The Luxury Second Home Market, An Analysis of Historical Sales and Property Data at The Greenbrier Resort (White Sulphur Springs, WV)

by

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Submitted to the Program in Real Estate Development in Conjunction with the Center for Real Estate in Partial Fulfillment of the Requirements for the Degree of Master of Science in Real Estate Development

at the

Massachusetts Institute of Technology

September, 2011

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Abstract

The global economic expansion and subsequent creation of wealth as well as increased purchasing power and disposable income has contributed to the growth in the secondary home market. Over the past decade developers that cater to such discerning buyers have focused significantly on bringing to market products that will meet the wants, needs, and expectations of their target customers. Despite the significant growth in the secondary home market and general infatuation that most individuals have with real estate, there are limited studies that analyze the second home market. Instead most research has focused on the commercial and primary home real estate markets. This study examines a specific development, The Sporting Club at The Greenbrier Resort in White Sulphur Springs, WV.

The study focuses on the residential home price transactions that occurred at The Greenbrier Resort since 1980. The data collected from the Greenbrier County Assessor's Office will be used to derive a hedonic price equation. This equation will help to explain the value derived from key home attributes; beds, baths, home square footage, and location. Then a nominal and real price index will be constructed and used to understand the correlation between home prices and supply and GDP. The end goal is to calculate, through regression analysis, a price equation with the dependent variable price and independent variables of supply and demand (GDP) and a supply equation.

The analysis has three conclusion sections. The first is the hedonic price equation that implies the law of marginal utility is recognized with respect to the number of bedrooms a home has and that any more than three a negative affect on price occurs. However, with respect to bathrooms, additional bathrooms do add to the price of the residence. The second and third conclusions are derived from time series equations. The first explains that for every increase by 1% in GDP the real price of a property increases by $4,332. The second equation tries to explain supply and concludes that a 5% increase in the real price index causes a 5.4% increase in supply or unit supply elasticity is observed.

A recommendation for the owner/developer of The Greenbrier Sporting Club is to buyback vacant lots because currently 78% of the supply is in control of the owners. This phenomena will most likely lead to future price volatility as supply will be delivered to the market as families and speculators chose. In other words supply will not be delivered to the market at a rate that will stabilize prices.

Acknowledgements

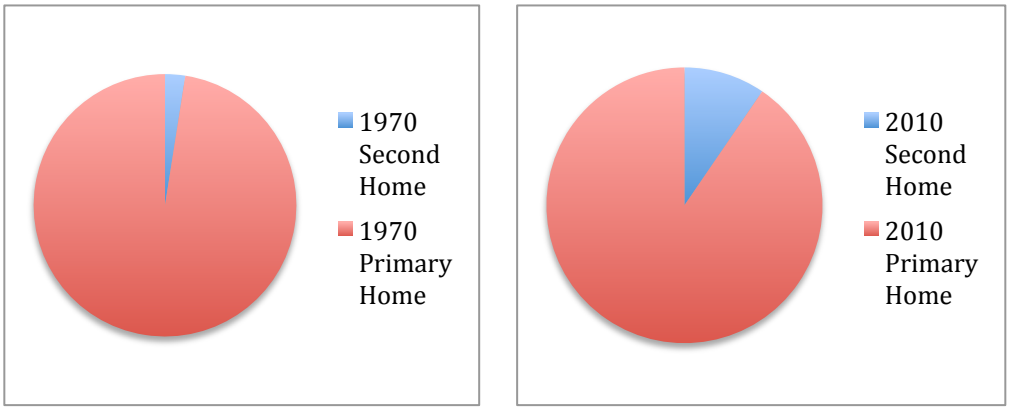
I would like to sincerely thank Professor William Wheaton invaluable insight, constructive guidance and technical expertise throughout the thesis process. I would also like to thank Schery Bokhari for all of his generous support and advice with the data analysis. Without both of these individuals commitment, I would not have been able to complete this thesis.

To my family, I would like to thank you all for your unconditional love, constant support, and continuous encouragement.

Chapter 1: Introduction

Background

The second home market in the United States has continued to grow at an astonishing rate since the early 1990s. Due to this phenomenon and the seasonality and subsequent redistribution of the population it has become a strong force in influencing and dictating all types of development. As of 2010 the U. S Census Bureau estimated that there where approximately 7.9 million vacation homes in the United States compared to roughly 75 million owner occupied homes. This an astounding figure when compared to an estimate by Renshaw in his article "The Demand for Housing in the Mid-70s", where he estimated there to be about 1.5 million second homes in the United States compared to an estimate of 59 million owner occupied homes.[1] This means that as a percentage of the residential market second homes have grown from 2.54% to 10.53% or roughly five fold during approximately a forty-year period (See below).



The economic boom was a driving force in propelling interest and subsequent growth in second homes over the past decade. This phenomena lead to individuals deciding to own a property in the location that the individual or family preferred to vacation. The purchase of a second home has also proven to be an investment decision for these people because of the ability to earn a return from the property through utilizing the rental markets, the assumption of price appreciation, and the presumed low volatility of

[1] Edward F. Renshaw, "The Demand for Housing in the Mid-1970's", Land Economics, Vol. 47, No. 3, (Aug., 1971), pp. 249-255

the asset class. In 2010 the National Association of Realtors 2009 survey of second home-owner's confirms this, and also shows that 29% of the participants stated that portfolio diversification was one of the most important motivators for their ownership.[2]

Given the growth in second home ownership it has become clear that this is an influential and very important part of the residential home market. Despite this fact significant analysis and research of the second home market specifically, does not compare to both commercial or primary residential real estate. For many years analysts and economists have intensely scrutinized and researched the cyclical movements and pricing behavior of the primary residential home market or commercial real estate market.

The objective of this thesis is to apply a detailed and quantitative approach to analyzing the price behavior of a known second home location, The Sporting Club at The Greenbrier Resort in White Sulphur Springs, WV, with the hope of uncovering important insights that can help in understanding better this vibrant and opaque market.

[2] National Association of Realtors. Second Homes: Talking Points. 10 March 2010. 6 July 2010 <http://www.realtor.org/press_room_secured/public_affairs/tpsecondhomes>.

Research Motivation

The motivation to research and analyze the residential home market associated with The Greenbrier Sporting Club, which is located on The Greenbrier Resort grounds is three-fold.

The first reason is the unique sample set that the Greenbrier Sporting Club (GSC) residences provide. It is a development whose owners and members are predominantly not from the local area but reside in states like New York, Georgia, Ohio, and Florida and the suburbs that surround the cities. This means that their GSC home is either a second home, or part of a larger residential real estate portfolio that the family maintains. The benefit of this is that the conclusions of this analysis can confidently state outputs that are relevant to the second home market. Another key benefit of the GSC is that the style and size of the residences constructed are controlled through a strict architectural review board (ARB). This ARB maintains the quality of construction and the homogenous atmosphere through approving architects and the final designs of any home. The GSC provides an excellent opportunity to analyze a high-end second home development.

The second reason for endeavoring on this analysis is to try and understand the value derived from key home characteristics. The characteristics that will be analyzed are number of beds, number of baths, number of half-baths, lot size, home square-footage, and location.

The third reason is to examine the trend in both real and current prices. This will be done by how yearly supply trends affect home prices. Then an economic time series model will be used to try and explain the price index level through a demand driver, GDP. The goal is to derive a “supply” equation in which new construction is explained by prices and their changes.

The completion of this three-fold analysis will hopefully provide insights for future high-end developers of second homes with respect to what the most valuable bed-to-bath ratio, square-footage, and lot size for a home. This would help enormously in the planning and development process of ground up projects where the developer can

leverage architectural review board control to dictate the characteristics of a home built within the development community.

Chapter 2: A Brief History of The Greenbrier (1-5 pgs)

The Greenbrier Resort Hotel and Spa is situated in a nondescript valley among the Alleghany Mountains in the town of White Sulphur Springs, West Virginia. As it stands currently it encompasses 6,500 acres, offers 721 hotel rooms, a 40,000-square-foot spa, three golf courses, a private club with residences, and requires a staff of 1,318 people. It is a resort with a long history of catering to the powerful and wealthy.[3]

Beginning in 1778 the property and surrounding areas were well known for their sulphur springs, which at the time were thought to have healing powers. After several years of local ownership the property was purchased by the Calwells a prominent Baltimore, MD family. During the Calwells ownership the resort would begin to take shape. In the beginning the family decided to sell cottages to prominent Southern individuals, many of which still stand today. Notable guests of the time included Martin van Buren and Henry Clay. In 1858 the original hotel, The Grand Hotel (see below), was built on the property and was originally know under the moniker of "The White" and later "The Old White."[4]

The Chesapeake & Ohio Railway purchased the property in 1910 and oversaw several construction projects including amenities and the building of The Greenbrier Hotel in

[3] http://www.time.com/time/photogallery/0,29307,1886881_1860349,00.html
[4] The Greenbrier - Wikipedia, the free encyclopedia

1913.[5] It was at this time that the hotel adopted the name The Greenbrier. It was the neighboring town that decided to take the name White Sulphur Springs. Unfortunately in 1922 the hotel was torn down and an addition, which is now the current main hotel structure, was constructed.

