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Apartment Price Models for the Glenwood Riverfront Development

Joseph Friedman, Economics

ABSTRACT

This study examines the rent prices of the student housing apartment market surrounding the University of Oregon. The first key component of this study includes a Hedonic price model that helps evaluate what apartment complex amenities and characteristics are most important and influential in determining rental rates in the local community. Secondly, using the information from our Hedonic price model, this study will help the city of Springfield in their plans to develop a student housing project in the Glenwood Riverfront district, located along the Willamette River. Specifically, this study of rental prices and apartment complex attributes should be useful in evaluating a potential student housing project to ensure sufficient rental profit for developers and for tax revenues for Springfield under their current development budget constraints.

INTRODUCTION

In 1998, the city of Springfield annexed the Glenwood district along Franklin Boulevard from Eugene. The Glenwood Riverfront area is a one square mile region located between Eugene and Springfield along the Willamette River. Since gaining jurisdiction, the city of Springfield has targeted the Glenwood Riverfront area as prime location for development which could potentially improve the local Springfield economy. Specifically, the greater goal of the Sustainable Cities Initiative of Springfield is to develop the Glenwood Riverfront area in order to create Nodal or mixed-use developments that create a neighborhood-like environment in this region. Mixed-use developments are defined as buildings and developments that have multiple purposes including commercial, residential, employment and transit infrastructure. However, with the constraints of Springfield's budget along with the lack of developer interest, the city has thus far been unable to jumpstart their mixed-use development plans.

In the long term, the city envisions the Glenwood area to include business offices, low-income housing, and commercial properties. However, for the scope of this project, we will focus on the potential impact of incorporating student-housing apartments into the Glenwood Riverfront development. Given the increased enrollment at the University of Oregon and the success of other recent student housing developments such as the Courtside Apartments, we foresee the potential of a student housing project as a key component in the greater Glenwood Riverfront development. The question at hand will be to what extent can the impact of a student housing development be measured and subsequently translated to developers in order to induce a development in the Glenwood Riverfront area. While we will discuss the specifics of our research approach later, the first step in our study will be to examine what components of housing developments in the local community are most important in determining rental rates for tenants. In evaluating this problem, we hope that our results are applicable towards determining cause and effect of other important questions for Springfield. A study of rental prices and apartment complex attributes should be useful in evaluating a potential student housing project to ensure sufficient rental profit for developers and for tax revenues for Springfield under their current development budget constraints. Targeting which apartment amenities are most influential on rental prices in the local community will allow us, and more importantly the city of Springfield, to market a student housing development as a beneficial project for developers and the city as a whole.

BACKGROUND

University of Oregon Housing Developments

According to the University of Oregon's enrollment history data, over the last five years the university has seen undergraduate enrollment increase from 16,681 in 2007 to 20,631 in the fall of 2011. As enrollment continues to increase, the amount of local student housing developments must continue to increase commensurately, in order to keep pace with this prolific demand. While specific characteristics of the apartments are unique for each development, a majority of the newer developments are designed with modern characteristics and tend to include more amenities such as a washer/dryer, high speed wireless internet, covered parking, and several others. Consequently, the new student housing complexes located near campus have higher rental rates than local houses or older apartments with monthly rates ranging between $400-800 per person. Our goal will be to identify and analyze the various amenities that are included in local student housing complexes in an effort to see their effects on rental rates. In order to analyze the effects on rent that the various housing amenities have, we collected student rental rates from the largest rental agencies in the Eugene area. These agencies include Mallard Properties, Bell Real Estate, Von Klein Property Management, Eugene Rentals. In addition, we retrieved rental information from some of the larger independent student housing complexes such as Duck Village and the Courtside/Skybox apartments. Our objective in collecting data was to acquire as much diversity as possible so that our coefficients predicted by the model would be as close to their true values as possible. The more comprehensive and explanatory our study is, the more helpful it will be to the city of Springfield in the future as they attempt to market this proposed project to potential investors and developers. Ultimately we hope to develop an accurate model that describes the relevant attributes, construction costs and proportional rent for a student housing complex in the Glenwood area looking to compete in the evolving U of O student housing market. We hope this model, at minimum, will provide insight into the benefits and costs to be considered in any such development in the Glenwood area.

LITERATURE REVIEW

The goal of our project is to construct a hedonic model that will allow us to determine the feasibility of a student housing complex in the Glenwood Riverfront area of Springfield. To do so we need to gather data on observable characteristics of rental price determinants, and estimates of the construction costs, preferably value added cost estimates associated with each amenity specified in the model. In order to familiarize ourselves with common attributes of hedonic rental models, we did some research on existing studies. Many of these studies helped to fortify our hypothesis of the most significant variables, and the likely sign of their coefficient in relation to our dependent variable.

