EFFECTS OF PHYSICAL CHARACTERISTICS ON INITIAL LISTING PRICE, TIME ON MARKET, AND ULTIMATE SELLING PRICE

by

Meredith Jones

A Senior Honors Project Presented to the

Honors College

East Carolina University

In Partial Fulfillment of the

Requirements for

Graduation with Honors

by

Meredith Jones

Greenville, NC

May 2018

Approved by:

Kimberly Luchtenberg

Department of Finance

East Carolina University College of Business

Abstract

A house is comprised of many different attributes that may affect how well it performs when listed for sale on the market. This study examines how certain physical characteristics of a house affect its listing price, time on market, and ultimate selling price. The physical characteristics in this study include age of the house, size of the house, number of bedrooms, number of bathrooms, presence of a fireplace, number of stories, and whether the home is waterfront. Data were collected from an Eastern North Carolina county and regression analysis was performed. The findings indicate age, size, number of baths, and whether a fireplace is present in a house all have a significant impact on the list price and sold price. The physical attributes of a house have no clear effect on the total number of days the house is for sale on the market.

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Effects of Physical Characteristics on Initial Listing Price, Time on Market, and Ultimate Selling Price

Throughout individuals' lifetimes, they will likely engage in the purchasing and selling of real estate property. Having knowledge of the real estate market is essential to optimize the chances of satisfying one's needs when buying or selling (Asabere and Huffman, 1993). This paper seeks to give insight into the behavior of the Pitt County housing market, particularly focusing on single-family residential homes. 12 C.F.R. §541.25 defines a single-family dwelling as "a structure designed for residential use by one family, or a unit so designed, whose owner owns, directly or through a non-profit cooperative housing organization, an undivided interest in the underling real estate, including property owned in common with others which contributes to the use and enjoyment of the structure or unit" (2004). Therefore, condominiums, townhomes, and manufactured homes are not considered single-family residences.

It is apparent that there are many factors that can affect the value of a home when selling or purchasing (Sirmans, Macpherson, & Zietz, 2005). Many studies have been performed that examine the relationship between listing price, marketing time, and selling price in regard to price concessions, seller motivation, marketing platforms, etc. (Haurin, Glower, & Hendershott, 1998, Springer, 1996). However, sellers are able to control these previously mentioned factors. Size, number of bedrooms and bathrooms, age of the home and location are just a few factors that sellers cannot control, or are extremely costly to control, when they decide to sell their home.

This research contributes to the large literature of hedonic real estate pricing models by giving a closer look at Eastern North Carolina's real estate market. The results will enhance the ability of sellers and their real estate brokers to understand how these uncontrollable factors

affect the listing price, marketing time, and selling price of their real estate. Buyers should also consider these uncontrollable factors during the home buying process as it could explain why some houses on the market have yet to sell. This research will also help buyers identify properties that have a greater potential resale value should market conditions stay constant.

Background

Sellers and real estate brokers of single-family residential properties must determine the initial price at which they want to list their home, which proves to be a difficult task (Knight, 2002). Although comparative market analyses and appraisals aid in determining an initial list price, the objective of the seller/broker of wanting to sell the property for the greatest price in the shortest amount of time is what makes this task challenging (Asabere and Huffman, 1993, Springer, 1996). There are typical complications that can arise when selecting an appropriate initial list price. For instance, if the house is priced too high, the pool of potential buyers may be reduced. Additionally, holding costs may increase because of the lengthier time on market. Yet, if the house is priced too low, it could sell very quickly but at a price lower than what could have been achieved if it had stayed on the market longer (Knight, 2002). The list price decision is important because it can affect both market duration and final sales price.

Lacking the knowledge of how the physical characteristics of the property affect the selling price and selling time is another added burden. Since age, size, number of bedrooms, number of bathrooms, presence of a fireplace, number of stories, and location of the property, in regard to whether it is waterfront, are characteristics that are frequently analyzed in recent literature, they will be examined in this paper (Sirmans, Macpherson, & Zietz, 2005). Also, the size, age, and number of stories are some of the most important attributes of a property, according to Grether and Mieszkowski (1973). All of these characteristics, suggest that houses

are a heterogeneous good, as opposed to a homogenous good, which makes it difficult to predict how the house will perform on the market (Sirmans, Macpherson, & Zietz, 2005).

