

# Determining the Value of Homeowners Associations Using Statistical Methods

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2021–22 Byron Hanke Fellow  
November 2022

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**Author Note:** This is a preprint and research has not been peer reviewed, do not consider this as a publication. Authors are in the process of submitting for journal publication. Please contact the corresponding author for updated citation information. Dr. Isabella Sanders is an Assistant Professor of Systems Engineering at the United States Military Academy – West Point and 2LT Brett Boswell is a 2022 graduate of West Point with a B.S. in Systems Engineering. The funding source of this project is the Byron Hanke Fellowship which was awarded by the Foundation for Community Association Research (FCAR) to Dr. Sanders as a PhD student at Georgia Tech.

**Abstract:** Residential Community Associations, specifically Atlanta condominiums and planned communities (collectively Community Associations), charge monthly or yearly fees to provide services and regulation within residential neighborhoods. In this study, we examine whether ownership (and mandatory membership in such Associations increase sale price and or market value of a home. We build a novel dataset consisting of both properties with HOA membership and without HOA membership within the suburbs of the Atlanta Georgia. Through the use of linear regression and hypothesis testing we find that in almost all cases, membership in an HOA does increase property sale price and market value.

**Keywords:** Zillow ZTRAX<sup>1</sup>, Homeowner's Association, Georgia, Linear Modeling, Regression, Hypothesis Testing

## 1. Introduction

A Residential Community Association, or RCA, is a planned residential community, overseen by a board of directors often with the assistance or professional management organization. Associations are governed by Covenants, Conditions & Restrictions (CC&R's) (Langbein 2004, Rogers 2006, Hopkins 2017). The most commonly known form of an RCA is a Homeowners Association or HOA. HOA's are often used by municipalities to provide local public services, and serve as privatized regulations (via the CC&Rs) to their members (Meltzer & Cheung 2014). RCA's have gained popularity since their inception in the mid-20<sup>th</sup> century. In the 1970's there were approximately 10,000 RCAs across the USA with 2.1 million residents. Today, there are over 355,000 RCA's with over 60 million residents (Treese 2020).

Originally, theoretically, RCAs were formed to fill gaps in public services and regulation in residential neighborhoods (Helsely & Strange, 1998). However, though RCA's do typically provide exclusive services found beyond the public sector, their main purpose is to preserve home value as noted by many RCA presidents (Bourdreaux & Holcombe 2002). In fact, a 2016 survey done by Scheller, he found that 97% of HOA presidents stated that they agreed or strongly agreed that the main goal of an HOA was to protect property values (Scheller 2016).

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<sup>1</sup> "Data provided by Zillow through the Zillow Transaction and Assessment Dataset (ZTRAX). More information on accessing the data can be found at <http://www.zillow.com/ztrax>. The results and opinions are those of the author(s) and do not reflect the position of Zillow Group."

This begs the question, do HOA's truly protect property values? Literature shows a mix of positive (Meltzer & Cheung 2014, Rogers 2006, Angjellari-Dajci et al. 2015, Scheller 2016) and negligible or negative (Groves 2008, Dehring & Lind 2007, Langbein & Spotswood-Bright 2004) impacts of HOA's on property value. Since a lot of HOA information is private, data is the largest barrier to conducting further empirical studies to answer this question (Meltzer & Cheung 2014). Many previous authors had to make large assumptions about HOA membership addresses to conduct their studies. In this study we build a novel dataset collected directly from the HOA's themselves alongside Zillow ZTRAX data.<sup>1</sup> We study three specific HOA communities as well as three matched-pair non-HOA communities within the state of Georgia. We study the impact of HOA's on sale price using both linear regression and hypothesis testing. This is the first empirical study to our knowledge which focuses on HOA's at such a granular level where each address has been confirmed as active member in the HOA at the time of publishing.

## **2. Literature Review**

An HOA is a specific type of Residential Community Association. Many authors use the terms RCA, HOA and gated community interchangeably. Through the literature review we maintain the terminology used by the original author when cited. In this paper, we focus on HOA's as they make up the dataset within our case study. Therefore, beyond the literature review, we will solely refer to the communities in the case study as HOA's. Homeowner's associations typically incorporated nonprofit organizations where the homeowners in the community share ownership of any communal resources (Cheung & Meltzer 2014). Examples of communal resources include security, pools, community centers, gyms and playgrounds. These HOA's are meant to preserve the neighborhood and are governed by CC&R's. They are either managed by a board of directors usually consisting of homeowners within the HOA or a professional management organization (Langbein 2004, Rogers 2006, Hopkins 2017). HOA's are found nationwide and have seen great growth over the past few decades (Treese 2014). However, many individuals are skeptical of the actual value of an HOA membership. Is it worth the fees and upkeep?

