A Million and Above: Hedonic Modeling of how the characteristics of High-End Houses in the Las Vegas Metropolitan Area are valued

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Abstract:
The paper analyzes housing values using hedonic modeling approach to show how affluent people value certain characteristics of high-end homes in the Las Vegas Metropolitan housing market. We also analyze whether the gender of the listing agent matters in the sales price of the homes. We have selected homes in the Las Vegas Metropolitan area which had sold over the past 36-month period for $1,000,000 or more and are all located in similar Master Planned Guard Gated communities within Summerlin and Henderson sub-markets. In this high-end micro-market of properties, buyers are willing to pay premiums for pools, bathrooms, single-story homes and the Summerlin location. We have also found that female listing agents outperform males in the Summerlin sub-market.

I. Introduction:

Real estate is a differentiated product that contains many different characteristics. Price differences and characteristics effects can be measured using hedonic modeling. Hedonic prices are defined as "the implicit prices of attributes and are revealed to economic agents from observed prices of differentiated products and the specific amounts of characteristics associated with them. They constitute the empirical magnitudes explained by the model." (Rosen, 1974). Differentiated products are made up of various characteristics, but the specific characteristics are not explicitly sold on the market (Palmquist, 1984). Determining the value of specific characteristics in housing can be a very useful tool in determining what a higher-end buyer perceives as more valuable or important characteristics of a property. This information can be useful to builders, buyers/sellers, real estate sales professionals as well as to vendors who manufacture or sell products that cater to the higher-end housing market or the individuals who own these properties.

The hedonic housing models that we are traditionally used to observing typically use statistics of average priced homes in a given area or region. Average price does not specifically represent the unique nature of the subsections or micro-markets in an area, such as specific low-end or high-end properties. The typical hedonic housing studies also contain various consumers with a large range of budget constraints for each individual person. (Palmquist, 1984). According to Rosen (1974), there is a tendency for market segmentation of consumers with similar incomes and purchase products with similar characteristics. All of the observations are located in similar guard-gated communities within the Las Vegas Metropolitan Area, which are in a much higher price range than the average that is used in the majority of studies of this type. The study will be controlling for different housing characteristics to determine how desirable (or undesirable) these characteristics are, and how they affect pricing and desirability of housing attributes to a more affluent purchaser.

The study will also compare the results in two competing parts of town - Summerlin and Henderson - to see if there are any distinct differences in what the high-end buyer perceives as important and how that translates to value. These two specific areas represent the two most common parts of town where the majority of the high-end homes exist and purchasers are usually very passionately biased about their preferences in living in one over the other.

Typically, it is possible to measure for certain externalities like crime, airport noise or even churches as they pertain to value. However, it is not possible to look at every single property to determine and account for certain ambiguous externalities that could exist and affect value because of their close proximity to a subject property. In order to limit this from occurring, two similar areas have been carefully chosen, Summerlin and Henderson, which have extremely close neighborhood characteristics. In addition, all of these homes are located within master planned guard-gated neighborhoods that have very similar Home Owner Association (HOA) rules and regulations to maintain strict uniformity.

Along with analyzing housing characteristics, we will also be analyzing data with regard to the gender of the listing agent and how that relates to the observations within the data. Once a

male-dominated field, females now make up over 60% of real estate professionals in the United States (Seagraves, 2013). Both male and female agents have the same required schooling as well as the same licensing credentials. We will analyze the data and describe what those differences reveal. Though males have traditionally dominated the real estate market, this may be one area where the gender wage gap is eliminated. Seagraves (2013) found that the net selling price of homes with female listing agents to be 6.5% higher than their male counterparts (in a data set of over 2,000 closed transactions). The study concluded that "agent specialization was the important factor" driving sales and earnings by female listing agents. Furthermore, the study found that buyers prefer to use females when there is a high reservation price and to use males when a quick sale with a much lower reservation price is desired.

Section II examines the hedonic model and provides a table that outlines the dependent and independent variables, a brief description of the variables (determinants) as well as their expected signs. Section III contains descriptive statistics. Section IV presents the empirical results. Section V concludes the analysis.