For the scope of our project, we wanted to investigate previous studies that dealt with similar hedonic price models. Specifically, we identified previous research that focused on hedonic models aimed at identifying rental rate characteristics using similar variables to those used in our study. While we were fortunate enough to find extensive relative research, we decided to focus on a limited quantity that we found to be most pertinent to our specific research on the University of Oregon student apartment market.

As a starting point, we reviewed a previous study conducted by University of Oregon students in 2006, that uses a similar model to ours in an effort to "examine the rent prices of apartments and sale prices of condominiums in Eugene, Oregon." From the substantive Brown, Reiter, and Pietzold (2006) findings, we were able to outline a feasible plan for how to best conduct our own research. For example, their study discusses the difficulty that exists in the Eugene area with obtaining rental pricing information. The major rental agencies in the Eugene area, Mallard Properties, Bell Real Estate, Property Management Concepts, and Von Klein Property Management, manage a vast majority of the student housing complexes surrounding the University of Oregon campus. With this in mind, as the 2006 study indicates, if one of the major management companies is unwilling to provide the necessary data to conduct a thorough hedonic price model, it significantly limits the amount of observations one can obtain as well as leaves room for biased results. In reviewing Brown, Reiter, and Pietzold (2006), we found that Bell Real Estate was unwilling to release the needed information to the students in their research process. Understanding that cooperation from and collaboration with Bell Real Estate would likely be difficult, we decided to focus on reaching out to them in order to give ourselves ample time to obtain their rental pricing information. While in the end we were unable to obtain significant data from Bell Real Estate, we were able to establish communication with one of their managers and were restricted more by time restraints than by Bell's unwillingness to share the information.

Another key element of Brown, Reiter, and Pietzold (2006) that helped in outlining our research process was to identify the variables they used in their study. While a majority of the included variables were obvious for our hedonic price model, such as square footage, number of bathrooms/bedrooms, washer/dryer included or not, etc, others were somewhat more abstract but nevertheless significant in predicting power. For example, while we had planned to include some type of variable to measure an apartment complexes distance to campus, by observing the significance of the "travel time to campus" measured as UO time in the study(a roughly $4 decrease in price for every minute increase in time), we decided it was crucial to include a time variable in addition to a simple distance variable. We also believe that because over the last 6 years there has been a significant increase in large student housing complexes in the surrounding Eugene area, the landscape of the University of Oregon housing community has broadened and now expands beyond the West Campus neighborhood much more than it did in 2006. With this in mind, a time variable to a specific location may be more predictive than a distance to campus variable that may not capture the significance of a complex built in a different neighborhood around campus such as the newly built Skybox and Courtside Apartments built in the new Arena District of campus. In addition, because the west campus neighborhood is so densely populated with complexes, we believe that a time variable that measures walking time will allow for more variation than a basic distance calculation. For example, a two block distance between two complexes may only record as a 0.1 mile difference in distance to campus, but up to 7 or 8 minutes difference in walking distance to campus. Based on the 2006 study, we believe this time disparity is a critical element in determining rental rates. However, as we will explain later, the strong multicollinearity between time and distance to campus forced us to ultimately take out our time to campus variable to strength our overall regression results. Nevertheless, for the purpose of our investigation, it was beneficial to have Brown (2006) as a basic outline to help frame our regression model.

In evaluating the results of Brown (2006), we analyzed the findings of their apartment rental rates without delving too much into the condominium side of their research. While the 2006 study concedes error in calculation with their condominium results, overall the apartment rental rate model appears to be a fair representative of the student housing apartment industry in Eugene. Aside from a lack of explanation as to the randomization process Brown (2006) used while acquiring their data, the analysis produced results that appeared unbiased and fairly consistent with expectations. The explanatory variables used by Brown (2006) include square footage(sqtfi), number of bathrooms(bathi), deposit amount (depositi), time to campus(uotimei), washer and dryer included in the unit (dwduniti), cleaning deposit fee clearningi), and bike storage (dbikestoragei). In using these variables, their final regression included the following:

Rent(i)= β0 + β1sqfti + β2bathi + β3depositi + β4uotimei + β5dwduniti+ β6dpetsi +β7cleaningi + β8dbikestoragei

Where:

β0 : 361.667 β1 : 0.343 β2 : 55.627 β3 : -0.206 β4 : -9.877 β5 : 80.149 β6 : 41.135 β7 : 0.155 β8 : 24.603

This model demonstrates a linear regression model, similar to the one we will look to use in our investigation. In its most basic form, we can view this model as $Y_i = \beta x + E_i$, where β represents the coefficient vector for any particular model and x represents the discovered values of any variable included in the model.

From their results, we can see the predictive qualities that one may expect to see from the above variables as they relate to rental rates in the Eugene Area. Additional square footage, bathrooms, bike storage, and number of units in the complex all appear to positively and significantly effect rental rates, while time to campus and amount of deposit appear to have a negative effect. While our evidence does not lead us to believe that deposit increases should lead to decreases in rental rates as the 2006 study suggest, overall this model provides a starting point to base our results off of. Essentially, we foresee our study being an updated rendition of the 2006 study with changes coming from the dynamic and continual evolving Eugene student housing community. With a significant increase in newer and larger student housing developments over the last 6 years, certain variables may be more or less significant as the scarcity of certain amenities has decreased.