The value of an HOA can be measured in many ways. Scheller defines the value of community associations through a neighborhood hierarchy of needs consisting of improvement of property values, professional management, neighborhood behavior monitoring, aesthetics, and crime deterrence (Scheller 2016). Hopkins notes safety, homogeneity and exclusivity as the main reasons for gated communities (Hopkins 2017). While there are several ways to measure the value of an HOA, several studies noted that preservation home value is the main purpose of HOA's (Bourdreaux & Holcombe 2002, Scheller 2016). Therefore, this study solely focuses measuring value through analyses of property sale price and market value. There are few empirical studies in literature which study the impact of HOA membership on property value (Meltzer & Cheung 2014). This paper aims to fill the gap by taking data driven approach to analyze value at the individual neighborhood association level.

The vast majority of existing empirical studies use hedonic regression as the methodology for measuring impact on property value. There is a mix between positive, negligible, and negative results. Meltzer & Cheung (2014) found that houses within HOA's sell at a 5% premium in Florida. Rogers (2006) found that properties within Greeley, CO which had restrictive covenants sold at a 3.1% premium. Angjellari-Dajci et al. (2015) found that real price was positively increased by HOA membership in North Florida. Groves (2008) found that generally while homes with

HOA memberships sold for higher, this no longer held true when controlling for certain factors in a study done in Saint Louis County, MO. Dehring & Lind (2007) found that covenanted properties in Southlake Texas sold for 21% less. Langbein & Spotswood-Bright (2004) found that private governments reduced property values likely due to the overpricing of fees. In this paper we also perform a regression analysis as is a proven technique in literature but add hypothesis testing to strengthen the statistical analysis.

Many existing studies use GIS methods to build their HOA datasets which comes with limitations. Meltzer and Cheung (2014) generate their dataset through HOA officer information. They assume that any addresses located within the same parcel are within the same HOA. While this generally holds, this is a broad assumption. There are sure to be several houses in this dataset that are miscategorized. Groves (2008) and Rogers (2006) also build large datasets using spatial techniques that are subject to similar mis categorizations. In fact, Rogers calls for future research to analyze RCA covenants and ensure that selected properties are current members of RCA's. This paper answers this call, only using addresses that have been confirmed by the HOA's themselves and pulls corresponding data from both the HOA and Zillow's ZTRAX database.

Our paper aims to add to the growing literature of papers addressing the impact of HOA membership on property value by studying HOA's within suburban Georgia using both linear regression and hypothesis testing.

### **3. Collection of Data**

This study pulls data from Atlanta neighborhoods within the state of Georgia. The authors contacted HOA lawyers, HOA managers and HOA realtors to gather accurate and timely data on such neighborhoods. The following HOA neighborhoods were selected as part of this study: Diamond Ridge, Hedgerow, Parkwood Commons, and Weatherstone Park. Diamond Ridge is in Canton, Hedgerow is located in Roswell, Parkwood Commons is located in Acworth, and Weatherstone Park is located in Buford. These four cities are suburbs located north of Atlanta.

In order to provide meaningful results, each HOA neighborhood needed to be matched with a non-HOA neighborhood located in the same city. According to Theiler (2013), classification problems with a matched-pair structure have significantly better classification accuracy. Zillow and Google Maps were used to find neighborhoods of similar size located within the same county that were not part of an HOA. They also shared the same or similar school districts, crime rates, house style and acreage. The following neighborhoods are the selected non-HOA communities to match the HOA neighborhoods: Hillcrest in Canton, Barrington Farms in Roswell, Wade Green Station in Acworth, and Quail Creek in Buford. Once each HOA neighborhood was matched with a non-HOA neighborhood, we collected data using the Zillow Transaction and Assessment Database (ZTRAX). The ZTRAX database is the largest real estate database in the nation that is available for academic research. The database is updated quarterly and includes property characteristics, geographic information, and valuations for millions of homes across the nation. The ZTRAX database is split into two sub-categories, ZTrans and ZAsmt. ZTrans includes all the transactional data while ZAsmt includes the assessment data (Zillow 2021). The ZTRAX database totals almost 900 GB of data. Due to its size, we downloaded the most updated version of the database in the third quarter of 2021 and uploaded it to a local server at the United States Military Academy.