II. Model

This paper uses the following hedonic model with price in log linear form:

***Log (Price) = F(SqFt, Bed, Bath, Garage, Pool, Age, DOM, SUM, GV, AgentGender*)**

Final price, *Price* is explained by a number of independent variables broken into three categories: structural characteristics, market conditions, and sale characteristics. The structural characteristics detail the physical attributes of the observed houses, such as the number of floors, bedrooms, bathrooms, garage spaces, and fireplaces, as well the square footage, the age, and whether or not there is a pool on the property. The market conditions list any independent variable that impacts the final sales price of the house due to temporal elements. In this study, a temporal element is days on the market *(DOM)*. The last category is sales characteristics which includes the independent variables that affect the final sales price through location of the property and the gender of the sales agent. The relationship between the dependent variable *LogPrice* and the explanatory variable is straightforward and captured in column 3 of Table 1 by the expected signs which indicate whether the explanatory variables impact sales price positively or negatively.

Table 1: Variables, Definitions, and Expected Signs:		
Variables	**Definition**	**Expected Signs**
Dependent Variable		
SalesPrice	Final sales price house	
Independent Variables		
Structural Characteristics		
Floors	Number of floors	(-)
SqFt	Square footage	(+)
Beds	Number of bedrooms	(-)
Baths	Number of bathrooms	(-)
Garage	Number of garage spaces	(+)
Pool	1 if pool and 0 if not	(+)
Age	Age of property	(-)
Fireplaces	Number of fireplaces	(+)
Market Conditions		
DOM	Days the property was on the market for sale	(-)
Sales Characteristics		
Summerlin	1 if in Summerlin and 0 if not	(-)
Male	1 if sales agent is male and 0 if not	(+)

III. Data and Descriptive Results

The data set for this analysis consists of 138 "sold" properties, which have closed in the previous 36 months at a price over $1,000,000. The dataset was obtained from the Multiple Listing Service database (MLS) from the Greater Las Vegas Association of Realtors (GLVAR). Every observation is located within a guard-gated community in the Las Vegas Metropolitan Area. Of the 138 properties, 68 are located in Summerlin and 70 are located in Henderson. Table 2 also contains the descriptive, mean, standard deviation, minimum and maximum values.

Table 2: Descriptive Statistics:

Variable	Obs	Mean	Std. Dev.	Min	Max
SalesPrice	138	1774282	825410	1000000	4350000
Floors	138	1.65	0.52	1	3
SqFt	138	5691.30	1694.75	3099	11704
Beds	138	4.54	1.00	3	8
Baths	138	5.80	1.36	4	11
Garage	138	3.73	1.65	2	15
Pool	138	0.89	0.31	0	1
Age	138	11.30	5.31	0	26
Fireplaces	138	2.75	1.32	0	7
DOM	138	105.80	110.87	0	573
Summerlin	138	0.49	0.50	0	1
Male	138	0.57	0.50	0	1

The mean sales price of the houses is $1,774,282. To put that in perspective, the mean sales price of a house in the entire United States in 2010 was $272,900, or 6.5 times less than the average observation in this sample. The standard deviation for sales price is $825,409.50. The data reported a maximum sales price of $4,350,000.00, which is nearly 16 times the mean sales price of a house in the entire United States in 2010. The number of floors ranges from 1 to 3. The average square footage is 5691.30 against a national average of 2,491 square feet in 2013 (Perry, 2016). The maximum observation is a house with 8 bedrooms with a mean of 4.54 and a standard deviation of 1.00. On average, there are 5.80 beds with a standard deviation of 1.36. The minimum and maximum bathrooms was 4 and 11, respectively. The range of observations for the variable garage is 2 through 15 spaces, with sixty observations reporting four or more spaces. Moreover, 89.13% or 123 houses of the 139 houses have a pool. The mean age of houses is 11.3 years. The mean of fireplaces is 2.75, the maximum value is 7. The market condition variable DOM (days on the market) is open-ended with a mean of 105.80 and a standard deviation of 110.87 days. The minimum value reported in this variable is 0, of which two observations were 0 and three more were 1; thus five of the houses in the sample sold in one day or less. Finally, 49% of the houses in this sample are located in Summerlin, 57% of the houses were sold by male sales agents, and 43% were sold by female sales agents.