Purpose

The purpose of this study is to examine how certain physical characteristics of a house affect its listing price, time on market, and ultimate selling price. The physical characteristics that this project will focus on includes: age of the house, size of the house, number of bedrooms, number of bathrooms, presence of a fireplace, number of stories, and whether the home was waterfront. Unlike a typical appraisal process that only estimates the value of a home, this study examines how physical characteristics affect how the house will perform on the market. By the end of this project, the relationship between these physical characteristics and initial listing price, market duration, and actual selling price will have been revealed. Beyond its academic motivation, this study conveys practical information that will assist real estate brokers in determining the best initial listing price.

Methodology

Data were received from the North Carolina Regional Multiple Listing Service (NCRMLS). This multiple listing service allows its users to view properties that are active, closed, expired, pending, or cancelled in the southeastern region of North Carolina. Although NCRMLS issues an accuracy disclaimer to protect against liability, the data collected appears to be clean and complete relative to other similar house transaction data. For the properties in the NCRMLS that have been sold, the original list price, cumulative days on market, and final sales price are presented on housing reports. The housing reports also include every detail about the property in regard to size, features, location, zoning, etc. All of the physical attributes that are examined in this study is present on the reports.

The data consist of 1,665 single-family residences that were sold in Pitt County between January 1, 2016 and December 31, 2016. It is then inserted into the analytics and data management software SAS, where multivariate and linear regression analyses are performed.

According to the North Carolina Real Estate Commission, square footage is defined as the living area of a residential property that is heated, finished, and directly accessible from other living areas of the property (2013). NCRMLS abides by the North Carolina Real Estate Commission guidelines, thus size of the home is defined as such in this study. Age of the home pertains to the age at the time the real estate transaction occurred. Time on market refers to the number of days that elapsed from when the home was put on the market for sale to when an offer was submitted *and* accepted to become a ratified contract.

The basic variables used in the regression can be found in Figure 1.

Figure 1: Variable Definitions

List price	original listing price of the house in dollars
Sold price	selling price of the house in dollars
CDOM	total number of days house was for sale and not under contract
Age	age of the house at the time of sale (in years)
Size	square feet of living space
Beds	number of bedrooms
Baths	number of bathrooms
Stories	the number of stories in the house
Fireplace	dummy = 1 if there is at least 1 fireplace
Waterfront	dummy = 1 if the house is waterfront

Results & Discussion

Descriptive Statistics

Of the 1,665 houses that closed in Pitt County from January 2016 to December 2016, the average house stayed on the market for about three and one-half months. The average age of the homes sold is about 23 years. Homes with 0 for age indicates that the home is new construction and is less than one year old. Dummy variables for waterfront and fireplace are included. The average sold price is slightly less than the average list price, which is as expected since most

realtors negotiate tremendously to obtain the lowest purchase price for their buyer clients. Other descriptive statistics are shown in Table 1. The results are encouraging and nearly all of the variables have reasonable results for mean, standard deviation, minimum, and maximum. However, it is unusual that the average size of the house is roughly 2,000 square feet. This seems rather large; however, the standard deviation is 812.67, which shows that the data is widely spread.

Table 1: Summary Statistics

Variable	n = 1665 Mean	Std Dev	Minimum	Maximum
Age	22.697	21.784	0	115
Size	2064.780	812.670	691	8562
Beds	3.307	0.649	2	6
Baths	2.358	0.676	1	6.5
Fireplace	0.853	0.354	0	1
Stories	1.416	0.511	1	3
Waterfront	0.003	0.055	0	1
CDOM	105.419	133.880	0	1226
List Price	193022.580	109233.470	14900	1425000
Sold Price	184786.410	104924.510	10500	1425000

Correlations

Both Pearson correlations and Spearman correlations were computed. Under both correlations, size and list price possess a high positive relationship with the Pearson correlation coefficient and Spearman correlation coefficient being 0.77793 and 0.85908, respectively. Since list price and sold price have a very high correlation, 0.98254 Pearson correlation coefficient and 0.98704 Spearman correlation coefficient, we also see that size and sold price are positively correlated. The variables of beds and baths both are positively correlated with size, list price, and sold price, as expected.

CDOM and the dummy variable representing whether the house is waterfront do not correlate with any other variable included in the data. Age is negligibly correlated with all variables with the exception of list price and sold price, in which we see a slightly negative correlation.

The natural log of the dependent variables list price and sold price is used in determining the correlations of variables and the regression analysis discussed later in this paper. Pearson correlation coefficients and Spearman correlation coefficients can be found in Table 2 and Table 3, respectively. Results are reasonable and as expected.