Once the data was uploaded to the local server, detailed datasets of the Atlanta Georgia neighborhoods were created. First, we determined what would be the most impactful factors of a home's sale value and market value. The same lawyers, managers and managers that aided in data selection also provided input in the importance of each of these factors. These factors came from the ZAsmt sub-database and include lot size, year built, year remodeled, number of stories, total rooms, total bedrooms, total kitchens, total bathrooms, number of fireplaces, garage size, and building area in square feet. All these factors as well as the house addresses and map coordinates were scraped from the local server's ZTRAX database. A dataset was created for each neighborhood, which totaled eight datasets, so that they could be rigorously examined for outliers, duplicates, and other mistakes. All but two of the neighborhoods had data on over 100 homes. The Parkwood Commons data set only had 64 homes, which is sufficient for our testing. However, the Hedgerow neighborhood contained data on only 6 homes. After further investigation, it was found that there were so little datapoints since the ZTRAX database did not include the majority of the homes in the Parkwood neighborhood. Therefore, the neighborhoods in Roswell, Georgia including Parkwood Commons and Barrington Farms were dismissed from further testing. Additional investigation showed that many of the factors were not available for the homes in the datasets. Many of the homes did not provide include the year built, year remodeled, total number of rooms, total number of kitchens, total bathroom count, lot size, and garage size. Some of these factors were included in the preliminary data, and when we conducted testing using all the preliminary variables, very few were significant to the model. Many of these factors have a lower impact on the sale price and market value compared to the other factors, thus they were taken out of the model. At this point, we combined the six datasets into a single cumulative dataset consisting of 679 homes and the six factors that were significant in the model. The final six factors were number of stories, total number of bedrooms, total market value, sale price, building area, and a binary HOA value. For HOA value, the factor equals one for homes in an HOA and zero for homes not in an HOA. We scrutinized the final dataset to ensure it was accurate and prepared for modeling. Table 3 shows that each HOA neighborhood is properly matched with a non-HOA neighborhood. In each of the three Georgia cities, the average sale price and market value of the neighborhoods are matched closely. Having closely matched neighborhoods is important to this study to ensure that the results are not skewed.

Table 1. Description of All Neighborhoods Examined

Neighborhood	Location	Number of Homes	Number of Streets	Zip Code	FIPS Code	HOA
<i>Diamond Ridge</i>	Canton	230	7	30114	13057	Yes
<i>Hillcrest</i>	Canton	120	5	30115	13057	No
<i>Hedgerow</i>	Roswell	295	18	30075	13121	Yes
<i>Barrington Farms</i>	Roswell	245	12	30076	13121	No
<i>Parkwood Commons</i>	Acworth	304	14	30102	13067	Yes
<i>Wade Green Station</i>	Acworth	215	11	30102	13067	No
<i>Weatherstone Park</i>	Buford	175	6	30519	13135	Yes
<i>Quail Creek</i>	Buford	145	8	30519	13135	No

The table above, Table 1, shows the collection of data on the eight neighborhoods examined for this study. As shown, all the neighborhoods are located rather close to each other and contain well over 100 homes. Each neighborhood is located about 40 miles north of Atlanta.

Table 2. Description of Neighborhoods Used in Testing

Neighborhood	Location	Number of Homes	Number of Streets	Zip Code	FIPS Code	HOA
<i>Diamond Ridge</i>	Canton	135	7	30114	13057	Yes
<i>Hillcrest</i>	Canton	106	5	30115	13057	No
<i>Parkwood Commons</i>	Acworth	64	14	30102	13067	Yes
<i>Wade Green Station</i>	Acworth	161	11	30102	13067	No
<i>Weatherstone Park</i>	Buford	145	6	30519	13135	Yes
<i>Quail Creek</i>	Buford	106	8	30519	13135	No

Table 2, above, shows the final data of the six neighborhoods we used in testing. As mentioned before, we threw out the Roswell neighborhoods because Zillow had very little data on the homes in those neighborhoods. Furthermore, the number of homes for each neighborhood was reduced since Zillow did not have data on all available homes in the neighborhoods. After collecting the data from Zillow, each neighborhood contained over 60 datapoints which is enough to deduce statistically significant results.