In taking a step back from analysis of the Eugene student housing market, *The Effect of Rent Control on the Price of Rental Housing: An Hedonic Approach* , or Marks (1984), provides one of the first hedonic price models used to research rental rates. This study was conducted at the University of Wisconsin, in an investigation into the effects of rent control in urban housing markets. Specifically, this study used data from the city of Vancouver to research "the extent, at the margin, to which controlled rent falls below the level it would reach if the particular unit were not controlled." While the intent behind our research will not be the same as Marks', there are still key elements of his study that will benefit us going forward. For example, the hedonic price model Marks uses in his study will be a good reference point for our study in terms of what variable to incorporate and what correlations we expect these variables to include. Perhaps the biggest limitation of this study will be that it was conducted over 25 years ago. With this in mind, we anticipate several additional variables will need to be included in our price model to accommodate current advancements in technology and design. Examples of this will be discussed further in the methodology section.

In a subsequent study conducted in 1989, *Determining Apartment Rent: The Value of Amenities, Services and External Factors,* Sirmans, and Benjamin provided a report published in The Journal of Real Estate Research that broadened the application of the hedonic price model as it relates to rental rates. The primary goal of this study was to investigate a similar concept to what we are researching for our project: what are the effects of various amenities on the rental rates for housing? While this study focuses on multifamily housing and ours student housing, we expect the overall findings to be similar to what we will discover in our research. For example, the authors of this study found that covered parking and "modern kitchen" were both independent variables that had a great impact on rental rates, which we assume will also be evident when we conduct our study. Similarly to Marks (1984), this study also provides a useful hedonic model that will help in setting up our own model with various independent variables. One key component of this study that should prove beneficial for us moving forward is the use of external factors being considered in the experiment. By including variables such as traffic congestions and access to public transportation, this study, and consequently our study, will be able to more accurately monitor the true effects of the various independent variables on the rental rate. As mentioned for Marks (1984), this study is somewhat limited as it was conducted 20 years ago and several variables that will be crucial to our investigation may not have been relevant or existent when the study was conducted.

Most other existing literature we researched which attempts to model student rental prices specifically cite variables distance to campus, number of bedrooms/bathrooms, utilities included, as well as a basic list of amenities (dishwasher, washer/dryer, parking, balcony or outdoor space, common space, exercise room, security etc. etc.) as the most significant factors affecting rent per square foot in the student market. We have been fortunate enough to gather data on many of the relevant variables that other parallel studies have found significant in their regressions. Des Rosiers and Theriault are among the more prominent researchers to successfully use hedonic models that accurately describe cause and effect relationships. Their report in the journal of real estate studies entitled *Rental Amenities and the Stability of Hedonic Prices: A Comparative Analysis of five Market Segments*, used a less conventional experimental design and hypotheses to yield some interesting results. One segment analyzed in their five market comparison was the student housing market at a university in Quebec Canada. They postulated that there were three main factors which contribute to student rental prices there. The first being amenities, services and physical characteristics, encompassed in our model by variables such as number of bedrooms, bathrooms and a myriad of dummy variables such as dishwasher, balcony, hardwood floors etc. The second characteristic was locational attributes, addressed in our model by variables distance to campus, distance to commercial grocery development and distance to nearest bus line. The final factor they hypothesized about was the effect of vacancies on rent. We did not include this variable in our model, because it quickly became apparent to us, as it did to Rosiers and Theriault that “a market dominated by the presence of a major university consequently displays a relatively low price-elasticity of demand for rental services,” suggesting that markets remain highly specific and that vacancy rates are not a significant factor in determining rent around universities, because students are fairly insensitive to price changes. This conclusion not only nullifies vacancy rates as a potentially omitted explanatory variable, but it makes an assertive statement about the prolific demand for student housing around campuses. It was easy for us to find evidence of similar conditions of disequilibrium between supply and demand around the University of Oregon campus as well, which only serves to reinforce the potential usefulness of our model in assessing the Eugene/Springfield market. Des Rosiers and Theriaults’ study found distance to be the strongest variable in determining rent. They concluded that, “the rent premium assigned by the market within a 500-meter radius from the University represented roughly 16.5% of average monthly rent, as opposed to 3% and 1.7% for the second and third 500-meter belts respectively.” In accordance with this conclusion, they posited that “a central location within walking distance of the university may drive landlords to increase rents throughout the academic year in order to compensate for higher vacancies during the summer time.” These two conclusions only reiterate findings of inelastic rental demand found around most college campuses.