Over the life of the hotel it played interesting roles in both the Civil War and World War II. Both the Confederate Army and Union Army occupied the property and on several occasions almost burnt it to the ground. Following the Civil War, the resort reopened. It became a place for many Southerners and Northerners alike to vacation, and the setting for many famous post-war reconciliations, including the White Sulphur Manifesto,[6] which was the only political position issued by Robert E. Lee after the Civil War, that advocated the merging of the two societies. The resort went on to become a center of regional post-war society, especially after the arrival of the railroad. Its role during World War II was that it served as an army hospital and as a relocation center for some of the Axis diplomats interned as enemies of the United States. After the war ended, C&O bought back the property from the government and reopened the resort, now redecorated by Dorothy Draper. It took her 14 months, 45,000 yards of fabric, 15,000 rolls of wallpaper and 40,000 gallons of paint to transform The Greenbrier.[7] The reopening was a social event of the season, attracting such luminaries as the Duke of Windsor with his wife, Wallis Simpson, Bing Crosby, and members of the Kennedy family.

In the late 1950s, the U.S. government approached The Greenbrier for assistance in creating a secret emergency relocation center to house Congress in the aftermath of a nuclear holocaust. The classified, underground facility, named "Project Greek Island"[8], was built at the same time as the West Virginia Wing, an aboveground addition to the hotel, from 1959 to 1962. Although the bunker was kept stocked with supplies for 30 years, it was never actually used as an emergency occasion, even during the Cuban

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[5] The Greenbrier - Wikipedia, the free encyclopedia

[6] The Greenbrier - Wikipedia, the free encyclopedia
Robert E. Lee (August 26, 1868). "White Sulphur Manifesto" (http://rosecransheadquarters.org/Rosecrans/WhiteSulphurManifesto/Lee.htm) . http://rosecransheadquarters.org/Rosecrans/WhiteSulphurManifesto/Lee.htm. Retrieved 26 August 2010.

[7] http://www.time.com/time/photogallery/0,29307,1886881_1860358,00.html

[8] "Tour The Greenbrier Bunker" (http://www.pbs.org/wgbh/amex/bomb/sfeature/bunker.html) . *PBS Documentary*.
PBS. http://www.pbs.org/wgbh/amex/bomb/sfeature/bunker.html. Retrieved 2008-06-18.

Missile Crisis. For 30 years, hotel staff kept the bunker stocked with supplies and food. A 25-ton blast door (see below) led to 18 dormitories that could accommodate 1,100 people, several decontamination chambers, a cafeteria, a pharmacy, a clinic with 12 hospital beds, meeting rooms for the House and Senate, a power plant with purification equipment, three 25,000-gallon water storage tanks, three 14,000-gallon diesel fuel storage tanks and a communications area that included a TV production studio and audio-recording booths.[9]

The bunker's existence was not acknowledged until Ted Gup of *The Washington Post* revealed it in a 1992 story; immediately after the *Post* story, the government decommissioned the bunker. The facility has since been renovated and is also used as a data storage facility for the private sector. It is once again featured as an attraction in which visitors can tour the now declassified facilities, now known as **The Bunker**.[10]

[9] http://www.time.com/time/photogallery/0,29307,1886881_1860361,00.html
[10] http://www.time.com/time/photogallery/0,29307,1886881_1860363,00.html

In 2000 The Greenbrier Resort (Clubhouse pictured above) and its owner CSX decided to embark on an ambitious plan to capitalize on the resort's superb amenities and large land holdings by deciding to develop a significant portion of the resort's surrounding land holdings into a luxury private club with residences. The development firm that selected was DPS development.

DPS development partnered with CSX and The Greenbrier Resort to transform the resort by building state of the art infrastructure for the luxury residences. The plan included construction of a two new clubhouses, workout facility with squash courts, pool, spa facility, tennis courts, and Tom Fazio designed signature golf course named The Snead.

DPS Vision:

Our specialty is a concept we created, a ***Life, Well Played,*** *a host of luxury amenities that provide enriching experiences for the entire family. Our designs complement nature's own, and we are committed to preserving the environmental integrity and distinctive character of each property. Our conservation-based planning approach helps us determine all sensitive elements of the land and create a plan to keep those elements untouched, always remembering that people who become members fall in love with the*

beauty of the raw land.[11]

The visions of the Greenbrier Sporting Club (See logo above) became a reality and a success. Since inception in 2001 up until 2010, there have been 380 home sites sold for more than $206 million. The aggregate sales of both home sites, residences, and resale's is valued at more thank $422 million through 563 transactions. These figures do not include the 409 memberships that were sold at an aggregate value of more than $40.5 million. As of April 26, 2011 sale volume has continued at a steady pace with aggregate sales of more than $14 million dollars through 21 transactions and almost $1m in memberships sold. [12]

Real Estate Sales Recap - GSC
as of 04/26/11

2001-2010	***# since Inception***	***$ since inception***
Company Homesites	380	206,161,051
Resale Homesites	108	75,598,500
Resale Shelters	75	140,383,526
Total Real Estate	**563**	**422,143,077**
Memberships	409	40,590,000

[11] http://www.dpsdevelopment.com/
[12] Transaction Data Provided by The Greenbrier and available at http://www.greenbrierassessor.com/portal/

2011 YTD	***# YTD***	***$ YTD***
Company homesites	1	25,000
Resale homesites	12	4,615,000
Resale shelters	8	9,585,000
Total	21	**14,225,000**
memberships	9	900,000

In March of 2009 The Greenbrier Resort continued to struggle after the economic meltdown of 2008 due to light traffic in the hotel and slowed real estate sales within the sporting club. Due to this slowdown, mounting costs associated with the staff and luxury facilities, debt began to mount up at the historic resort to more than $500 million. The result was that the resort was losing more than $1 million per week and a decision to file for bankruptcy was made by the owner CSX.[13]

Marriott, the worldwide hotel chain, was interested in the resort and presented an offer to purchase the resort. Due to the economic environment and the financial instability of the resort, Marriott's offer included that CSX provide the hotel with a $50 million loan and not get fully paid for the resort until seven years later for a maximum amount of $60 million.[14]

Jim Justice, a West Virginia billionaire, who owned more than 47 companies and had more than 3,000 employees heard about the potential transaction and decided to engage with CSX. In an effort to prove how serious he was he flew down to Jacksonville, FL (CSX headquarters) and personally offered $10 million cash with no loan. By the end of the day, a deal was struck for a little more than $20 million but due to the Marriott breakup fee and other costs the total cost to Mr. Justice was a little more than $40 million.[15]

Since the acquisition by Jim Justice The Greenbrier Resort has embarked on an aggressive plan to expand and update the hotel's amenities. This was done in an effort to return the famed and historical resort to the prestigious AAA five-diamond level. The ambitious plan included updating all the hotel rooms, constructing an underground

[13] http://www.time.com/time/photogallery/0,29307,1886881_1860349,00.html
[14] http://www.huffingtonpost.com/2009/03/19/greenbrier-bankruptcy-mar_n_176978.html
[15] http://dailymail.com/News/statenews/201103060466

casino at a cost of more than $80 million, another $120 million in upgrades, and bringing a PGA event to the hotel. The Greenbrier Classic is now played each year as part of the FedEx Cup.[16]

As of 2011 the aggressive plan for revitalize the hotel continues with much success and on January 14, 2011 The Greenbrier Resort was awarded the AAA Five Diamond Award. It is one of three lodges to have received the distinguished honor.[17]

[16] http://dailymail.com/News/statenews/201103060466
[17] http://www.greenbrier.com/press-room/press-releases.aspx?id=4971

Chapter 3: Literature Review

The second home real estate market is one that has been an intriguing topic of conversation for many years because the exponential growth in demand has been the catalyst for the expansion of historic vacation destinations, the search for new hot spots, and the emergence of new vacation communities.

Up until recently the historic vacation destinations of individuals who owned more than one residence has focused on destinations that provide outdoor activities or a refuge for harsh weather. Given this ski resorts and golf communities have been very popular.

The constant growth and unique attributes of ski resorts and their surrounding areas has sparked interest in understanding the market dynamics of those regions. Three thesis' that were written at the Massachussetts Institute of Technology (MIT) in the Masters in Real Estate Development Program about ski resorts or their surrounding housing markets were reviewed. The reason that the ski market and not a golf community was the focus of literature review is due to the similarities between The Greenbrier Resort's Sporting Club and a ski resort or community. Both communities offer activities for each season, whether it is golf and hiking in the spring and summer, skiing in the winter, and a wide array of ancillary activities such as bowling, shopping and fine dining that are frequented throughout the year.

In paper written by William Wheaton and John D. Carey titled, Ski Resort Real Estate: Why not to invest (2000), the authors analyzed the behavior of major ski resort property located in New England over a 25 year period. The analysis began with a property price series of Loon Mountain, which was considered an excellent sample given its similarities with other ski resorts. "This series reveals that *nominal* prices are no higher today than they were in 1980, and consequently *real* prices have eroded by close to 40%. The price series also exhibits considerable variation across time."[18] In an effort to understand the causes of these fluctuations a VAR model was constructed of the resort. This model provided three important insights; "First, natural snowfall is crucial to the annual

[18] Ski Resort Real Estate: Why not to invest (2000) Wheaton & Carey

business (skier visits) in the broader New England area. Second, regional annual business is central to the price appreciation at particular resorts. And finally, resort supply responds so elastically to any movement in prices or business that it effectively curtails any long-term property appreciation."[19] It is clear that all three of these conclusions are extremely interesting and will most likely provide important insights into the pricing behavior of the residential real estate properties located at The Greenbrier Resort.