Table 3. Matched Neighborhoods in each Georgia City

	Canton, GA		Acworth, GA		Buford, GA	
	<i>Diamond Ridge</i>	<i>Hillcrest</i>	<i>Parkwood Commons</i>	<i>Wade Green Station</i>	<i>Weatherstone Park</i>	<i>Quail Creek</i>
	HOA	Non-HOA	HOA	Non-HOA	HOA	Non-HOA
<b>Average Sale Price</b>	\$ 190,088.90	\$ 133,808.50	\$ 162,211.90	\$ 151,777.20	\$ 211,337.80	\$ 210,634.60
<b>Average Market Value</b>	\$ 206,153.30	\$ 182,831.10	\$ 190,360.30	\$ 188,006.20	\$ 252,659.30	\$ 286,611.30

#### 4. Approach and Methodology

The purpose of this research is to determine whether Homeowner Associations add value to a home's sale price and overall market value. To do this, we created two linear regression models. Linear regression is a statistical technique that models the relationship between a response variable and one or more explanatory variables. A model with multiple explanatory variables is considered a multiple linear regression model. For our study, we included multiple explanatory variables which classified our models as multiple linear regression. The models we developed consisted of the factors from the combined dataset mentioned above. The first model examined sale price as the response variable and consisted of four explanatory variables: number of stories, total number of bedrooms, building area, and HOA value. In creating the model, we assessed the importance of each variable using the absolute value of the t-statistic for each factor. If the variable's importance was not significant, meaning its t-statistic was greater than 0.1, then we removed the factor and reran the model. Correlation among factors is also important to assessing the validity of a model. We assessed the variable collinearity of the factors in our model using a correlation matrix. If the correlation between two variables in the model was significantly high, then the factors were removed from the model. The correlation matrix showed no significant correlation between any of the explanatory factors in the model.

After accounting for variable significance and correlation among factors, the linear regression model for sale price takes the form:

$$Y = 36,760.30 + 22,234.24 * X_1 + 27.49 * X_2 + 29,869.99 * X_3$$

[ 1 ]

Where:

$X_1$  = Total Number of Bedrooms

$X_2$  = Building Area (square feet)

$X_3$  = HOA Value (0 or 1)

$Y$  = Total Sale Price of Home

The second linear regression model, using total market value as the response variable, was created utilizing the same methodology as the above model. The market value model was developed using the same four explanatory variables: number of stories, total number of bedrooms, building area, and HOA value. We assessed the model for variable significance using the same methodology as stated before. For this model, all four explanatory variables were extremely significant. Again, the factors were not significantly correlated which meant all factors were used in the model. The total market value linear regression model is as follows:

$$Y = 64,917.14 + 21,651.27 * X_1 + 44.58 * X_2 + 20,271.55 * X_3 - 13,273.73 * X_4$$

[ 2 ]

Where:

$X_1$  = Total Number of Bedrooms

$X_2$  = Building Area (square feet)

$X_3$  = HOA Value (0 or 1)

$X_4$  = Number of Stories

$Y$  = Total Market Value of Home

After we created the two linear regression models and found that the HOA factor significantly affected sale price and market value, we conducted hypothesis testing. Hypothesis testing is a statistical method to determine if data supports a certain hypothesis and can determine if there is a statistically significant difference between means. Two hypothesis tests for each pair of neighborhoods in each Georgia city were conducted. The first hypothesis test determined if the sale price of homes in HOAs is significantly higher than non-HOA homes. The second hypothesis test is similar but measures whether the total market value of HOA homes is significantly higher than non-HOA homes. The null and alternative hypotheses of the tests are as follows:

$$H_0 : \bar{X}_{HOA} - \bar{X}_{non-HOA} = 0$$

$$H_a : \bar{X}_{HOA} - \bar{X}_{non-HOA} \neq 0$$

For the first test, the null hypothesis ( $H_0$ ) states that there is no difference between the average sale price of HOA homes ( $\bar{X}_{HOA}$ ) and the average sale price of non-HOA homes ( $\bar{X}_{non-HOA}$ ). The alternative hypothesis ( $H_a$ ) states that there is a difference between the average sale price of HOA homes and non-HOA homes. In this scenario,



we are trying to reject the null hypothesis in support of the alternative hypothesis. In order to conduct the hypothesis test, we calculated the z-score for each pair of neighborhoods. The z-score comes from the following equation:

$$Z = \frac{\bar{X}_{HOA} - \bar{X}_{non-HOA}}{\sqrt{\frac{\sigma_{HOA}^2}{n_{HOA}} + \frac{\sigma_{non-HOA}^2}{n_{non-HOA}}}}$$

[ 3 ]

Where:

$\bar{X}$  = sample mean

$\sigma$  = sample standard deviation

$n$  = number of observations

Once the z-score is calculated, it is compared to the critical value of the hypothesis test. The critical value is determined based on the significance level of the hypothesis test and comes from the table of standard normal probabilities. If the z-score is higher than the critical value for the specified significance level, then the null hypothesis is rejected. For example, a 95% significance level has a critical value of 1.645. In order to reject the null hypothesis with 95% confidence that the results of the test are real, the z-score must be greater than 1.645. The same process was done for both the average sale price and the average market value. The only difference is that  $\bar{X}_{HOA}$  represents the average market value of HOA homes and  $\bar{X}_{non-HOA}$  represents the average market value of non-HOA homes.