A comparative 1987 study conducted at the University of Alabama by Economics and Real Estate professors Karl Guntermann and Stefan Norrbin entitled *Explaining the Variability of Apartment Rents,* used a similar model to investigate rents surrounding college campuses. They concluded that "common area amenities and extra bedrooms for a given apartment unit size have a significant affect on rent. While students may have a strong location preference for the area around a university, they are sensitive to the condition of apartment units, with better quality units having significantly higher rents." If the results from both of these studies hold true for our model, it will suggest that although students are fairly insensitive to price changes in close proximity to campus, contrary to popular belief, students are sensitive to the condition of apartment units.

The permanent income theory states that people will spend money consistent with their expected long-term average income. As concluded in Jonathan Ogur's paper *Higher education and Housing: The Impact of Colleges and Universities on Local Rental Housing Markets*, "college and university students have high permanent incomes in relation to the rest of the population. More-over, among all groups in the population, college and university students are especially likely to be affected by permanent income in their consumption of rental housing services." Pg 388. This would help to explain the insensitivity to movements in price in units close to campus, and the preference and willingness to pay for higher quality units due to their higher expected long-term incomes.

LITERATURE REVIEW

In order to determine the feasibility of a student housing project in the Glenwood riverfront area, we decided that using a hedonic property model to gather observations on the attributes that comprise a typical unit would best allow us to speculate on what a structure might look like if built in this area. Thus our original model included the following variables:

# of bedrooms	Years since built	DUMMY internet included
# of bathrooms	# of renovations	DUMMY parking
Average deposit	# of floors	DUMMY sustainable design
# of additional units	DUMMY balcony	DUMMY sustainable certification
Distance to campus	DUMMY bike storage	DUMMY Utilities
Distance to EmX line	DUMMY complex security	DUMMY washer/dryer included

Distance to grocery store	DUMMY dishwasher
Time to walk from campus	DUMMY exercise room

Through a combination of site-specific internet research, relevant literature review and consultation with management companies, we were able to define these variables to be the most relevant and accessible in determining rent per square foot in the Eugene market. For variables such as number of bedrooms, bathrooms, number of floors, average deposit, number of additional units, years since built, and number of renovations, we simply collected the appropriate quantitative values for each variable. For our distance variables, we used Google maps to approximate the distance to campus, grocery store and EmX transit bus stations from each of the observations in our study.

In measuring the “distance to campus” we observed the distance from each housing complex to a specific “East 13th Avenue” address on Google Maps. We chose to use this specific location on campus because it closest in proximity to a majority of classes as well as encompassed the many other attractions on 13th that are near the actual university campus such as the U of O book store and several local restaurants and bars which cater to college students.

For the “distance to grocery store” variable, we calculated the distance from each observation in our study to either the Safeway on 18th avenue or the Market of Choice on Franklin Boulevard, ultimately recording the lesser of the two distances. We chose these two establishments because they are the two largest grocery stores in the geographic region surrounding the vast majority of student housing complexes in the campus district of the university. While we acknowledge that there are smaller markets and convenience stores that may be closer in proximity to some student housing complexes, the extent to which students can purchase groceries beyond the basic necessities is quite limited.

In measuring “distance to EmX” we calculated the distance between each complex and the closest EmX station that runs along Franklin Boulevard. For example, the “distance to EmX” for a student housing unit on 14th and Patterson would be the distance between the unit and the EmX Hilyard Station, the nearest location that a resident could actually get on the EmX line.

Lastly, our “time to walk to campus” variable was calculated using Google maps to approximate the time it would take for an average student to walk to campus, specifically, the time it would take to walk to the campus entrance on 13th Avenue.

In addition to the hedonic property model which is useful to evaluate general physical, mostly non-financial characteristics of property rents, we will obtain estimates of the construction costs associated with building a development to a particular set of standards. We hope to obtain estimates of the value added per amenity costs of each characteristic we would expect to observe in a new complex in the Glenwood area.

Through reconciliation of these two figures, we have a rough sketch of appropriate rent to charge to cover total construction costs, as well as the derivative rent associated with each observed amenity. Although we understand these estimates will be far from perfect, we hope it will provide a framework, and a snapshot for parties on both sides of the equation, i.e. the city of Springfield, who is trying to incentivize development in the Glenwood area, and developers/management companies who are looking to expand their property ownership and differentiate themselves within the marketplace.

