisal Journal,* 45, pp 7–13.
- Jud, G. D. and D. T. Winkler. (1991). Location and Amenities in Determining Apartment Rents: An Integer Programming Approach. *Appraisal Journal,* 59. pp. 266–75.
- Lancaster, K. (1971). *Consumer Demand: A New Approach*, New York: Columbia University Press.
- Marks, D. 1984. The Effect of Rent Control on the Price of Rental Housing: A Hedonic Approach. *Land Economics.* 60. Pp. 81-94.
- Ogur, D. (1973). Higher Education and Housing: The Impact of Colleges and Universities on Local Rental Housing Markets. *American Journal of Economics and Sociology,* 32. pp 387–94.
- Ozanne, L. and S. Malpezzi, (1985). The Efficacy of Hedonic Estimation with the Annual Housing Survey: Evidence from the Demand Experiment. *Journal of Economic and Social Measurement.* 13. pp. 153–72.
- Rosen, S., (1974). Hedonic Prices and Implicit Markets: Product Differentiation in Pure Competition. *Journal of Political Economy,* 82. pp. 34–55.
- Rugg, J. et al. (2002). “Studying a Niche Market: UK Students and the Private

Rented Sector". *Housing Studies*, 17, pp. 289–303.

Sirmans, G. S. and J. D. Benjamin. (1991). "Determinants of Market Rent". *Journal of Real Estate Research*, 6, pp. 357–79.

Sirmans et al. (1989). Determining Apartment Rent: The Value of Amenities, Services and External Factors. *Journal of Real Estate Research*. 4. pp. 33-44.

Sirmans, G.S., et al (1990). Rental Concessions and Property Values. *Journal of Real Estate Research*, 5. pp. 141-151.

Smith, H.C. and J.D. Belloit. (1987). Real Estate Appraisal, 2<sup>nd</sup> Edition. Century VII Publishing. New York.

Smith, C. A. and M. Kroll. (1988). Improving Estimates of Potential Gross Income in Multifamily Properties through Market Research. *Appraisal Journal*. 1. Pp. 118–25.

Waddell, P., et al. (1993). Residential Property Values in a Multinodal Urban Area: New Evidence on the Implicit Price of Location. *Journal of Real Estate Finance and Economics*. 7.. pp. 177-141.

Waugh, F.V. (1928). Quality Factors Influencing Vegetable Prices. *Journal of Farm Economics*. 10. pp. 185-196.

Wheaton, W. C. and G. Nchayev. (2005). Does Location Matter? *The Journal of Portfolio Management*. 1. pp. 1-9.

## Appendix A: Technical Report

The City of Whitewater Student Housing Survey was conducted by the University of Wisconsin-Whitewater Fiscal and Economic Research Center between January, 2009 and May, 2009. Surveys were mailed to 1121 randomly selected property owners in Whitewater. Two hundred sixty nine (269) surveys were completed and returned by mail. The response rate for the survey was 23% (Table A:1.)

Table A:1 Response Rates

Completed Surveys	269	23%
Non-returned surveys	910	77%
Total	1121	100%

### Sampling Error

The City of Whitewater Student Housing Survey, like all surveys, is subject to the existence of Confidence Intervals and Statistical Sampling Error. While error caused by statistical sampling is only one type (others include sample selection bias, social desirability bias, etc), the calculation of this error is important. This Survey, like all survey instruments, is subject to sampling error due to the fact that all households in the area were not interviewed. The sampling error is calculated as follows:

$$\text{Sampling Error} = \pm(1.96) * \sqrt{\frac{P * (100 - P)}{N}}$$

Where P is the percentage of responses in the answer category being evaluated and N is the total number of persons answering the particular question. Turning to the t-distribution and a two-tailed test, the sampling error provides that the probability is 95% that the results fit within this range.

This report presents values that are bounded by this 95% confidence interval estimate. Thus some answers provide a plus/minus range. However, due to the nature of Likert scaling, this type of probability estimation is not applied to all univariate answers. While results can be estimated, their meaning (in regards to Likert scaling) lacks decisiveness.

For example, suppose you had the following distribution of answers to the question, "Should the state spend more money on road repair even if that means higher taxes?" Assume 1,000 respondents answered the question as follows:

Yes	- 47%
No	- 48%
Don't Know	- 5%

The sampling error for the "YES" percentage of 47% would be:

$$\text{Sampling Error} = \pm(1.96) * \sqrt{\frac{47 * (100 - 47)}{1000}} = \pm3.1\%$$

The sampling error for the “Yes” percentage of 48% would be:

$$\text{Sampling Error} = \pm(1.96) * \sqrt{\frac{48 * (100 - 48)}{1000}} = \pm3.1\%$$

The Sampling error for the “Don’t Know” percentage of 5% would be:

$$\text{Sampling Error} = \pm(1.96) * \sqrt{\frac{5 * (100 - 5)}{1000}} = \pm1.4\%$$

In this case we would expect the true population figures to be within the following ranges:

Yes	43.9% - 50.1% (i.e., 47% $\pm$ 3.1%)
No	44.9% - 51.1% (i.e., 48% $\pm$ 3.1%)
Don’t Know	3.6% - 6.4% (i.e., 5% $\pm$ 1.4%)

### Chi Square Test

In its simplest fashion, the chi-square test is used to test the difference between two independent proportions. In one instance, this report considers the difference between groups in their view on affordable single-family housing (are single family home prices reasonable?). This question was exposed to a chi square test, which tested the answers against the different groups answering the question. It was found that given the degrees of freedom given, and chi-square value exceeding 37.652 prompted a rejection of the null hypotheses (all groups feel the same).

The chi-square test is commonly used in political polling. Suppose, for example, a pollster is interested in knowing whether males and females differ in their endorsement of a candidate. The null hypothesis is that females and males are just as likely to support a candidate. If 33% of the 100 males interviewed support the candidate while 17% of the females support the candidate, it is important to test whether the difference was due to chance alone.

The chi-square test provides a simple mechanism to test whether certain group’s responses fall outside the expected range, given the group’s response. This study uses a standard significance level of 5%. This significance level makes the statement that sampling variation is an unlikely explanation of the discrepancy between the null hypothesis and the sample values.

## Appendix B: Tables

Table B.1: What amenities are included in your lease

	No	%	Yes	%
Dishwasher in unit	107	45%	130	55%
Garbage Disposal in unit	149	63%	88	37%
Washing Machine in Unit	134	57%	103	43%
Washing Machine in Building	115	49%	122	51%
Central A/C in unit	164	69%	73	31%
Window Unit A/C	126	53%	111	47%

Table B.2: Which additional amenities are included with your lease

	No	%	Yes	%
Cable Television	86	36%	151	64%
Satellite Television	203	86%	34	14%
Internet	93	19%	144	61%
Pets (Dogs or Cats)	128	54%	109	46%