The second paper that was reviewed was An Analysis of the Aspen Housing Market by John Markham Soininen (1999), which focused on the Pitkin Housing situation and the shortage of housing supply for local residents.[20] It concluded that the biggest factor limiting supply was the local zoning, which divided the county into very large lots or where dense zoning was permitted it was on very valuable land located on or near the ski resorts. This paper also concludes that the results of the government intervention and zoning laws were intentional and successful given that the residents goal was and is to preserve and playground for the rich an famous. This however, has also made it difficult for supply of the area to meet the demand of the second home market, thus causing prices to increase significantly in the area. Similar to the paper discussed before, this article provides important insights into the affects of zoning to the market and given that The Greenbrier is able to strictly control the zoning on its grounds, it is an important conclusion to consider and review.

The third paper reviewed was Second Home Real Estate Market: Economic Analysis of Residential Pricing Behavior Near Heavenly Ski Resort, CA by Sean Lee. This thesis examines a ski resort in the Lake Tahoe region of CA in an effort to understand historical pricing behaviors and to try and forecast future prices using an econometric model.[21] The author collected data over a 20-year period and created a price index and controlled it to only track real prices as a function of time. From there a econometric model was derived where new permits as a measure of supply and Tahoe skier visits, as a measure

[19] Ski Resort Real Estate: Why not to invest (2000) Wheaton & Carey
[20] An Analysis of the Aspen Housing Market by John Markham Soininen (1999)
[21] Second Home Real Estate Market: Economic Analysis of Residential Pricing Behavior Near Heavenly Ski Resort, CA Sean Lee (2008)

of demand were used to forecast future supply and demand in three economic conditions: realistic, optimistic, and pessimistic. The conclusion was that residential home prices would continue to increase in all cases except for the pessimistic scenario, which was described as one with poor economic conditions and a light snowfall. The other two scenarios showed upward trends in prices. This thesis is interesting because it too looks at an important economic indicator and its affects on price. Clearly the use of snow fall is case specific to the ski home industry, but none the less it provides insight into the importance of particular variable and their affects on price behavior in a particular market.

The fourth and final thesis reviewed was Resort Real Estate: An Economic Analysis of Second Home Pricing Behavior in Park City, Utah by Brady Larsen. The purpose of this thesis was to examine the market pricing behavior of vacation homes in resort property markets. Similar to the other thesis a price index was constructed and an econometric model was used to understand the price behavior. The price indices surprisingly showed long term real price depreciation from 1981 to 2010 of 12-25%. The key determinants of price in the region were obviously snowfall but not the local economy, instead national economic conditions are a key demand driver. The conclusion of the analysis was that despite the price index, the Park City resort market is well functioning and healthy. The model derived indicated that, "while increases in prices do stimulate new construction, the growth in the total number of dwelling units reveals a relatively inelastic supply market." [22] In other words, this suggests that any growth in demand should be accompanied with long-term price appreciation in the market.

In conclusion, it is clear that pricing behavior in resort communities are almost always connected with a macro demand driver, such as GDP and not a local one. The reason for this is that these resorts are often the economic engine for the town and not the byproduct of a towns' economic success. Despite this fact, each area does have unique characteristics, such as weather that clan play an enormous role in the pricing behavior of the areas properties. It is clear in reviewing these thesis that a detailed and case by

[22] Resort Real Estate: An Economic Analysis of Second Home Pricing Behavior in Park City, Utah Brady Larsen (2010)

case analytical approach is needed to uncover the real independent variables that affect a second home markets' pricing behavior.

Chapter 4: Hedonic Price Equation and Price Index

Methodology

In order to achieve the ultimate goal of providing valuable insights to residential real estate developers and owners, we first begin with applying the methodology of hedonic regression to transaction and home characteristic data that was collected. This process will help us in:

1. Explaining the value derived from the following key home characteristics: number of beds, number of baths, number of half-baths, lot size, home square footage, and location.
2. Examining the trend in both real and current prices.
3. Applying an economic time-series model to try and explain the price index level through a demand driver, GDP, and supply.
4. Deriving a "supply" equation in which new construction is explained by prices and their changes.

Before endeavoring on this analysis, it is first important to understand the dynamic between housing attributes and housing preferences and how both contribute to an individual home's price.

One can easily observe in residential real estate that a set expenditure of $250,000 can buy an individual or a family two totally different residences when comparing markets. An excellent example of this can be seen when comparing a neighborhood within New York City and a Dallas Suburb.

In New York City, the expenditure of $250,000 will provide you with the purchasing power to acquire a 230 square-foot, one bedroom and one bath apartment that is located close to Columbia University and the NYC Subway C Train (see below).

Compared to a Dallas suburb home that also costs $250,000 but will provide you with 2,655 square-foot, three-bed and two and one-half bathrooms home with a garage (Picture on next pg.).

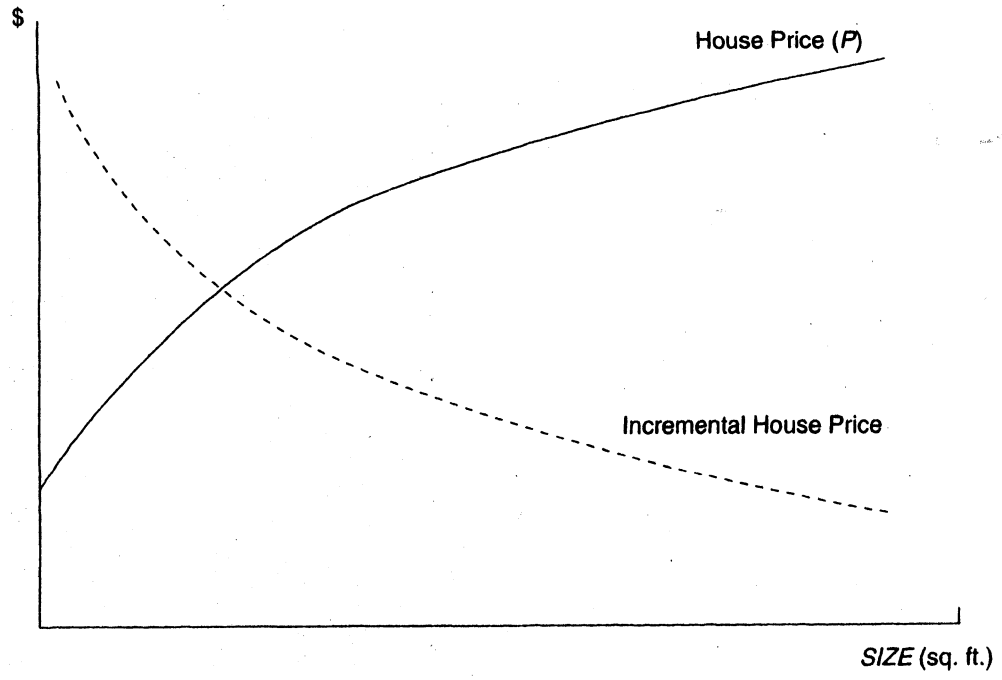
The point of comparing what an individual can acquire in one neighborhood to another for the same price is to illustrate that housing is a heterogeneous commodity. This

means that homes are different with respect to their own structure size, characteristics, location and type of property. [23]

Understanding that each home or residence has been constructed using certain materials and built to a certain specification one must recognize that these characteristics are expenditures and not measures of the dwelling's price. One way to understand this concept is to analyze other commodities' prices. In the case of gasoline, one pays a price per gallon (at the retail level) or with respect to produce one often pays a price per pound when purchasing a particular fruit at a grocery store. The difference here is that real estate is not a market where standardized unit prices are observed.

In evaluating the price of a residence one must apply a valuation method or process that is based on the unit's different and unique attributes. Here the buyer would use the attributes of the unit such as beds, baths, square footage, lot size, location, and even commuting time to derive at a price that the unit is worth to them. It is important to note that as with any commodity, the law of diminishing marginal utility will apply. Therefore, both the buyer and the seller understand that *the added value of additional consumption of a commodity drops as more is consumed*.[24] A great example of this is seen in the graph below taken from Urban Economics and Real Estate Markets by DiPasquale and Wheaton.

[23] Urban Economics and Real Estate Markets, DiPasquale and Wheaton
[24] Urban Economics and Real Estate Markets, DiPasquale and Wheaton



The Solid line depicts how the household's total valuation for a house varies with its floor area, while the dashed line depicts the implicit valuation of each additional square foot. Both demonstrate that a household is willing to pay less per square foot as more floor area is acquired.[25]

The goal of attributing a price to each of the characteristics (variables) that each house has can be done through using multiple regression analysis to estimate the *hedonic price equation*.[26] A hedonic price equation states that the price paid for a house, P – dependent variable, is a function of the levels of all observable characteristics, independent variables, of that house.

$$P = \alpha + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_n X_n$$

These characteristics (independent variables) for this analysis are:

[25] Urban Economics and Real Estate Markets, DiPasquale and Wheaton
[26] Urban Economics and Real Estate Markets, DiPasquale and Wheaton

1. Neighborhood
2. Parcel ID (Account)
3. Legal Description
4. Acre(s)
5. Location
6. Owner
7. Parcel Number
8. Map #
9. Sale Date
10. Sale Price
11. Land Use
12. Year Built
13. Square Feet
14. Number of Beds
15. Number of Baths
16. Number of half-baths

In a hedonic price equation the dependent variable is the price or rent of the unit and the independent variables are the characteristics that can be observed (see above). The independent variables can be both continuous and discreet. A continuous variable is one that takes an infinite number of possible values and usually is in the form of measurements. An example would be square feet. A discreet variable one that may take on only a countable number of distinct values such as 0,1,2,3,4. An example would be a swimming pool, garage, or year built.

$$P = \alpha + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_n X_n$$

In this analysis an economic modeling program STATA will utilize the independent variables that were collected and calculate the equation and therefore provide the values for the constant or α, and the coefficients, β, for the independent variables.