IV. Empirical Results:

Table 4 contains the results of five separately run regressions. The second column contains results based on the full model. The third and fourth columns control for location: Summerlin and Henderson, respectively. The fifth and sixth columns report results controlling for male and female listing agents. P-values are included to account for the significance levels of the individual coefficients. In general, the signs and magnitudes of the coefficients are consistent with expectations, except for Male. For all five regression results, the coefficients that are statistically significant at the 1% level are: SqFt, Age and Summerlin. The remainder of the results contained five variables that are statistically significant at the 5% level; three at the 10% level; and the remaining coefficients are not statistically significant at any conventional level.

It appears that in this high-end micro-market of properties, swimming pools are of significant importance and increase the sales price by 18% in the full model (by 29% in Henderson). Properties in Summerlin have a positive coefficient of 27%, which means that holding all other variables constant that sales prices will be 27% higher. It is clear that there is a very large premium for pools. However, it is more likely that it is not so much a premium than it is a deficiency for a property not having a pool in this sub-market. Homes of over $1,000,000 commonly have very luxurious pools, which cost well over $100,000. Wealthy buyers in the high-end market have an expectation of this characteristic to be present when they purchase a resale. Finally, for every floor added to a home in the Full Model, the sales price will drop by 8%.

When comparing columns three and four for the differences between the areas, the two variables that stand out are Floors, Baths and Pool. In both Summerlin and Henderson there is a negative coefficient for Floors, but it is much greater for Henderson at -.11%, compared to Summerlin at -.04. This means that adding a floor to a property will decrease the sales price by 11% in Henderson and 4% in Summerlin. For Pools, the differences are even greater with positive coefficients of 13% for Summerlin and 29% for Henderson. Homes in Henderson with a pool have a 29% premium in the sales price when compared to homes without a pool within these observations. In this high-end housing sample, buyers prefer single-story properties and are willing to pay a premium.

Columns five and six consist of the gender difference in the listing agent based on the whole data. There are several interesting coefficients to note: Beds, Baths and Summerlin. For Male and Female, the Beds coefficient is negative at -3% and -12% respectively, as it relates to a reduction in the sales price of the property. The coefficient for Baths is negative for Male agents at -.006%, but positive for Female agents at .05%. This difference is very significant since it translates to an approximately 30% difference in sales price in favor of Female agents (based on the average of six bathrooms per home in the whole data). The coefficients for Summerlin are both positive at .24% for Males and .29% for Females. On average, Females are selling homes in Summerlin for 5% more than their Male counterparts.

Table 4: Empirical Results: Full Model, Area and Gender of Listing Agent

Variables	Full Model	Summerlin	Henderson	Agent Male	Agent Female
Floors	-0.086	-0.035	-0.106	-0.069	-0.032
	(2.03)**	(0.56)	(1.64)	(1.18)	(0.43)
SqFt	0	0	0	0	0
	(8.08)***	(5.24)***	(5.57)***	(6.47)***	(4.65)***
Beds	-0.045	-0.128	-0.038	-0.033	-0.119
	(1.53)	(2.41)**	(0.95)	(0.83)	(2.48)**
Baths	0.019	0.116	-0.018	-0.006	0.048
	(0.65)	(2.46)**	(0.47)	(0.15)	(1.15)
Garage	-0.006	0.015	-0.012	-0.03	0.012
	(0.41)	(0.65)	(0.52)	(1.2)	(0.57)
Pool	0.182	0.127	0.291	0.145	0.175
	(2.88)***	(1.68)*	(2.32)**	(1.52)	(1.93)*
Age	-0.028	-0.026	-0.035	-0.034	-0.018
	(6.90)***	(5.09)***	(4.62)***	(5.83)***	(3.16)***
Fireplaces	0.028	0.045	0.03	0.012	0.037
	(1.68)*	(1.61)	(1.33)	(0.49)	(1.74)*
DOM	0	0	0	-0.001	0
	(1.32)	(1.92)*	(0.43)	(2.04)**	(0.44)
Summerlin	0.272			0.238	0.288
	(6.68)***			(4.03)***	(5.08)***
Male	-0.041	-0.033	-0.006		
	(1.04)	(0.58)	(0.1)		
_cons	13.545	13.581	13.669	13.821	13.326
	(95.32)***	(68.86)***	(63.54)***	(64.99)***	(69.42)***
R2	0.72	0.76	0.73	0.73	0.78
N	138	68	70	79	59