Following the hypothesis testing, analysis of variance (ANOVA) testing was conducted on a special case neighborhood, Parkwood Commons. The Acworth HOA neighborhood, Parkwood Commons, has different levels of membership for their Homeowners Association. Recreational members pay \$350 per year which gives them access to the community pool and tennis courts. Civic members pay \$150 per year which gives them access to the tennis courts. Pool access is optional for civic members, but it costs an extra \$300 if they choose to use the pool. Non-members pay no fee for the HOA but are encouraged to pay the \$150 civic fee. If the majority of non-members choose not to pay the fee, then the price required to be a Recreational or Civic member increase. Reports show that about 25% of non-members choose to pay the civic fee. ANOVA testing is a statistical method used to analyze the distinction among different levels of a particular factor. In this case, ANOVA testing was conducted to determine if the HOA level impacts the sale price and market value of a home.

## 5. Results and Analysis

After testing the data, we received promising results. The linear regression models indicated that several factors affect the sale price of a home and its market value. Most importantly, the models showed that being apart of a Homeowners Association significantly affects both of these response variables. Table 4 shows which factors impact sale price and which factors impact market value. Equation 1 and Equation 2, written above, show that being in an

HOA increases a home's sale price by almost \$30,000 and increases a home's market value by about \$20,000. This is extremely significant to homeowners because it directly being in an HOA to higher home value. Furthermore, the sale price model's  $R^2$  value is 0.3253. This means that the linear model accounts for 32.53% of the variation in the data. At first glance, this may seem very low. However, fitting well over a quarter of real-world data is a significant accomplishment (Cohen 1992). With this in mind, the market value model's  $R^2$  value is 0.5832. The market value model accounted for almost 60% of the variation in the model which is extremely impressive in a real-world context.

Table 4. Factors Included in Linear Regression Models (Based on Significance)

Type of Model	Number of Stories	Total Bedrooms	Building Area	HOA Value
<i>Sale Price</i>	✗	✓	✓	✓
<i>Market Value</i>	✓	✓	✓	✓

The results of our hypothesis testing are also very convincing that HOAs add value to the homes in their neighborhoods. The first round of hypothesis testing examined an HOA's effect on a home's sale price. For Canton, the null hypothesis was that the difference between Diamond Ridge homes' sale price and Hillcrest homes' sale price is zero. The alternative hypothesis was that the difference is not zero. We calculated the z-score using Equation 3 and found very convincing results. For a significance level of 99.98%, the critical value is 3.49. Our z-score for Canton was 12.16 meaning there is no doubt that homes in Diamond Ridge have a higher sale price than Hillcrest homes. Our calculated z-score was 2.14 which gives us 98.38% confidence that Parkwood homes have a higher sale price than West Green Station homes. Buford's null hypothesis was that the difference between Weatherstone Park homes' sale price and Quail Creek homes' sale price is zero. The alternative hypothesis was that the difference is not zero. The z-score calculated for this city was 0.104. Although not as convincing as the other locations, there is still 54% confidence in the fact that Weatherstone Park homes have a higher sale price than Quail Creek homes. Table 5 outlines the significance thresholds of each city's sale price hypothesis testing. The percentages listed are the levels of confidence we have that HOA homes sell for a higher price than non-HOA homes.

Table 5. Confidence Levels of Sale Price Hypothesis Test

Location of Neighborhood Pair	50%	75%	80%	95%	99%
<i>Canton, GA</i>	✓	✓	✓	✓	✓
<i>Acworth, GA</i>	✓	✓	✓	✓	✗
<i>Buford, GA</i>	✓	✗	✗	✗	✗

The second round of hypothesis testing examined an HOA's effect on a home's market value. For Canton, the null hypothesis was that the difference between Diamond Ridge homes' market value and Hillcrest homes' market value is zero. The alternative hypothesis was that the difference is not zero. The calculated z-score for this test was 7.07 which gives us 99.98% confidence that Diamond Ridge homes have a higher market value than Hillcrest homes.