The hedonic price equation will provide an answer to the first goal of explaining the value derived from the following key home characteristics: number of beds, number of baths, number of half-baths, lot size, home square footage, and location.

In order to answer the second goal of examining the trend in both real and current prices a price index needs to be calculated. The first step in calculating the trend is to use the hedonic price index that was derived from The Greenbrier sales data and add dummy variables that correlate to each year.

The process of adding dummy variables to the hedonic price equation include the following steps:

1. Add up the number of transactions for each respective year. (Example: Apply 1 to an observation if it occurred in a respective year and 0 if it did not.)
2. Run the analysis on STATA to derive the hedonic price equation using the new dummy variables for each year.
3. New hedonic price equation calculated.

Once the hedonic price equation, with yearly transaction dummy variable, is derived the following steps are taken to calculate the current price index:

1. Decide on a base year for the equation. (Could be the beginning of data collection or when observations are at a statistically significant level.)
2. Calculate the average number for each of the independent variables, except for the yearly transaction dummy variables.
3. Input those values into the hedonic price equation to derive the price index for the base year.
4. Using the Sale Price Index for the first year as a baseline, for each of the following years add/subtract its respective dummy variable value to calculate its respective Sale Price Index. Repeat until index includes all years.

$P_{base\text{-}year} = \alpha + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_n X_n$

$P_{BASE\text{-}YEAR + N} = P_{base\text{-}year} + YearDummy_N$

Once the current price index is calculated the followings steps are taken to calculate the real price index:

1. Calculate the inflation index for the respective period.
2. Apply consumer price index to the current price index.
3. Real Price index calculated.

Completion of the hedonic price equation and the subsequent price index will help to provide insights into the price behavior and how certain characteristics affect price.

Data Collection

The data collection process utilized public information of the sales transaction data available at the Greenbrier County Assessors office website. In the beginning the key was to research only transactions of properties located on the grounds of The Greenbrier Resort and Sporting Club. This meant that the key was to target three neighborhoods as characterized by the assessor's office or 0430, 0430A, 0430B. The next step was to manually lookup each transaction and log in an excel spreadsheet the following key information:

1. Neighborhood
2. Parcel ID (Account)
3. Legal Description
4. Acre(s)
5. Location
6. Owner
7. Parcel Number
8. Map #
9. Sale Date
10. Sale Price
11. Land Use
12. Year Built
13. Square Feet
14. Number of Beds
15. Number of Baths
16. Number of half-baths

Once the data was collected and inputted in the excel spreadsheet it was then used to conduct the analysis.

Regression Description

The first goal of this analysis, as stated in the Methodology section, is to explain the value derived from the following key home characteristics: number of beds, number of baths, number of half-baths, lot size, home square footage, and location.

A regression analysis that would provide the hedonic price equation, which would explain the answer to the question, would have a dependent variable, or the Price (P), and independent variables, or the property's unique characteristics.

In order to have the best possibility of the regression analysis providing statistically significant results the characteristics of the properties, or the independent variables, had to be analyzed. It was concluded, after running the regression analysis with all variables as collected that achieving statistically significant results would be difficult. Therefore, a decision was made to include five independent variables in the regression analysis; home square footage (squarefeet), number of beds (bed3, bed4, bed5plus), number of full baths (fullbaths), location (NBRHD_dum2, NBRHD_dum3, NBRHD_dum4) and sale year (year_dum2 – year_dum30)..

In the case of number of beds, location, and sale year important steps were taken to derive the independent variable.

The number of beds a property has is a key differentiator but in the property transaction data set there were homes that had between two and eight bedrooms. Given the range between low and high it was important to simplify the number of beds variable. To do this the variable was segmented. The base case that the regression analysis uses with respect to the number of beds variable is two bedrooms. Then properties, given the number of beds in the residence, were segmented into three variables; bed3 (home has exactly three bedrooms), bed4 (home has exactly four bedrooms), and bed5plus (home has five or more bedrooms).

Location is always an important differentiator as well for a property and at The Greenbrier the Sporting Club residences are segmented by neighborhood. Each neighborhood has its own unique set of descriptive features. Since there are fifteen neighborhoods, a similar simplification processes as with the number of bedrooms, was applied to the data. The neighborhoods were grouped based upon location at the resort. Similar to the number of beds variable a base variable was derived and in the case of the location independent variable the neighborhoods were grouped as such:

1. Base: Creekside, Howard Creek, Old White, and White Sulphur
2. Group 2 (NBRHD_dum2): Summit, Oak Hollow, Ridges
3. Group 3 (NBRHD_dum3): The Snead, Lodge Cottages, Meadows, and Travelers
4. Group 4(NBRHD_dum4): Springhouse, Copeland Hill, Reservoir, and Fairway Cottages

The variable, sale year, was a dummy variable that was derived from the data. It is a discreet variable that inputs either a 1, property was sold in that year, or 0, property was not sold in that year. This independent variable is needed to be able to calculate a price index over the period. The data runs from 1980, base year, until 2010 (year_dum30).

Analysis: Hedonic Price Equation

Now that the independent variables are properly accounted for and segmented the regression analysis was conducted in an effort to derive a hedonic price equation.

$P = \alpha + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_n X_n$

$P = 12.27 + 2.20e\text{-}05(X_1) - .0527(X_2) - .150(X_3) - .201(X_4) + .0356(X_5) - .201(X_6) + .109(X_7) - .146(X_8)$

$R^2 = .578$

Here the R^2 is .578 or approximately fifty eight percent of the variation in the response variable can be explained by the explanatory variable. The remaining forty two percent can be explained by unknown, lurking variables or inherent variability.

Variables	Coefficient	Exponentiated Value	Percent
squarefeet	2.20E-05	1.000022	0%
bed3	-0.0527	0.948664569	-5%
bed4	-0.15	0.860707976	-14%
bed5plus	-0.201	0.817912432	-18%
fullbaths	0.0356	1.036241267	4%
NBRHD_dum2	-0.201	0.817912432	-18%
NBRHD_dum3	0.109	1.11516235	12%
NBRHD_dum4	-0.146	0.864157703	-14%
Constant	12.27	213,202.99	

The equation can be interpreted as:

1. Constant: 213,202.99 is the geometric mean
2. 0%: increase for each additional square foot

3. -5%: percentage decrease per bedroom for a three bedroom house compared to a two bedroom
4. -14%: percentage decrease per bedroom for a four bedroom house compared to a two bedroom
5. -18%: percentage decrease per bedroom for a five bedroom house compared to a two bedroom
6. 4%: percentage increase per additional full bathroom
7. -18%: percentage decrease for a property located in NBRHD 2 compared to Base
8. 12%: percentage increase for a property located in NBRHD 3 compared to Base
9. -14%: percentage decrease for a property located in NBRHD 4 compared to Base

In conclusion, the law of diminishing marginal utility can be observed with respect to the number of bedrooms in a residence because there is a clear decrease in price associated with the adding four and five or more bedrooms. The second important insight is with respect to the number of bathrooms in a residence. Including additional bathrooms above the base of two does add to the price of the property. Understanding that statistical significance was not recognized in this regression, the conclusion is it is likely that the market prefers three bedroom and three or more bath residences. The third important insight is in understanding how location affects price. The regression output implies that Neighborhood 3, which consists of The Snead, Lodge Cottages, Meadows, and Travelers is the highest price grouping and is followed by Neighborhood 1 (base), Neighborhood 4, and Neighborhood 2. It should be noted that these conclusions are not statistically significant but do make market and economic sense. The reason for there insignificant values can probably be connected to the small sample size.

VARIABLES	LABELS	lnsaleprice_psf
squarefeet	Square Feet	-0.000177***
bed3		-0.0924
bed4		-0.242*
bed5plus		-0.274*
fullbaths	Full baths	0.0586
NBRHD_dum2	Neighborhood== 2.0000	-0.217*
NBRHD_dum3	Neighborhood== 3.0000	0.0712
NBRHD_dum4	Neighborhood== 4.0000	-0.137
year_dum2	saleyear== 1981.0000	-0.555
year_dum3	saleyear== 1982.0000	0.00816
year_dum4	saleyear== 1983.0000	0.0149
year_dum5	saleyear== 1984.0000	-0.186
year_dum6	saleyear== 1985.0000	-0.174
year_dum7	saleyear== 1986.0000	0.0407
year_dum9	saleyear== 1988.0000	-1.491*
year_dum10	saleyear== 1989.0000	-0.21
year_dum11	saleyear== 1990.0000	-0.126
year_dum12	saleyear== 1991.0000	0.35
year_dum13	saleyear== 1992.0000	0.18
year_dum14	saleyear== 1993.0000	0.0815
year_dum15	saleyear== 1994.0000	0.169
year_dum16	saleyear== 1995.0000	-0.363
year_dum17	saleyear== 1996.0000	0.343
year_dum18	saleyear== 1997.0000	-0.00824
year_dum19	saleyear== 1999.0000	0.421
year_dum20	saleyear== 2000.0000	0.788
year_dum21	saleyear== 2001.0000	0.467
year_dum22	saleyear== 2002.0000	0.799
year_dum23	saleyear== 2003.0000	1.442**
year_dum24	saleyear== 2004.0000	1.346**
year_dum25	saleyear== 2005.0000	1.631**
year_dum26	saleyear== 2006.0000	1.657**
year_dum27	saleyear== 2007.0000	1.813***
year_dum28	saleyear== 2008.0000	1.814***
year_dum29	saleyear== 2009.0000	1.906***
year_dum30	saleyear== 2010.0000	1.627**
Constant	Constant	4.810***
Observations		433
R-squared		0.573