HEDONIC PRICE MODEL RESULTS

Initially, we conducted our investigation with "rent per square foot" as our dependent variable. However, our first regressions produced some unperceived results most notably unrealistic coefficient signs and values, likely due to specification issues in the model. With rent per square foot as our dependent variable, we obtained a relatively modest R-squared value of .518 with only 5 explanatory variables being significant in our regression model. [1] Upon observing our regression output, we revised our final hedonic price model to have our dependent variable be simply "rent" with "square footage" becoming an explanatory independent variable in the model. Our final regression appears as the following:

$$Rent_i = \beta_0 + \beta_1 bathrooms_i + \beta_2 bedrooms_i + \beta_3 deposit_i + \beta_4 distancetocampus_i + \beta_5 distancetogrocery_i + \beta_6 DUM\_bikestorage_i + \beta_7 DUM\_dishwasher_i + \beta_8 DUM\_exercise_i + \beta_9 DUM\_furnished_i + \beta_{10} DUM\_internet_i + \beta_{11} DUM\_security_i + \beta_{12} DUM\_utilities_i + \beta_{13} floors_i + \beta_{14} renovations_i + \beta_{15} sqft_i + \beta_{16} additionalunits_i + \beta_{17} distancetoEmX_i + \beta_{18} DUM\_balcony_i + \beta_{19} DUM\_sustainablecert_i + \beta_{20} DUM\_washerdryer_i + \beta_{21} yrssincebuilt_i$$

In the above regression, β_0 represents our constant value while β_1 through β_{21} represent the coefficients for each of our respective dependent variables. These coefficients represent the value that each variable in our model has on the rent value ($) holding the rest of variables in the model constant. For example, if hypothetically β_1 had a value of 100, we would expect a one unit increase in "bathrooms" to result in a $100 increase in rent.[2]

After finalizing our regression model based on the variables we had obtained information on during our data collection, our investigation produced the following regression outputs:

[1] Appendix A
[2] Appendix B

Dependent Variable: RENT
Method: Least Squares
Date: 05/31/12 Time: 14:12
Sample: 1 134
Included observations: 134
White Heteroskedasticity-Consistent Standard Errors & Covariance

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	251.9520	179.1823	1.406121	0.1625
BATHROOMS	83.81231	44.19789	1.896297	0.0605
BEDROOMS	139.3712	57.97780	2.403871	0.0179
DEPOSIT	0.593993	0.114016	5.209729	0.0000
DISTANCETOCAMPUS	-277.0824	71.06340	-3.899086	0.0002
DISTANCETOGROCERY	-101.2438	50.74576	-1.995119	0.0485
DUM_BIKESTORAGE	82.06390	28.02294	2.928455	0.0041
DUM_DISHWASHER	-89.39012	64.19573	-1.392462	0.1665
DUM_EXERCISE	-338.8507	145.1100	-2.335130	0.0213
DUM_FURNISHED	733.8645	193.6986	3.788693	0.0002
DUM_INTERNET	237.3088	167.4603	1.417105	0.1592
DUM_SECURITY	101.6929	43.41792	2.342187	0.0209
DUM_UTILITIES	117.5668	132.5530	0.886942	0.3770
FLOORS	-45.79934	21.94388	-2.087112	0.0391
RENOVATIONS	83.19379	73.23183	1.136033	0.2584
SQFT	0.321179	0.162490	1.976600	0.0505
ADDITIONALUNITS	-0.824369	1.474486	-0.559089	0.5772
DISTANCETOEMX	1.924736	66.68903	0.028861	0.9770
DUM_BALCONY	7.847911	24.40578	0.321560	0.7484
DUM_SUSTAINABLECERT	15.83493	48.31324	0.327756	0.7437
DUM_WASHERDRYER	39.69828	45.24383	0.877430	0.3821
YRSSINCEBUILT	-2.099652	3.410551	-0.615634	0.5394

R-squared	0.964751	Mean dependent var	1910.522
Adjusted R-squared	0.958142	S.D. dependent var	697.6829
S.E. of regression	142.7400	Akaike info criterion	12.90894
Sum squared resid	2281967.	Schwarz criterion	13.38471
Log likelihood	-842.8992	Hannan-Quinn criter.	13.10228
F-statistic	145.9730	Durbin-Watson stat	1.552346
Prob(F-statistic)	0.000000		

EVALUATION OF FULL REGRESSION OUTPUT

Despite the fact that a number of our variables were insignificant, we decided to leave them in the model in order to exemplify the full list variables we collected data upon which we had originally hypothesized would have significance in determining rent. However, after running a correlation matrix between all of our variables, we removed the variables time from campus because of its perfect correlation with distance to campus, as well sustainable design because of its high correlation with sustainable certification. Highly correlated independent variables cause multicollinearity, which occurs when there exists a linear relationship between two variables, meaning that when collinear variables are included in a model, each unique variable that is collinear give us inaccurate information regarding their relationship to the dependent variable, because some of their unique explanatory power is being shouldered by another variable or vis-versa. Although multicollinearity does not cause bias or inconsistency, it does cause variances and standard errors to be higher, and thus t-statistics to be smaller. Another issue with our data was heteroskedasticity, this is a problem with most cross sectional data such as ours. It occurs when the disturbance term in each observation is not constant and results in coefficient estimates that are inefficient. Because we did not know what the form of our heteroskedasticity might look like, we used White's correction because it does not require a form to be specified. White's correction is an automated correction in eviews that corrects the standards errors to normalize the output. Additionally, because there was no variation in the data for dummy variable parking(it was observed in every circumstance), we could not analyze its effects on rent, so we removed it from our model.