In Acworth, the null hypothesis was that the difference between Parkwood Commons homes' market value and West Green Station homes' market value is zero. The alternative hypothesis was that the difference is not zero. Our z-score for Acworth was 0.93, which provides an 82.38% confidence level that Parkwood Common homes have a higher market value than West Green Station homes. Lastly, the null hypothesis for Buford was that the difference between Weatherstone Park homes' market value and Quail Creek homes' market value is zero. The alternative hypothesis was that the difference is not zero. In Buford, our calculated z-score was -7.43 which is drastically different from the other neighborhoods. A negative value means that the non-HOA homes have a higher market value than HOA homes in Buford. Furthermore, a negative value so large means that there is 99.98% confidence in that statement. However, the large majority of the market value hypothesis testing proved that HOA homes provide a greater market value than non-HOA homes. Similar to Table 5, Table 6 outlines that significance thresholds that each city's hypothesis testing provided for market value.

Table 6. Confidence Levels of Market Value Hypothesis Test

Location of Neighborhood Pair	50%	75%	80%	95%	99%
<i>Canton, GA</i>	✓	✓	✓	✓	✓
<i>Acworth, GA</i>	✓	✓	✓	✗	✗
<i>Buford, GA</i>	✗	✗	✗	✗	✗

The purpose of conducting these hypothesis tests is to illustrate the impact that Homeowner Associations have on property value. These three neighborhoods in northern Atlanta are just samples of the United States demographic. Hypothesis testing allows us to conclude that our results can be applied to all cities and states across the country. Two of the three locations that were tested provided over a 98% confidence level that HOA homes sell for higher prices and over an 80% confidence level that HOA homes have a higher market value. This gives buyers the confidence that purchasing a residence in a Homeowners Association in any location across the country will likely result in owning a higher valued home. Math calculations prove that the financial benefits often outweigh the financial costs. The annual HOA fees are \$475 for Diamond Ridge, \$350 for Parkwood Commons, and \$450 for Weatherstone Park. These fees average out to \$425 per year. Also, the average U.S family lives in a single home for about 10 years (NAR 2016). Multiplying these two values gives a lifetime HOA fee of about \$4,250. Our hypothesis testing showed that, with 95% confidence, the average sale price of an HOA home is about \$17,000 greater than a non-HOA home and the average market value of an HOA home is \$6,000 greater than a non-HOA home. Both of these values are greater than the costs associated with living in an HOA. Therefore, the benefits of owning a residence in an HOA are much greater than the costs.

The results from the ANOVA testing with Parkwood Commons provided novel results. To our knowledge a study does not exist that studies the difference between levels within an HOA. Member status of the Homeowners Association provided no significance to a home's sale price or market value. We expected these results because the

membership statuses have nothing to do with the residence itself. The membership status only provides access to the neighborhood's community facilities which adds value to the community as a whole, not individual homes. As a homeowner, deciding to pay a fee in order to use community facilities is a decision made out of personal preference. Whether a homeowner decides to do this or not, it will not impact the sale price nor the market value of their home. However, paying the homeowner's fee would provide the HOA with more funds to ensure the community and its facilities remain pleasant and enjoyable. Doing so would drive the community's value higher which would in turn drive individual homes' value higher. This is likely why Parkwood Commons encourages residents to pay the optional fee each year. Furthermore, this chain reaction is likely why HOA homes sell for higher prices and have higher market values.

## **6. Future Research**

This study shows convincing evidence that purchasing a home in an HOA can be beneficial. Our testing shows that both the sale price and market value of a home are positively impacted from being apart of an HOA. However, it is important to understand that the conclusions reached in this study are from just one region of the many HOA communities across the United States. To validate our results, further research needs to be conducted in other regions in the country. Furthermore, expanding the scope of the study would also help validate our results. The next step of our study would be to expand the dataset for all HOAs across the state of Georgia. Testing on data with all HOAs in Georgia would allow us to validate our conclusions across the entire state. If testing on the entire state of Georgia produces the same conclusions, then we would conduct the same test nationally. By testing HOAs nationwide and producing the same results would allow us to create an accurate and helpful model for home buyers to understand the benefits of living in an HOA. However, data collection is a lengthy process since HOA status is often private. Having easy access to HOA home data would allow us to expand this study nationally which would greatly benefit anyone purchasing a home in the United States.