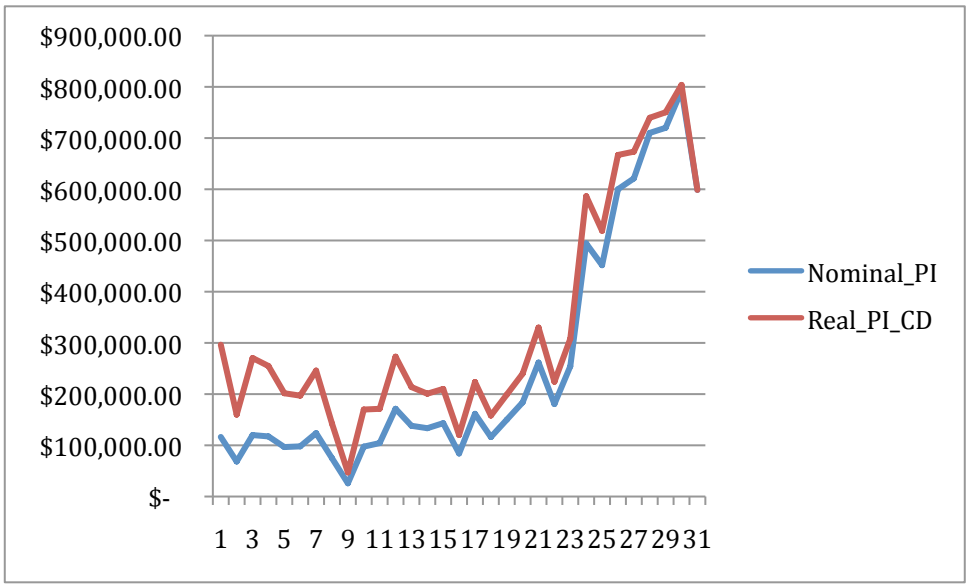
Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Introduction: Price Index

The results from the regression analysis and subsequent hedonic price model provide the foundation for deriving the price index. The reason is that the base year, or 1980, is e (2.71828183) to the power of the sum of all of the coefficients of the hedonic price equation.

In order to calculate the price index for each subsequent year, e is raised to the value of that year's dummy variable coefficient minus zero. Once the price index for each year is derived then it is divided by the number one, or the value of the base year to get the percentage return for that year. The next step is to multiply the value that was calculated for the base year price by the percentage change in price to calculate the following year's price. The process is repeated for each year to calculate the 31-year period's price index, percentage change, and yearly price on both a gross property price and per-square-foot basis.

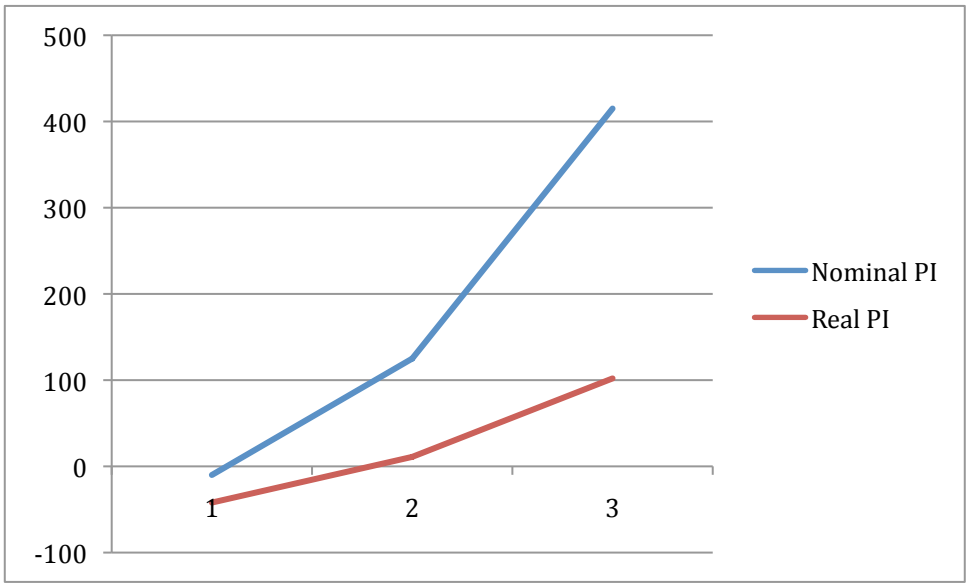
Real and Current – Gross Price



The real and current gross price index (See graph above) shows how price in both terms have increased exponentially over the analyzed thirty-year period. It also shows how for the first 20 years there was a significant spread between real and nominal prices, which can be attributed to the inflationary period between 1980-2000, where inflation average roughly 3.5%.

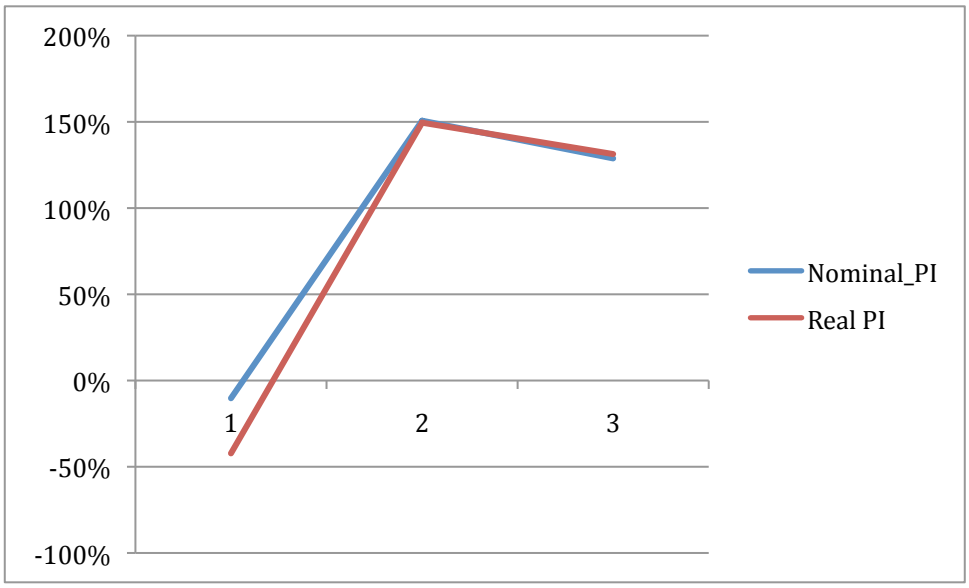
The information is very interesting when analyzed under an assumed ten, twenty, and thirty year holding period. If an investor or home-owner decided to purchase a property in 1980 and hold it until 1990, their gross return would be negative 10% in nominal terms and 42% in real terms (See table & graph below). Continuing the analysis to include a twenty-year holding period the returns improve but continue to show the spread as nominal returns for the period would be 125% compared to an 11% return in real terms. Finally a thirty-year holding period in reviewed and again the spread between returns is significant as nominal returns are 415% compare to 102% in real terms.

Year	Nominal_PI	Real PI
Period 1: 1980-1990	-10%	-42%
Period 2: 1980-2000	125%	11%
Period 3: 1980-2010	415%	102%



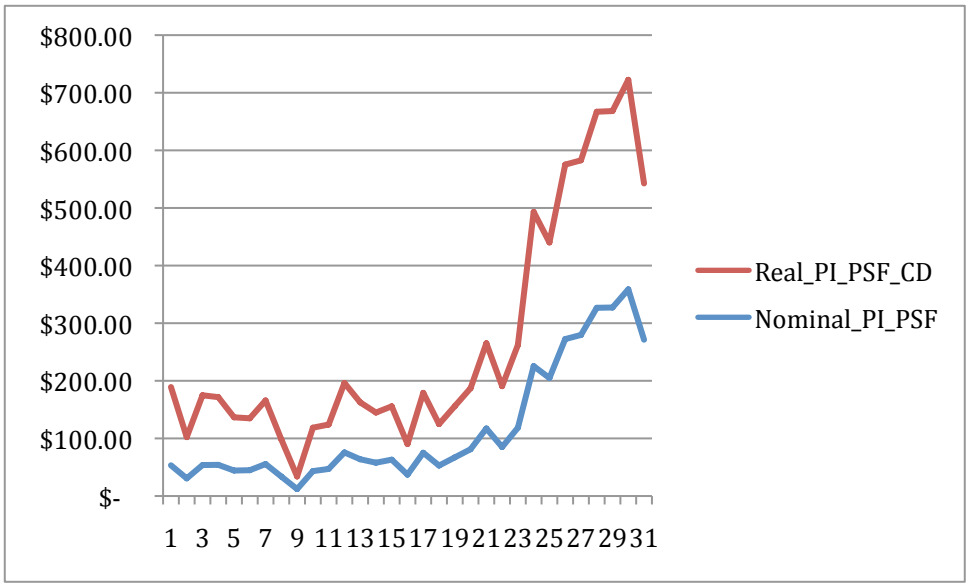
In the real estate business many investors and owners review and analyze their investments' over a period of ten years to understand the risk return profile of each individual investment. Given the thirty-year period of the data set an interesting analysis is to compare each decade return to an investor in both real and nominal terms. When each decade is compared it is easy to notice that the spread between returns when comparing nominal and real prices is not significant. However, the returns to investors over each decade is very different and not surprisingly favors an individual with a holding period from 1990 to 2000. This decade was one that did not get negatively affected by the two major recessions of 2001 and the economic crisis of 2008 (See table & graph below).