The R-squared value of our new regression was .964 which tells us that roughly 97% of the variation in rent is caused by the explanatory variables in our model. This is a high R squared value, it suggests that we have included the most important explanatory variables in determining rent.

APPLICATION OF THE MODEL

In order to determine the feasibility of a student housing project in the Glenwood riverfront area, we gathered information on an estimate of the cost structure that might face a student complex to be built in the Glenwood area. We were able to use the cost structure of an existing student complex as a proxy for the prospective development in Glenwood. After we provided Anslow & DeGeneault construction with an estimate of the cost of land at the proposed building site for the Glenwood development, our contact was able to factor this land cost into his existing cost structure. In doing so he was able to inform us that a 44,000 Sqft (not including an underground parking lot), 34 unit apartment complex would cost around 5.3 million including between $150-$200,000 in interest payments for construction financing, as well as $50,000 in permanent financing costs. These figures assume a loan for 75% of the total costs of the project.

Once we had these numbers we used the variables of significance from our full model(5% significance level) in order to determine an auxiliary regression specific to the Glenwood area. We left out the dummy variables furnished and exercise room, even though they were both significant in our full model. By looking at trends in our data, we deduced that only complexes with more than 80 units had an exercise room, and only one apartment complex had fully furnished rooms available so neither of these were relevant to our perceived structural design. Given these constraints, our model for the Glenwood Riverfront complex looked of the following form:

Rent = β1 + β2(Bathrooms) + β3(Bedrooms) + β4(deposit) + β5(security)+ β6(floors) +β6(SqFt.) β7(BikeStorage) + β8(Distancetocampus) + β9(Distancetogrocery) [3]

We decided to run two different regressions in order to see how our model would compensate for price discrimination between differing units, also because price discrimination is a better assumption when we are attempting to simulate real market conditions. We made a few important assumptions/tenets for this these auxiliary regressions. Namely, for ease of calculation, we decided the building would be four floors, the first three would have ten units each and the top would have four much larger premium units. Secondly, of the 44,000 SqFt. we would ascribe 4,000 to be common space (difference between real and usable square feet), recognizing that this is likely an underestimation of the actual common space required for a building this size.Our first regression represents the homogenous units of the first three floors. Each unit is assumed to have 3 bedrooms, 2 bathrooms, a deposit of $1621 (as calculated from the average of our data's deposit) unit confinement within one floor, unit security, unit bike storage, 1,100 square feet(as calculated from the average of 3 bedroom 2 bathroom units found in our data), a distance to campus of 1.7 miles and a distance to closest commercial grocery retailer of 1.5 miles. Our second regression represents the 4 premium units on the top floor. Each unit is assumed to have 4 bedrooms and 3 bathrooms, a deposit of $2263, confinement to one floor per unit, unit security, unit bike storage, 1,750 square feet, a distance to campus of 1.7 miles and a distance to closest commercial grocery retailer of 1.5 miles.

Introducing these numbers into our model yielded results of $1656.25 per month for the 3 bedroom rooms ($552.08 per person) and $2478.009 per month for the 4 bedroom premium units ($619.50 per person).

With our limited sample size we recognize that some of the variables we omitted from our original regression output might likely be significant given a larger data sample with greater variance. However, our results reinforced our original hypotheses. As we expected, rent per square foot in the Glenwood Riverfront area is considerably less than the average rent per square foot in the Eugene student housing complex. Rent per square foot in the Eugene market ranges between $2 and $3.5 per square foot. Using an average of the two different rental standards in our prospective Glenwood development, we calculate an average rent per square foot to be $1.46. As an estimate provided by our construction contact Anslow and DeGeneault, cost per square foot for the Glenwood area would be between $115 and $125 per square foot. From the Lane county Department of Assessment and Taxation, we were able to estimate and factor in monthly taxes for the Glenwood area, based upon the specification of our project construction costs. This turned out to be $5,002.50 per month. From local commercial real estate appraisers Duncan & Brown, we acquired an estimate of monthly operating expenses as a % of gross monthly revenue. This was quoted at between 28% and 30%. Using a $120 estimate as cost per square foot we can estimate a break-even point for the Glenwood development. Total construction costs are 5,280,000(120 x 44,000) and gross monthly revenue is 57,600 (1.46 x

[3] Appendix C

40,000). 57,600-21,687.62(monthly taxes + operating expenses) = 35,912.38 in net monthly revenue. 5,280,000/35,912.38 = 147.02→ 147 months. Given these estimates we can conclude that it would take a Glenwood riverfront complex 147 months or approximately 12.25 years rented at 100% capacity to break even in this model development.