## **7. Acknowledgements**

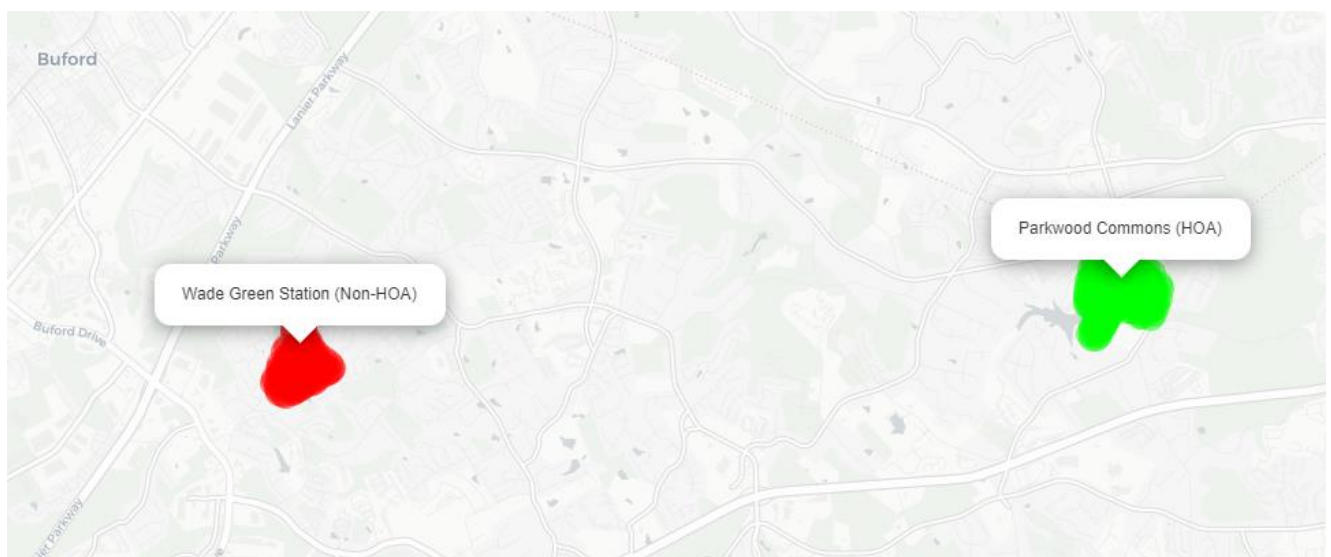
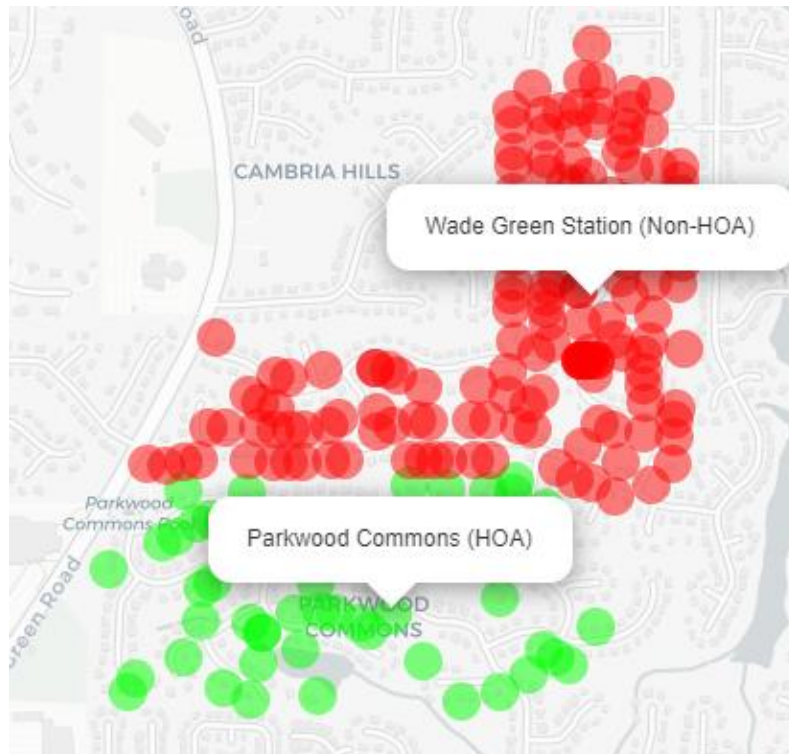
I would like to thank the FCAR Staff, Dawn Bauman, CAE, Executive Director, and Jake B. Gold, FCAR Director of Programs as well as FCAR Research Committee Chair, Mark Jones, PCAM, and Committee Member, Clifford J. Treese together two Atlanta Association professionals, Michele Richards, PCAM and George Nowack, Esq, CCAL.