Year	Nominal_PI	Real PI
Period 1: 1980-1990	-10%	-42%
Period 2: 1990-2000	151%	150%
Period 3: 2000-2010	129%	131%


200%
150%
100%
50%
0%
-50%
-100%
1
2
3
Nominal_PI
Real PI

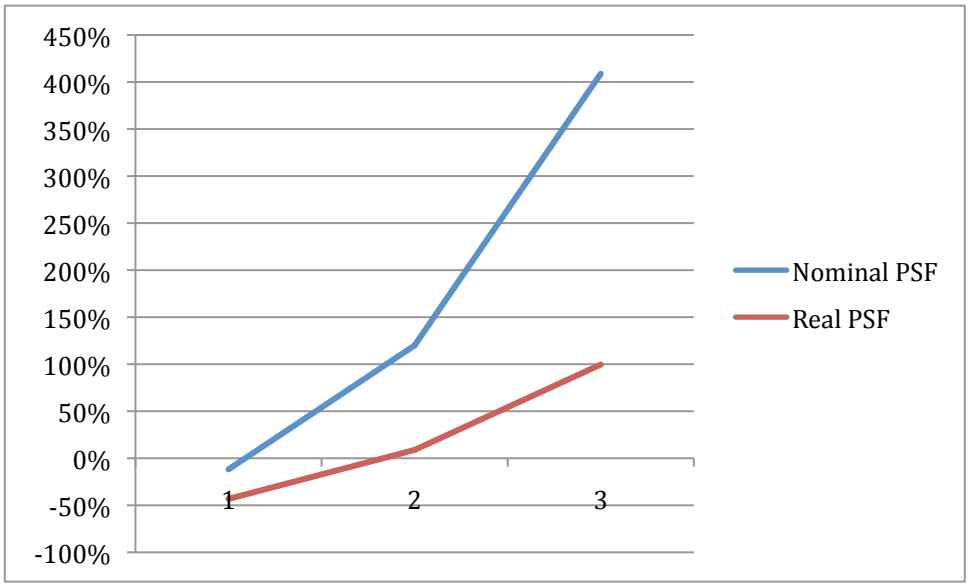
Real and Current – Price per Square Foot

The analysis that was conducted on the gross price index, both real and nominal, was also completed with respect to a price per square foot price index (See graph below).



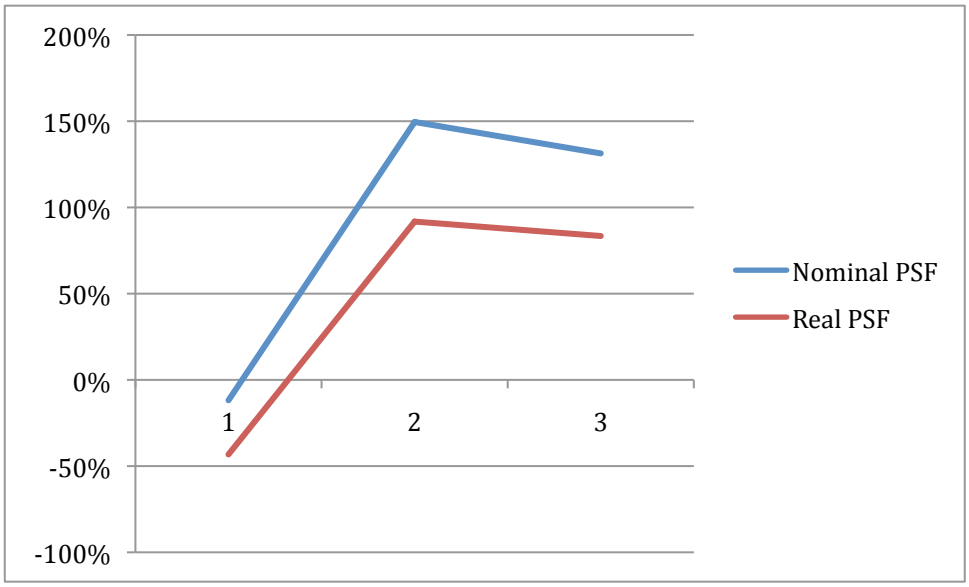
Here the exponential growth in prices is also apparent on a price per square foot basis. However, in this chart the difference in spread between real and nominal is more dramatic over the last ten years of the analyzed period. This contrasts the gross price chart, where the spread occurred in the first twenty years of the analyzed period (See chart below, graph next pg.).

Period	Nominal PSF	Real PSF
Period 1: 1980-1990	-12%	-43%
Period 2: 1980-2000	120%	9%
Period 3: 1980-2010	409%	100%



The analysis continued with reviewing the price per square foot over ten, twenty, and thirty year periods with the same base year of 1980 (See chart below, graph next pg.). Similar results were recognized here as they were in the gross price index in both real and nominal terms.

Period	Nominal PSF	Real PSF
Period 1: 1980-1990	-12%	-43%
Period 2: 1990-2000	150%	92%
Period 3: 2000-2010	131%	83%



The decade analysis for the price per square foot index also was similar to the gross price index analysis in nominal terms. However, when the real terms indexes are compared the price per square foot returns per period are significantly lower when compared to the gross price index decade price returns. From 1990-2000 gross price index return was 150% compared to 92% on a per square foot basis and a similar result was observed in the 2000-2010 decade where the gross price index return 131% compared to the per square foot index of 83%.

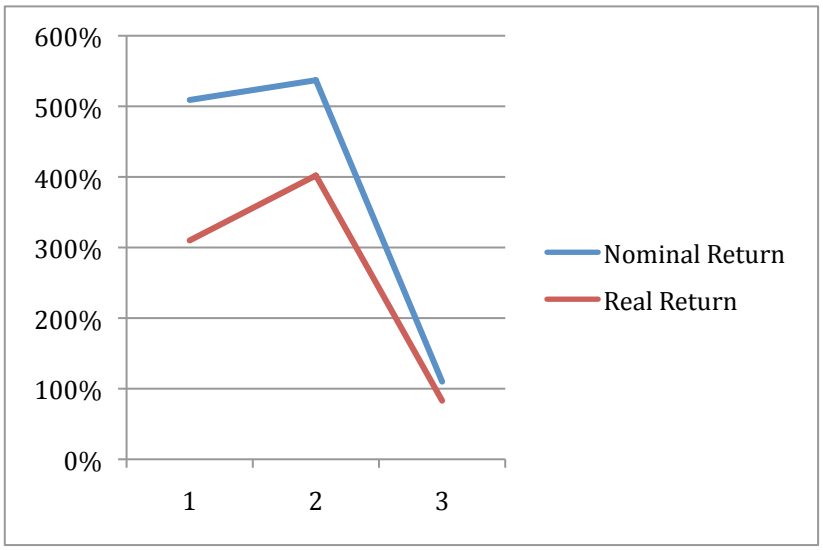
Conclusion: Price Indexes

In conclusion, when analyzing the price indexes of price and price per square foot in both real and nominal terms, it is clear that investing in properties from a macro level at The Greenbrier Resort's Sporting Club has not been a good investment. The reason is when comparing the price indexes to the S&P 500 over the same period, in almost every instance investing in the S&P 500 would have a significantly better investment return.

S&P 500

Period	Nominal Return	Real Return
1980-1990	509%	310%
1990-2000	537%	402%
2000-2010	110%	83%

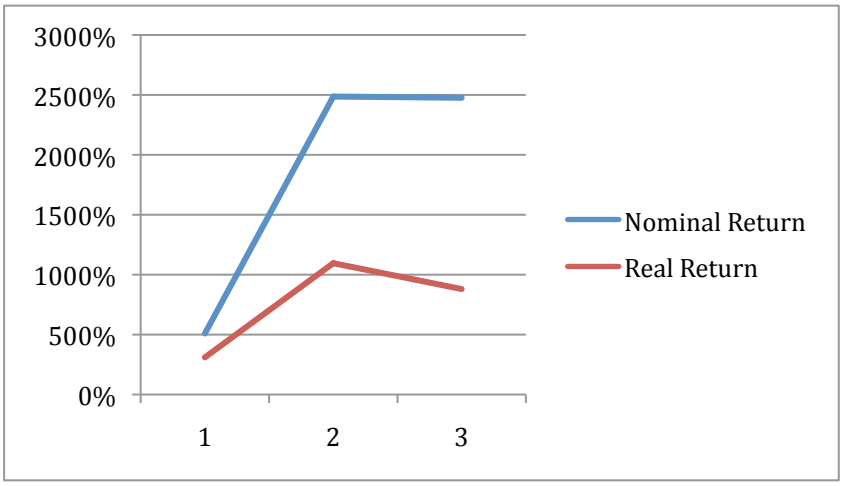
Return on $1.00 investment on Jan 1 of beginning period year