Table 2: Pearson Correlation Coefficients

Pearson Correlation Coefficients, N = 1665
Prob > |r| under H0: Rho=0

	Age	*Size*	*Beds*	*Baths*	*Fireplace*	*Stories*	*Waterfront*	*CDOM*	*List Price*	*Sold Price*
Age	1									
Size	-0.126	1								
Beds	-0.102	0.672	1							
Baths	-0.289	0.816	0.661	1						
Fireplace	-0.220	0.258	0.165	0.271	1					
Stories	-0.250	0.455	0.382	0.483	0.202	1				
Waterfront	-0.013	0.164	0.025	0.117	0.023	-0.023	1			
CDOM	-0.019	0.088	0.080	0.077	-0.042	0.044	0.006	1		
List Price	-0.442	0.778	0.528	0.731	0.399	0.453	0.107	0.052	1	
Sold Price	-0.471	0.734	0.507	0.706	0.411	0.444	0.102	-0.004	0.983	1

Table 3: Spearman Correlation Coefficients

Spearman Correlation Coefficients, N = 1665
Prob > |r| under H0: Rho=0

	Age	*Size*	*Beds*	*Baths*	*Fireplace*	*Stories*	*Waterfront*	*CDOM*	*List Price*	*Sold Price*
Age	1									
Size	-0.167	1								
Beds	-0.137	0.665	1							
Baths	-0.262	0.791	0.650	1						
Fireplace	-0.181	0.322	0.172	0.291	1					
Stories	-0.265	0.546	0.414	0.570	0.205	1				
Waterfront	-0.007	0.082	0.035	0.088	0.023	-0.023	1			
CDOM	-0.043	0.050	0.071	0.053	-0.021	0.032	-0.006	1		
List Price	-0.428	0.859	0.563	0.744	0.373	0.527	0.077	0.045	1	
Sold Price	-0.467	0.839	0.555	0.733	0.374	0.525	0.078	-0.015	0.987	1

Multivariate Analysis Using Multiple Regression

How much a home is originally listed for and ultimately sold for depends on the physical attributes that are present in the home. The amount of time the home spends on the market is also dependent upon these physical characteristics. We therefore follow the example of other studies, for example, Grether and Mieszkowski (1973) and use regression analysis

where

LP	=	natural log of the original list price of the house in dollars
SP	=	natural log of the ultimate sold price of the house in dollars
CDOM	=	total number of days house was for sale and not under contract
A	=	age of the house at the time of sale (in years)
S	=	square feet of living space
B	=	number of bedrooms
B_1	=	number of bathrooms
S_1	=	the number of stories in the house
F	=	a dummy variable for whether a fireplace is present
W	=	a dummy variable for whether the house is waterfront

List price. The dependent variable used in this regression is list price. The data reveals that the independent variables reliably predict list price, with the variables of age, size, baths, and fireplace being statistically significant. In addition, r-square is equal to 0.7481; thus, 74.81% of the variance of list price is explained by the independent variables.

Table 4 Panel A: Parameter Estimates
Dependent Variable: List Price

Variable	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	11.0130	0.0417	264.3000	<.0001
Age	-0.0073	0.0003	-22.1200	<.0001
Size	0.0004	0.0000	27.0900	<.0001
Beds	-0.0180	0.0143	-1.2600	0.2086
Baths	0.0754	0.0186	4.0500	<.0001
Fireplace	0.2152	0.0196	10.9800	<.0001
Stories	0.0247	0.0151	1.6400	0.1015
Waterfront	-0.1260	0.1230	-1.0200	0.3055

Table 4 Panel B: Fit Statistics
Dependent Variable: List Price

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	7	352.3016	50.3288	703.0200	<.0001
Error	1657	118.6245	0.0716		
Corrected Total	1664	470.9261			

Root MSE	0.2676	R-Square	0.7481
Dependent Mean	12.0366	Adj R-Sq	0.7470
Coeff Var	2.2229		

The following is the equation used to determine initial list price:

$$LP = 11.0130 - 0.0073A + 0.0004S - 0.0180B + 0.0754B_1 + 0.2152F + 0.0247S_1 - 0.1260W$$

Results are encouraging and as expected. It is typical to see that the physical attributes of a home are used to determine the initial list price, although there are other factors that need to be reasonably considered to increase the accuracy of the model.