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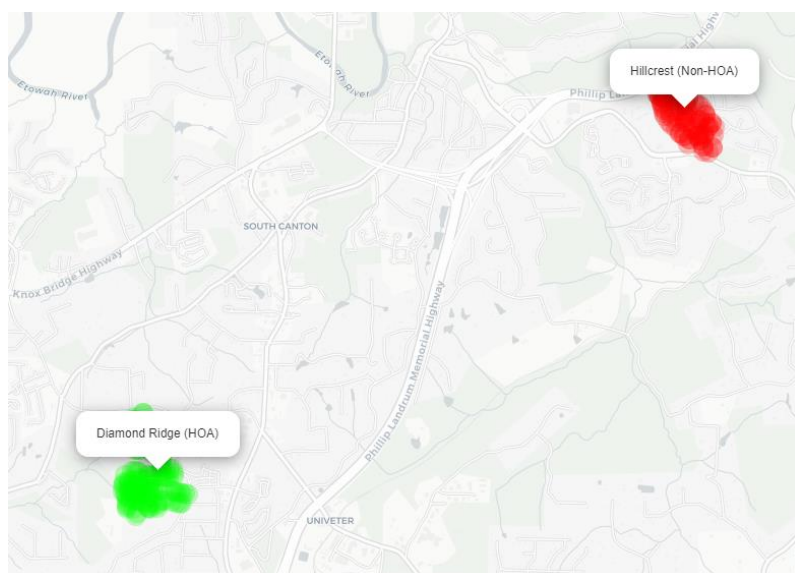
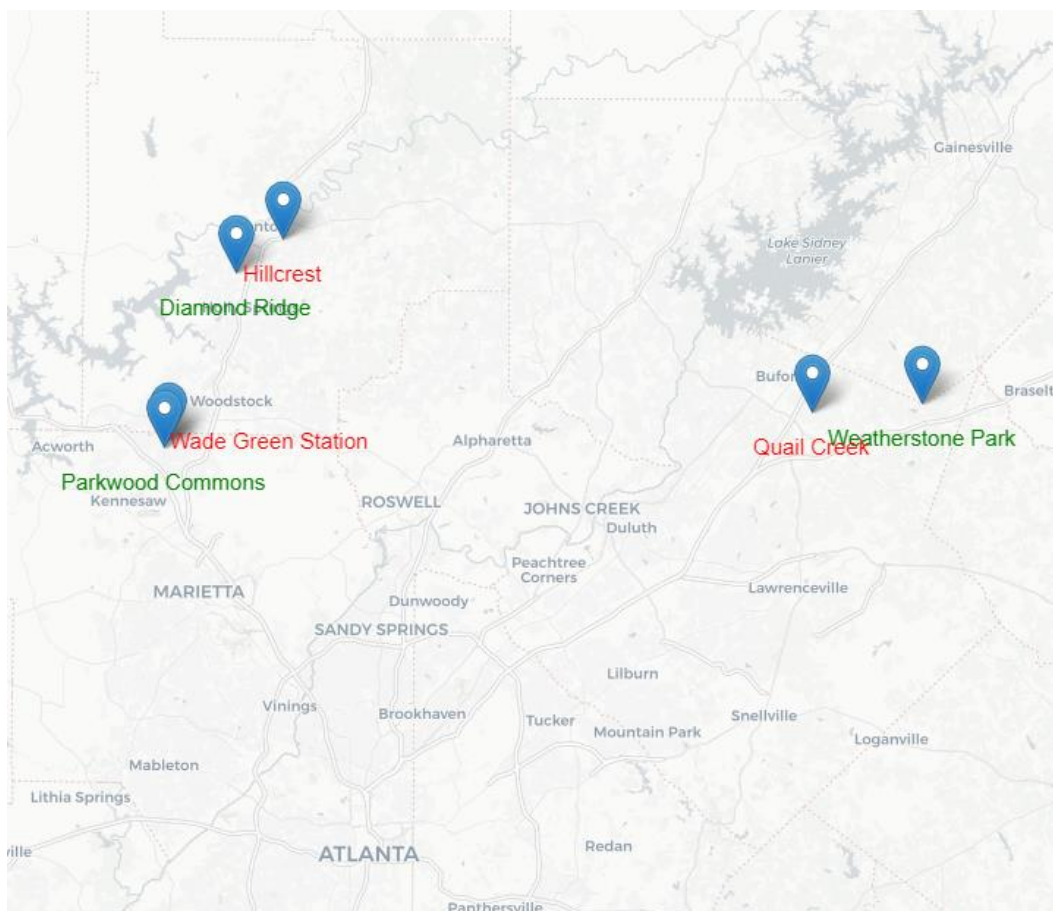
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## 7. Appendix

The figures below show the maps of the neighborhoods studied.









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