S&P 500

Period	Nominal Return	Real Return
1980-1990	509%	310%
1980-2000	2486%	1096%
1980-2010	2476%	880%

Return on $1.00 investment on Jan 1 of beginning period year



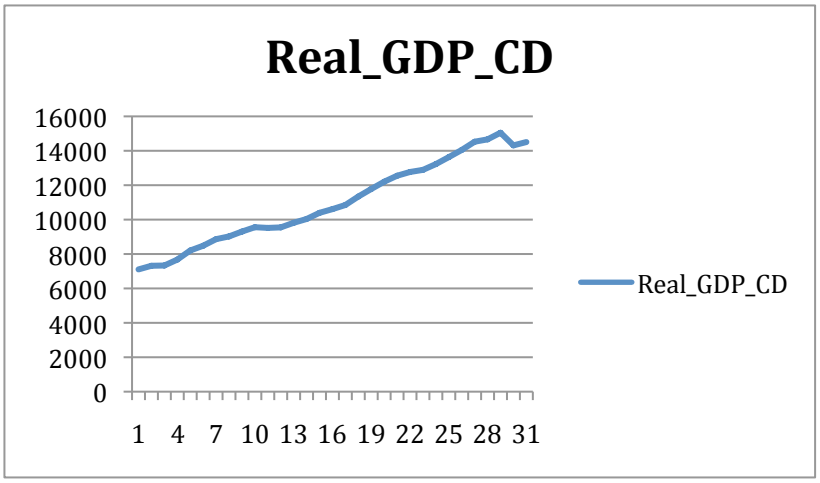
Whether the comparison is made on a decade by decade investment holding period or on a ten, twenty, or thirty year basis beginning in 1980, the investment returns that were realized over the same period in the S&P 500 significantly outpace that of the properties at The Greenbrier Resort.

Chapter 5: Time Series Analysis

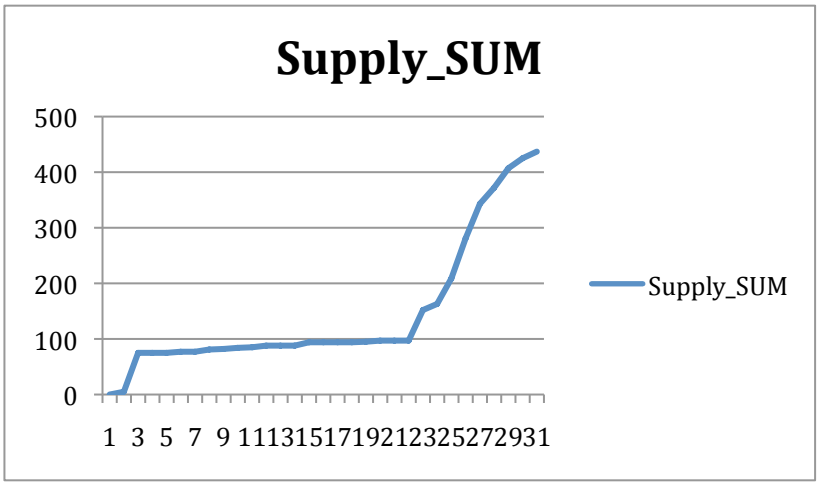
Methodology

Time series analysis is used here because they are especially suitable for evaluating short-term effects of time-varying exposures. In this time-series study, a single population, The Sporting Club residences at The Greenbrier Resort is assessed with reference to its change over the time.

There are two time series regression analyses that will be conducted. The supply and demand analysis consisted of utilizing three variables. The dependent variable was the real price index and the independent variables were the real price index, GDP, and supply.



The GDP variable was used because the local economy of White Sulphur Springs, WV or even the state was not a good indicator of demand because, as described earlier, the ownership group at The Sporting Club came from across the country.



The supply variable accounted for the cumulative supply of homes that exist at The Greenbrier.

Several analyses were run with the described dependent and independent variables and several alterations to the data, but the output was not satisfactory. In an effort to calculate better results three manipulations of the data were done. The first was to calculate supply as a cumulative supply for each period beginning with 1980 as the base year. The second was to use lagged values because growth in GDP or supply isn't going to instantly effect prices. Therefore a one-year lag was imputed into the regression for the real price index and two period lags were used for the supply, and GDP variables. The regression outputs are described in the section; Regression Description and Discussion: Supply and Demand Analysis.

The second regression analysis that was conducted was also a time series analysis and its dependent variable was the supply sum and the independent variable was the real price index lagged both one period and two periods. Similar to the reason described before, using lagged independent variables was done because of the recognition that reactions to catalysts do not occur immediately but often take a period of time to be realized. The regression outputs are described in the section; Regression Description and Discussion: Supply Equation.

Regression Description and Discussion: Supply and Demand Analysis

Regression Output:

Source	SS	df	MS		Number of obs =	29
					F(3, 25)	44.44
Model	1.14E+12	3	3.8155e+11		Prob > F	0
Residual	2.15E+11	25	8.5855e+09		R-squared	0.8421
					Adj R-squared	0.8231
Total	1.36E+12	28	4.8545e+10		Root MSE	92658

real_pi_cd	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
real_pi_cd						
L1.	0.8253834	.1917245	4.31	0.000	.4305195	1.220247
real_gdp_cd						
L2.	29.86068	13.42575	2.22	0.035	2.209843	57.51152
supply_sum						
L2.	-421.0097	439.5302	-0.96	0.347	-1326.239	484.2197
_cons	-197176.4	111980.6	-1.76	0.091	-427804.7	33451.83

P = -197,176.11 + .8254 (real pi) + 29.8607 (real gdp) - 421.097 (supply sum)

R^2 = .8421

The equation above can be interpreted as:

1. Constant: -197,176.11 is the geometric mean
2. .8254: or 1 – .8254 = 18% decrease in net price increase/decrease year over year
3. 29.8607: is the incremental increase in price per every unit increase in real GDP
4. -421.097: is the incremental decrease in price for every unit increase in supply

It is important to note, that the variables have been lagged either one or two periods in this regression. This was done because the real estate market, and many other markets, do not react instantaneously to independent variable movements. For example, it can be assumed that an increase in real GDP would positively affect many individuals earning power through increased income. However, those individuals rarely spend that income immediately on a house or other big-ticket items. Normally there is a lag between the independent variable movement or action and its affect on the dependent variable.

This equation derived above provided the ability to calculate how may new units are necessary to bring to market in order to counterbalance each 1% growth in GDP.

Real GDP (2010)	14508.2
1% Change	1.0%
	145.082
1% Real GDP	145.08
Real GDP Coefficient	29.86
Price Increase per 1% Increase GDP	$ 4,332.25
Price Increase per 1% Increase GDP	$ 4,332.25
Supply Sum Coefficient	(421.01)
Units Necessary to meet 1% Increase GDP	(10.29)
Units Necessary to meet 1% Increase GDP	(10.29)
Supply Sum Coefficient	(421.01)
Price Decrease due to Unit Increase	4,332.25
Price Decrease due to Unit Increase	$ 4,332.25
Price Increase per 1% Increase GDP	$ 4,332.25

The 2010 Real GDP was multiplied by 1% to get the 1% change in Real GDP, or 145.082. The next step is to multiply 145.082 by the Real GDP Coefficient in an effort to calculate the price increase for each one percent increase in Real GDP. The increase is $4,332.25. In order to calculate how many units are need to be added to supply to counter that price increase, $4,332.25 is divided by the Supply Sum coefficient, -412.01, and the answer is 10 units. This can also be calculated by calculating what -421.01 must be multiplied by in order to get -$4,332.25, or the price increase per 1% increase in Real GDP.

The next step is to understand the price trend given an assumption that over a ten-year period, Real GDP would continue to increase at 1% and supply would remain unchanged. Also, what the similar price movement would be given a flat GDP and a steady increase, year-over-year, in supply by 10 units.

Real Price Index Lag 1 Coefficient			0.8254	0.1746
	Real GDP Increase 1% Yr 1, Supply Unchanged	Real GDP Unchanged, Supply Increase 10 Units Yr One		
Year 1	$ 4,332.25	$ (4,332.25)		
Year 2	$ 3,575.84	$ (3,575.84)		
Year 3	$ 2,951.50	$ (2,951.50)		
Year 4	$ 2,436.17	$ (2,436.17)		
Year 5	$ 2,010.81	$ (2,010.81)		
Year 6	$ 1,659.72	$ (1,659.72)		
Year 7	$ 1,369.94	$ (1,369.94)		
Year 8	$ 1,130.75	$ (1,130.75)		
Year 9	$ 933.32	$ (933.32)		
Year 10	$ 770.36	$ (770.36)		
Total	$ 21,170.65	$ (21,170.65)		

The chart above calculates the increase and decrease in price over a 10-year period given the affects of two different economic and market forecasts. The first forecast (column 1) is that GDP will increase by 1% in year one and then stay flat, (0% growth) while supply remains unchanged. The result is that price will increase $4,332 in the year that GDP increase by 1% and if GDP does not grow anymore in year two the price will still increase but at $3,575 and after ten years the cumulative increase would be $21,169. The second economic forecast of supply increasing by ten units in year one and then remain flat (0 units per year), while GDP remains unchanged has the same time pattern to its effect. This means that prices in the year that supply increases by 10 units and GDP if flat will decrease by $4,322 and continue to decrease but at a lower rate in year two of $3,575. The 17.5% decrease and increase in price given the two economic forecasts is because of the coefficient that is calculated for the real price index, .8254 or 82.54% (1 - .8254 = .1746, or 17.46%). Given this phenomena and the time complexity, it can be concluded that it

will take 10 units of supply to offset the price increase due to a 1% increase in real GDP.