* p<0.1; ** p<0.05; *** p<0.01

Note: Numbers in parenthesis are t-values

The asterisks *, ** and *** indicate statistical significance at the 0.1, 0.05 and 0.01, respectively.

The R^2 results for each of the variables in this model all show moderately strong goodness of fit. The R^2 result is .72 percent for the Full Model, which suggests that 72% of the variation in the sales price of homes within this data set can be explained by the full regression model. The R^2 results for the areas of Summerlin and Henderson are .76 and .73 percent, respectively, pertaining to the regression results when separating out for the two separate areas, meaning that 76% and 73% of the variation in the sales prices of homes within this dataset can be explained by the full regression model.

Table 5: Gender Differences in the Form of Monetary Returns by Each Variable:

	Full Model			Agent Male		Agent Female		Difference Female - Male	
Variables	Mean	Coefficient	Total Value	Coefficient	Total Value	Coefficient	Total Value	Coefficient	Total Value
SalesPrice	$1.774.282.00		$1.774.282.23		$1.741.242.79		$1.781.424.01		$ 40.181.21
_cons	1	$ 273.737.64	$ 273.737.64	$ 656.455.45	$ 656.455.45	-6837.960376	$ (6.837.96)	$ (663.293.41)	$(663.293.41)
Floors	1.65	$(233.884.82)	$ (386.418.41)	$(173.311.76)	$ (286.341.19)	-177622.4487	$ (293.463.19)	$ (4.310.69)	$ (7.122.00)
SqFt	5691.30	$ 406.10	$2.311.256.52	$ 430.27	$2.448.786.44	388.0392279	$2.208.446.49	$ (42.23)	$(240.339.95)
Beds	4.54	$ (67.369.29)	$ (306.090.88)	$ (40.405.94)	$ (183.583.48)	-196358.3741	$ (892.149.95)	$ (155.952.44)	$(708.566.47)
Baths	5.80	$ 2.822.89	$ 16.364.58	$ (51.162.32)	$ (296.593.14)	80510.43927	$ 466.727.15	$ 131.672.76	$ 763.320.29
Garage	3.73	$ (34.019.92)	$ (126.958.41)	$ (79.657.33)	$ (297.271.93)	-2745.646297	$ (10.246.43)	$ 76.911.69	$ 287.025.49
Pool	0.89	$ 372.330.22	$ 331.859.52	$ 352.010.51	$ 313.748.48	317001.6046	$ 282.544.89	$ (35.008.90)	$ (31.203.59)
Age	11.30	$ (54.476.81)	$ (615.430.00)	$ (66.950.23)	$ (756.343.43)	-33470.11944	$ (378.115.29)	$ 33.480.11	$ 378.228.14
Fireplaces	2.75	$ 35.374.80	$ 97.152.53	$ 7.041.02	$ 19.337.30	59779.23755	$ 164.176.32	$ 52.738.22	$ 144.839.03
DOM	105.80	$ (566.10)	$ (59.895.89)	$ (1.225.51)	$ (129.664.23)	-254.8638803	$ (26.965.69)	$ 970.65	$ 102.698.54
Summerlin	0.49	$ 532.845.78	$ 262.561.67	$ 512.857.81	$ 252.712.53	542477.3555	$ 267.307.67	$ 29.619.55	$ 14.595.14
Male	0.57	$ (41.673.65)	$ (23.856.65)	$ -	$ -	$ -	$ -	$ -	$ -

*** Note: Total Value is equal to the model's coefficient in relation to the variables full model mean.

Table 5 above outlines all the variable coefficients into their respective monetary values based on the Full Model mean values. The results show that at the mean sales price of $1,774,242.79, Female listing agents have a sales price that is $40,181.21 higher than that of their Male counterparts. Women are outperforming men at the mean sales price.