APPLICATION OF THE MODEL

As mentioned above, in applying our hedonic price model for the University of Oregon student apartment industry to the Glenwood development, we can estimate the potential revenues a student housing complex could provide developers and the city planners of Springfield. We realize our estimate of 12.25 years for full repayment of costs fails to recognize other potential sources of income and costs such as omitted significant positive variables on rent or maintenance costs to the facility.

Additionally, we acknowledge that this model assumes that demand exists for such a property, which we could not properly determine given our resources and timeframe. Yet we believe flagship projects such as the downtown Capstone project, a proposal for a student complex that would house 1200+ students is a strong indication of the prolific demand in this market. We also recognize that changes in demand and supply can be very volatile in the short run, but hope that this model may still serve to capture the relevant ratios of rent to attributes, ratios that we believe won't significantly change with shifts in supply and demand for student apartment housing.

With that in mind, it is still difficult for us to make a firm recommendation for a student housing development in the Glenwood Development. At this point in time, it is nearly impossible to measure the full potential economic impact a student housing complex could have in the Glenwood district given that development plans are still in preliminary stages. However, to achieve the results of the Glenwood Development that the city of Springfield envisions, we do believe that a student housing complex is a reasonable option given the current budget restraints and goals for the city. For one, the costs of development for a student apartment complex is significantly cheaper than other alternative developments and may prove to be self-sufficient enough in the long term to begin attracting developers to the Glenwood region. In addition, if the city envisions a mixed-use development in the Glenwood region, then a student housing complex may serve as the perfect project to jumpstart potential future investment. By implementing a facility that could potentially bring in over 100 residents, the Glenwood region would immediately become more attractive to potential businesses and developers.

With more time and extensive analysis, a refined model could be used to compare the feasibility of a student apartment complex with other potential developments. Future hedonic rental models could be crucial components in cost benefit analysis for developers, investors, and local governments. Given the current circumstances of the Glenwood region, including the lack of developer and investor interest, our study leads us to believe that a relatively low cost student housing project that will target a specific demographic with its unique set of attributes, could be an appropriate venture to jumpstart development in the Glenwood region.

FURTHER CONSIDERATIONS

Recognizing that 12.25 is probably too long a period to be advertising as a payback period for a development, it is up to the city of Springfield to make concessions in order to incentivize development. As an example, if Springfield fully abated the $60,030 in annual tax payments for the first seven years, it would reduce the payback time to ten years, after the seven years, the realized market value would increase over 1200%, or $4,884,000 which would more than fully pay back the tax abatements. This reduction in payback is not hugely significant considering the number of years the city would not be collecting tax revenues from this property. Unfortunately, the payback period for any type of rental development going into this area is going to be long because the premium on rent will be small. Due to the lack of external market value in the surrounding area, a new development here will not realize the mutualistic market value spillovers of a more attractive, less industrialized area. Additionally, the management company will be of great importance. According to Duncan & Brown local commercial real estate appraisals, small, independent management companies face large initial operating expenses, especially with respect to management, because on site management can cost up to 7% of gross monthly revenue. Thus a prospective development pitch may be better aimed at existing, larger property management companies that have reduced aggregate operating costs through economies of scale.

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ADDITIONAL RESOURCES

Courtside Apartment Complex information:http://livecourtside.com

Duck's Village Complex information: http://www.ducksvillage.com/

University of Oregon enrollment : http://registrar.uoregon.edu/statistics/facts_at_a_glance

Appendix A

Initial Regression Results with "RENTPERSQFT" dependent variable

Dependent Variable: RENTPERSQFT
Method: Least Squares
Date: 05/11/12 Time: 13:08
Sample: 1 145
Included observations: 95
White heteroskedasticity-consistent standard errors & covariance

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.210686	0.372085	5.941340	0.0000
BEDROOMS	0.192112	0.053985	3.558649	0.0006
BATHROOMS	-0.206290	0.062928	-3.278207	0.0016
ADDITIONALUNITS	0.004729	0.003848	1.229010	0.2228
DISTANCETOCAMPUS	-0.102674	0.103380	-0.993164	0.3237
DISTANCETOEMXLINE	-0.066918	0.094584	-0.707498	0.4814
DISTANCETOGROCERYSTORE	-0.251378	0.104421	-2.407342	0.0185
FLOORS	-0.043512	0.029622	-1.468906	0.1459
RENOVATIONS	0.269316	0.086242	3.122799	0.0025
YEARSSINCEBUILT	0.002749	0.017615	0.156061	0.8764
DUM_BALCONY	0.001743	0.054736	0.031852	0.9747
DUM_BIKESTORAGE	-0.085097	0.060814	-1.399303	0.1657
DUM_COMPLEXSECURITY	0.086510	0.088452	0.978046	0.3311
DUM_DISHWASHER	-0.627793	0.276924	-2.267022	0.0262
DUM_EXERCISEROOM	-0.153008	0.309377	-0.494568	0.6223
DUM_SUSTAINABLEDES	-0.052943	0.091138	-0.580906	0.5630
DUM_UTILITIESNOTINRENT	0.173538	0.093302	1.859953	0.0667
DUM_WASHERDRYER	-0.026300	0.115541	-0.227623	0.8205