Regression Description & Discussion: Supply Equation

Regression Output:

Source	SS	df	MS	Number of obs =	29
				F(2, 26)	261.92
Model	391898.375	2	195949.188	Prob > F	0
Residual	19451.4869	26	748.134112	R-squared	0.9527
				Adj R-squared	0.9491
Total	411349.862	28	14691.0665	Root MSE	27.352

supply_sum	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
real_pi_cd						
L1.	0.0002948	.0000557	5.29	0.000	.0001802	0.0004093
L2.	0.0002932	.0000617	4.75	0.000	.0001664	0.00042
_cons	-27.3661	9.531905	-2.87	0.008	-46.95921	-7.772992

S = -27.3661 + .0002948 (real pi L1) + .0002932 (real pi L2)

R^2 = .9527

The equation can be interpreted as:

1. Constant: -27.3661 is the geometric mean
2. .0002948: real price index coefficient lagged one period
3. .002932: real price index coefficient lagged two periods

This equation provided the ability to figure out given a increase in the price index what is the change in supply and therefore what is the price growth needed to bring out that supply. In order to answer this question the year 2010 real price index was input for both real pi L1 and L2 and then the supply was calculate. Then the real pi L1 and L2 was increased by 5%, in an effort to calculate the new supply. Then each of the supply outputs was compared to get a delta given a 5% increase in the real price index.

S = -27.3661 + .0002948 (real pi L1) + .0002932 (real pi L2)

real pi L1		598,671.31	628,604.88
real pi L2		598,671.31	628,604.88
Supply		324.65	342.25
	Delta	**17.60**	**5.421%**

Constant	(27.3661)
Coefficient real pi L1	0.00029480
Coefficient real pi L2	0.00029320

The conclusion is that given a 5% increase in the real price index there is a 5.421% increase in supply. This is an example of unit supply elasticity, which means any change in price is matched by an equal relative change in quantity.

Chapter 6: Conclusion

The intent of this study was to conduct a hedonic price equation analysis, derive a price and price per square foot index, and derive two time series equations. One analysis would focus on the independent variables of supply and demand and the dependent variable real price index. The second would focus on deriving a supply equation for the analyzed market of the Greenbrier Sporting Club at The Greenbrier Resort in West Virginia.

The analysis began with the first step of understanding through a hedonic price equation how certain home characteristics played a role in a property's price. Even though the independent variables, in many occasions, did not have statistically significance, their conclusions still provided important insights. In conclusion, the law of diminishing marginal utility can be observed with respect to the number of bedrooms in a residence because there is a clear decrease in price associated with the adding four and five or more bedrooms. The second important insight is with respect to the number of bathrooms in a residence. Including additional bathrooms above the base of two does add to the price of the property. Understanding that statistical significance was not recognized in this regression, the conclusion is it is likely that the market prefers three bedroom and three or more bath residences. The third important insight is in understanding how location affects price. The regression output implies that Neighborhood 3, which consists of The Snead, Lodge Cottages, Meadows, and Travelers is the highest price grouping and is followed by Neighborhood 1 (base), Neighborhood 4, and Neighborhood 2.

The price index that was derived helped to segment the price behavior of the market by both decades and three holding periods of ten, twenty, and thirty years. Upon analyzing the pricing behavior it is clear that an individual who purchased property at The Greenbrier did not, on average, beat the same returns as a diversified equity portfolio, or the S&P 500. The price index also provided a foundation and key data to derive the time series equations.

The conclusions from the time series equations are very interesting. The first equation, that analyzes supply and demand, uncovers that for every 1% increase in GDP there is a $4,332 increase in price. The supply equation, or second time series analysis, uncovers that unit supply elasticity is observed because a change in price is matched equally by a change in quantity, or in this case an increase in the real price index by 5% was matched by a 5.4% increase in supply.

Following a similar thought process Real GDP growth is assumed to be stable and likely for the foreseeable future at 2.5%. Given this economic assumption we can calculate the supply, in units, that needs to be delivered to the market, in order to stabilize prices.

Real GDP (2010)	14,508.2
2.5% Forecast	2.5%
	362.71
2.5% Real GDP	362.71
Real GDP Coefficient	29.86
Price Increase per 2.5% Increase GDP	$ 10,830.37
Price Increase per 2.5% Increase GDP	$ 10,830.37
Sum Supply Coefficient	(421.01)
Units Necessasry to meet 2.5% Increase GDP	(25.72)
Units Necessary to meet 2.5% Increase GDP	(25.72)
Supply Sum Coefficient	(421.01)
Price Decrease due to Unit Increase	$ 10,830.37
Price Decrease due to Unit Increase	$ 10,830.37
Price Increase per 2.5% Increase GDP	$ 10,830.37

The calculations above explain that there is a need to deliver roughly 25 units to market for every increase in real GDP by 2.5%. In other words, every percentage increase in GDP should stimulate 10 units of supply.

It was mentioned earlier that a desired outcome of this analysis was an ability to provide the developer and owner of The Greenbrier with insights into how he can control the market in an effort to limit price volatility. Given the calculations above he now

understands how positive and negative growth of GDP can affect prices of the residences at The Sporting Club.

Unfortunately for the developer of The Greenbrier, excessive growth and subsequent sales of residential vacant lots during the period of expansion limits his control of supply and leaves the resort exposed to price volatility in the future.

Vacant Land at The Greenbrier (units)		371
Units Necessary to meet 2.5% Increase GDP		25.72
Year of Supply given 2.5% Increasae in Supply		14.42
Vacant Land at The Greenbrier (units)		371
Vacant land Owned by The Greenbrier (developer)		83
Vacant land Owned by Members (owners)		288
	Total	371
% Vacant land Owned by The Greenbrier (developer)		22%
% Vacant land Owned by Members (owners)		78%
Yearly Supply (Units) Owned by The Greenbrier (developer)		3.23
Yearly Supply (Units) Owned by Members (owners)		11.20

The chart above explains how, according to the Greenbrier County assessor's office there are 371 vacant lots at The Greenbrier. Assuming that real GDP grows at 2.5% per year and that 25 units of supply is needed to be deliver to the market in an effort to stabilize price, it can be concluded that there is almost 15 years of supply embedded at the resort given current zoning.

The unfortunate reality for the owner of the resort is that most of the future supply of residences is controlled by current members of the club. The chart above explains how 78% of the vacant lots at the resort are owned by the owners and only 22% is owned by the developer/owner. The problem with this structure is that the control of supply is not in the hands of the resort but its owner and members. Given the fact that the ownership group is diverse and individuals have purchased with both a desire to construct a home for personal enjoyment as well as on a speculative basis, this dynamic leads one to conclude that volatile prices will continue in the future. One way that the resort could try and limit future volatility is to buy back units as they come to market with the intention of

“land-banking.” This strategy would enable the developer/owner to control supply and limit volatility in the market.

The final conclusion is that given the volatility of GDP growth and a supply backlog of roughly 15 years, it will probably be more than 15 years until the properties at The Greenbrier have potential for significant price increase due to a lack of supply. In the meantime, prices will continue to be volatile as GDP fluctuates and individuals, not the developer, decide when to bring units of supply to the market.

Bibliography

1. Conte, Robert S. *The History of the Greenbrier: America's Resort*. Charleston, W. Va.: Published for the Greenbrier by Pictorial Histories Pub., 1989. Print.

2. Edward F. Renshaw, “The Demand for Housing in the Mid-1970's”, Land Economics, Vol. 47, No. 3, (Aug., 1971), pp. 249-255

3. National Association of Realtors. Second Homes: Talking Points. 10 March 2010. 6 July 2010 <http://www.realtor.org/press_room_secured/public_affairs/tpsecondhomes>.

4. DiPasquale, Denise, and William C. Wheaton. *Urban Economics and Real Estate Markets*. Englewood Cliffs, NJ: Prentice Hall, 1996. Print.

5. "The Greenbrier." *Wikipedia*. Web. 27 July 2011. <http://wikipedia.com>.

6. *DPS Sporting Club Development Company - Home*. Web. 27 July 2011. <http://www.dpsdevelopment.com>.

7. "Greenbrier Bankruptcy." *Breaking News and Opinion on The Huffington Post*. Web. 27 July 2011. <http://www.huffingtonpost.com>.

8. *Charleston Daily Mail - West Virginia News and Sports -*. Web. 27 July 2011. <http://dailymail.com>. http://dailymail.com/News/statenews/201103060466 http://dailymail.com/News/statenews/201103060466

9. Wheaton, and Carey. "Ski Resort Real Estate: Why Not to Invest (2000)." *MIT MSRED Thesis*. Print.

10. Corey, John D. "Econometic Model of Ski Condo Prices in New England." *MIT MSRED Thesis*. Print.

11. Soininen, John M. "An Analysis of the Aspen Housing Market." *MIT MSRED Thesis*. Print.

12. Larsen, Brady W. “Resort Real Estate: An Economic Analysis of Second Home Pricing Behavior in Park City, Utah.” *MIT MSRED Thesis*. Print

13. Lee, Sean “Second Home Real Estate Market: Economic Analysis of Residential Pricing Behavior near Heavenly Ski Resort, CA. *MIT MSRED Thesis*. Print