Table 6: Sales Breakdown by Location and Gender

Average final sales price of a sold house.

Model	Women	Men
Summerlin	$2.021.850.00	$1.730.419.00
Henderson	$1.615.691.00	$1.767.590.00
Full	$1.808.444.00	$1.748.769.00

Table 7: Sales Breakdown by Location and Gender				
Average $/SqFt of a sold house				
Model		Women		Men
Summerlin		$366.36		$341.00
Henderson		$271.27		$271.41
Full		$316.40		$306.64

Tables 6 and 7 above breakdown the sales by location, gender, average final sales price and average sales price per square footage. When you consider the average sales price of sold homes, we see that men are outperforming women in Henderson ($1,767,590 vs. $1,615,691). But, in contrast, women have a higher sales price than men in Summerlin. The difference is obvious when you observe the average price per square foot in Table 7. When looking at the per square foot differences between males and females, it becomes clear that the difference is negligible in Henderson ($271.41 vs. $271.27), the real difference lies in the Summerlin averages in which Males are selling at $341 per SqFt on average and Females are selling at $366.36 per SqFt on average. It was previously stated that men have a sales price that is on average 4% lower than that of females. This difference is isolated in the Summerlin Data. It was also previously noted in Table 3 that the coefficients Beds, Bath and Summerlin had the greatest impact on the differential between Male and Female listing agents. Based on these results, it would be prudent for women to adjust their habits and concentrate on the area and housing amenities that have produced the greatest returns in the high-end micro-market in the Las Vegas Metropolitan housing market.

VI. Conclusion

The purpose of this paper was to analyze how affluent people value certain characteristics of high-end homes in the Las Vegas Metropolitan housing market. The data is comprised of homes sold in the past 36-month period for $1,000,000 or more and that are all located in similar Master Planned Guard Gated communities in Summerlin and Henderson. We also analyzed the data with regard to the gender of the listing agent to find out if one gender outperforms the other.

The key results show that in this high-end micro-market of properties there are certain characteristics for which affluent people are willing to pay premiums. Pools are found to be of significant importance and increase the sales price by 13% in Summerlin and by 29% in Henderson. Buyers were also willing to pay a 27% premium for properties located in Summerlin

over homes located in Henderson. These wealthy buyers also preferred single story homes and we found that for every floor added to a home the sales price dropped by 8%.

When evaluating data on listing agents we found that in general Male listing agents have a sales price that is 4% lower than Female listing agents. We also found that the difference in Baths between Male and Female listing agents was significant and accounted for an approximate 30% difference in the average sales price between the cohorts. The mean sales price of the whole data was found to be $1,774,242.79, and Female listing agents have a sales price that is $40,181.21 higher than that of their Male counterparts. On Average, Female listing agents are outperforming Males at the mean sales price. When looking specifically at Summerlin, Female listing agents had a higher sales price per square foot as well. Based on all the results, we found that Summerlin had the greatest impact on the differential between Male and Female listing agents.

One must consider that all agents of both genders are free to market and sell any property in the area in any price range. Given that all real estate professionals are commission based and that every transaction in any given price range involves a relatively equal amount of effort, obtaining the highest price per square foot in the highest price range possible will maximize their earning potential. We believe that it is improbable that Males are being discriminated against as far as sales, ability or some other variables.

However, we find it more likely that Female listing agents have been able to adjust their habits and concentrate on the area and housing amenities that have produced the greatest returns in the high-end micro-market in the Las Vegas Metropolitan housing market.

As a future extension that could strengthen this study, one could add additional variables to the data such as butler's pantries or number of closets (things that might be important to a high-end buyer). Additional variables such as number of years the listing agent has been licensed, their age, and whether or not they have kids, could lead to a deeper analysis of the differences in the listing agents' statistics.

Reference

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