R-squared	0.518754	Mean dependent var	1.691391
Adjusted R-squared	0.412505	S.D. dependent var	0.292181
S.E. of regression	0.223952	Akaike info criterion	0.014103
Sum squared resid	3.861886	Schwarz criterion	0.497996
Log likelihood	17.33010	Hannan-Quinn criter.	0.209632
F-statistic	4.882440	Durbin-Watson stat	1.616259
Prob(F-statistic)	0.000001		

Appendix B

Final Regression Model – All included variables

$$Rent_i = 251.95 + (83.81)bathrooms_i + (139.37)bedrooms_i + (0.59)deposit_i + (-277.08)distancetocampus_i + (-101.24)distancetogrocery_i + (82.06)DUM\_bikestorage_i + (-89.39)DUM\_dishwasher_i + (-338.85)\ DUM\_exercise_i + (733.86)DUM\_furnished_i + (237.31)DUM\_internet_i + (101.69)DUM\_security_i + (117.57)DUM\_utilities_i + (-45.80)floors_i + (83.19)renovations_i + (0.32)sqft_i + (-0.82)additionalunits_i + (1.92)distancetoEmX_i + (7.84)DUM\_balcony_i + (15.83)DUM\_sustainablecert_i + (39.70)DUM\_washerdryer_i + (-2.10)yrssincebuilt_i$$

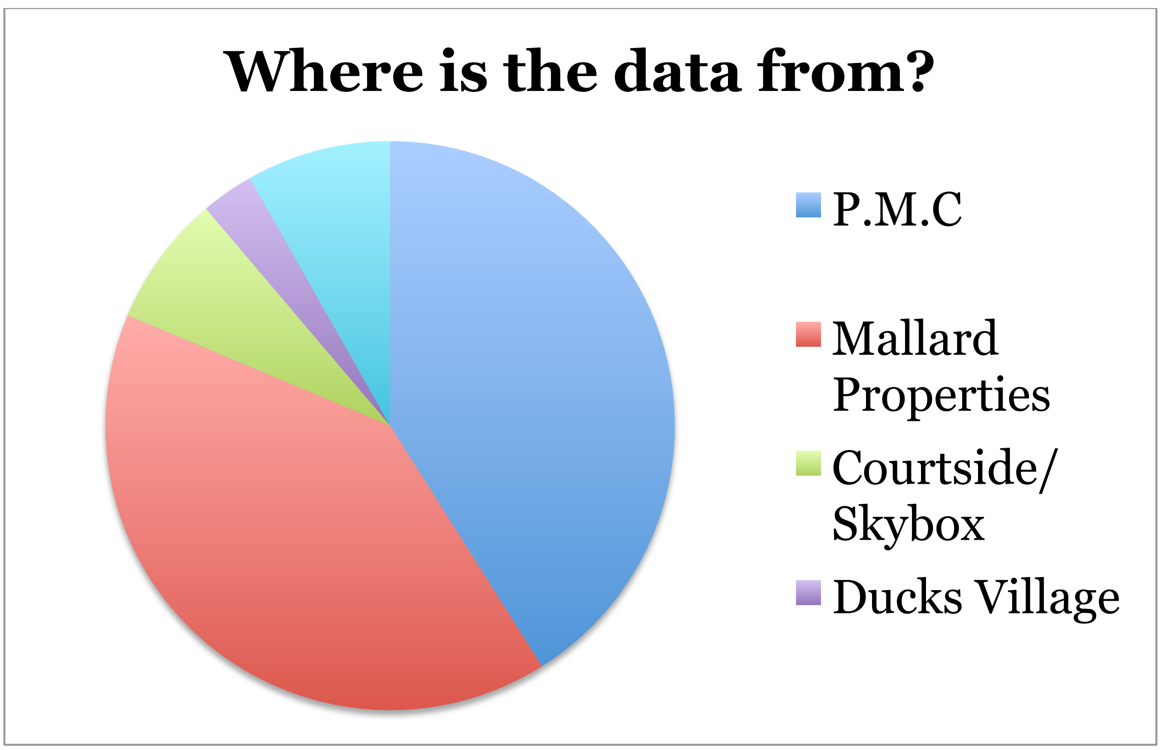
Appendix C

Final Regression Model – Application to Glenwood (3 Bedroom)

$$Rent_i = 251.95 + (83.81)bathrooms_i + (139.37)bedrooms_i + (0.59)deposit_i + (277.08)distancetocampus_i + (-101.24)distancetogrocery_i + (82.06)DUM\_bikestorage_i + (101.69)DUM\_security_i + (-45.80)floors_i + (0.32)sqft_i$$

Appendix D

Data Collection Chart



Appendix E

Regression Results – Graphical Representation of Coefficients