Sold Price. The ultimate selling price is the dependent variable used in this regression analysis. It was revealed that the independent variables age, size, baths, and fireplace are statistically significant and that the independent variables reliably predict sold price since the p value is less than 0.0001. R-square is equal to 0.7132, suggesting that 71.32% of the variance is explained by the model.

Table 5 Panel A: Parameter Estimates
Dependent Variable: Sold Price

Variable	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	10.9097	0.0481	226.9400	<.0001
Age	-0.0087	0.0004	-22.8000	<.0001
Size	0.0004	0.0000	22.6700	<.0001
Beds	-0.0078	0.0165	-0.4700	0.6387
Baths	0.0864	0.0215	4.0200	<.0001
Fireplace	0.2627	0.0226	11.6200	<.0001
Stories	0.0296	0.0174	1.7000	0.0897
Waterfront	-0.0984	0.1419	-0.6900	0.4881

Table 5 Panel B: Fit Statistics
Dependent Variable: Sold Price

	Analysis of Variance			
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	7	392.6165	56.0881	588.6300	<.0001
Error	1657	157.8895	0.0953		
Corrected Total	1664	550.5060			

Root MSE	0.3087	R-Square	0.7132
Dependent Mean	11.9798	Adj R-Sq	0.7120
Coeff Var	2.5767		

The following is the equation used to determine sold price:

$$SP = 10.9097 - 0.0087A + 0.0004S - 0.0078B + 0.0864B_1 + 0.2627F + 0.0296S_1 - 0.0984W$$

Like with list price, results are reasonable. The strong correlation of list price and sold price explains why the regression results are similar. As mentioned above, there are several additional factors that should be considered to improve the accuracy of the above equation; however, the results make sense and fit with the assumption that physical attributes of a home can predict sold price.

Cumulative Days on Market. Cumulative Days on Market (CDOM) is the final dependent variable used in this study. None of the independent variables are statistically significant and with a p value of 0.002, they do not reliably predict CDOM. R-square is a mere 0.0135, meaning that only 1.35% of the variance of CDOM can be explained by the independent variables.

Table 6 Panel A: Parameter Estimates
Dependent Variable: CDOM

Variable	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	79.5488	20.7526	3.8300	0.0001
Age	-0.1235	0.1645	-0.7500	0.4530
Size	0.0128	0.0076	1.6800	0.0924
Beds	6.8003	7.1291	0.9500	0.3403
Baths	1.0601	9.2735	0.1100	0.9090
Fireplace	-28.0749	9.7615	-2.8800	0.0041
Stories	0.9035	7.5199	0.1200	0.9044
Waterfront	-16.4532	61.2388	-0.2700	0.7882

Table 6 Panel B: Fit Statistics
Dependent Variable: CDOM

Analysis of Variance				
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	7	402729	57533	3.2400	0.0020
Error	1657	29422728	17757		
Corrected Total	1664	29825457			

Root MSE	133.2540	R-Square	0.0135
Dependent Mean	105.4186	Adj R-Sq	0.0093
Coeff Var	126.4046		

The results suggest that this model is not adequate to reasonably predict CDOM. CDOM did not correlate with any other variables, which further suggests that the physical characteristics of a home have little to no effect on how long the home stays on the market.

Conclusion

This paper finds that the physical attributes of a home have an effect on the initial listing price and ultimate selling price of a home in Pitt County. List price and sold price are strongly correlated with each other judging by the results of the regression analyses. CDOM is not correlated with any other variable in this study; thus, the regression analysis shows that the variance in CDOM cannot be explained by the independent variables. Both list price and sold price possess statistically significant variables and the variance in both can be explained by the independent variables.

Limitations & Future Research

As with any study, there are limitations. The data used in this study contain only homes processed through the North Carolina Regional Multiple Listing Service (NCRMLS), and our results only apply to the location and time for which the data were collected. Homes that were for sale by owners are not typically listed in the NCRMLS, unless the owners pay a fee. Therefore, these homes were not included in this research.

This research can be performed across multiple counties, states, or geographic regions to allow consumers to have a better understanding of how their home will perform on the market when listed. Additional physical characteristics can also be added. A suggestion when trying to recreate this study is including other factors, not just physical factors, such as seller motivation, financing, etc. Research can also be done that solely focuses on how foreclosures, new construction, and investment properties perform on the market. Obviously, real estate market performance is widely studied and there are several routes that can be taken to further broaden this research.

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