How Different Home Styles Are Valued in the Salt Lake City Market

By

Barrett Peterson

Bachelor of Arts in Political Science, 2000

Duke University

Submitted to the Department of Architecture in Partial Fulfillment of the Requirements
For the Degree of

MASTER OF SCIENCE
In Real Estate Development
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Signature of Author____ _____

Barrett Peterson
Department of Architecture
August 4, 2003

Certified by_____

Dr. Henry O. Pollakowski
Visiting Scholar, Center for Real Estate
Thesis Supervisor

Accepted by_____

David Geltner
Chairman, Interdepartmental Degree Program in Real Estate Development

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Submitted to the Department of Architecture on August 4, 2003 in Partial Fulfillment of the Requirements for the Degree of Master of Science in Real Estate Development At the Massachusetts Institute of Technology

Abstract

This thesis focuses on market valuation of attributes of single family housing in the Salt Lake City market. Using data from different sub-regions of Salt Lake County, this paper addresses the question of buyer demand with respect to home style. Using hedonic regression analysis, the thesis explores the premium or discount associated with different styles of homes. Analyzing the hedonic results in the context of the current housing stock in the Salt Lake Area provides interesting insights into how rambler, two-story, split-entry and tri-level homes are valued. The hedonic model shows that buyers pay a premium for ramblers across the different sub areas of Salt Lake City. Given this premium, the thesis explores what the optimal mix of home style might be in the two areas where considerable developable land remains.

Thesis Supervisor: Henry O. Pollakowski
Title: Visiting Scholar, Center for Real Estate

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1. INTRODUCTION

1. 1 Introduction

One of the most difficult parts about buying a home is finding the right fit. Buyers searching for houses evaluate potential purchases attempt to match their preferences with what is currently available on the market given their income and prices for different house types. Many of the preferences that buyers have seem completely rational. For instance, the need for a certain number of bedrooms or bathrooms is a fairly standard preference. The desire to locate in a neighborhood that makes the buyer feel at ease is another straightforward preference. Other buyer preferences, however, are less standard and more complex. In colder climates, some buyers refuse to purchase a home that faces north because it means a long winter of un-melted snow in the yard and driveway. Another example of a more unusual preference is those buyers who will only live on a cul-de-sac or a dead end road. The point is that every buyer possesses an intuitive collection of preferences that feeds into the purchase decision. Trying to completely understand the logic behind any one home buyer's decision making process is a little like trying to see into a black box.

Comprehending the balancing of preferences, income and prices of each individual home buyer on the market is an impossible task. However, by looking at market outcomes, much can be learned about what an "average" home buyer wants. An example of this aggregate approach to understanding buyer demand is the regional differences in the U.S. housing stock. Imagine a couple looking to buy a home in Salt

Lake City. Without knowing this couple, it would be impossible to guess what exactly they are looking for in a home. Using some intuition and a bit of statistical reasoning though, it would be easy to deduce that there is a pretty good chance this couple is not looking for a Cape Cod style home. On the other hand, if the buyers were Boston-based, the odds would be much higher that they actually would be looking for a Cape Cod or New England-style home. The point is that there are regional differences that help explain what gets built where and statistics are a helpful way to identify and make sense of them.

Regional differences can be attributed to a variety of factors. A region's history, climate, demographics, local culture, and historical building patterns are just a few of the factors that contribute to the variation of housing stock from region to region in the U.S.

For developers and builders, understanding the nature of housing demand is a key to being successful. If a builder undertakes the construction of single family homes, he must have a fairly good idea of what works in a given market and what does not. The builder must be savvy enough to know the essentials of what the buyers want. If the builder is clever, he might be able to locate underserved areas of the market. For instance, perhaps a spacious "great room" (instead of a standard size family room) is becoming popular in a given area. The builder must be able to recognize the changing trends in buyer demand and capitalize on the trends by building what the buyer wants as he undertakes new construction projects.

One facet of a home builder's job is selecting which type of home style will sell successfully in a given area. Rare is the case in which one home style completely dominates a relatively sizeable market. For this reason, it would not make sense for a

home builder to construct only one style of home. Indeed, it would make much more sense to offer a mix of home styles. The difficult part, however, is to correctly gauge what the correct mix is. For a home builder, having a firm grasp on what this optimal mix is critical before embarking on a project of any considerable size.

This thesis attempts to answer this very question. Using a data set composed of home sale transactions from the past seven years and the tool of hedonic regression analysis, the goal of this paper is to determine what the optimal mix of home style is within different areas of Salt Lake City.

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1.2 Outline of Paper

This paper will be divided into seven chapters: 1)Introduction, 2)Surveying the Built Environment, 3) Data Collection and the Creation of Seven Sub Areas, 4)Local Home Styles , 5)Methodology and Regressions, 6) Getting to an Optimal Mix of Home Style in the Seven Sub Areas and 7) Conclusion. The Introduction has already given a brief description of what will be covered in the paper. Chapter Two covers different aspects of the Greater Salt Lake area housing stock to brief the reader on essential background information before delving into the more in-depth analysis of the data set. Chapter Three catalogs how the data set was collected and the rationale behind the separation of the data into various subsets. Chapter Four summarizes the different home styles that are studied in this paper and statistically compares the different home styles across various subsets of data. Chapter Five narrates the methodology I employed to

arrive at my subsequent results. Chapter Six discusses the optimal mix of home style for each sub area based on the regression analyses. Finally, Chapter Seven weaves together the various strands of information from the different chapters to draw the paper to a close.

2. SURVEYING THE BUILT ENVIRONMENT IN SALT LAKE

2.1 Salt Lake's Current Housing Stock

The first step in understanding the aggregate buyer demand in a given area is to look at the market outcomes of the home transactions there. It should be noted, however, that it is inherently difficult to effectively convey in words the characteristics of the entire housing stock of a large metropolitan city. Telling the story with statistics and figures also has it limitations. Attempting to give an overview of a sizeable group of homes armed with only numbers inevitably fails to convey any sort of mental picture of the homes. Indeed, perhaps the best way to describe the typical housing of Salt Lake is to combine narratives and numbers in a way that gives the reader some semblance of what the housing stock in Salt Lake actually looks like.

Starting with the numbers, as of the 2000 Census, there were roughly 310,988 homes in the Salt Lake area.[1] Based on the data from Salt Lake's local real estate listing service (the MLS), most of the homes in the valley fall into five different categories based on how they look from the outside and how they are structured. The most prevalent type of home is the rambler/ranch home. In addition to the rambler, the four other dominant types of homes are two-story, split-entry, tri/multi-level, and bungalow/cottage style homes.

Another way to describe the housing stock in Salt Lake City is to focus on what is conspicuously absent. Noticeably absent from the housing stock in the Salt Lake Valley

[1] 2000 U.S. Census, U.S. Census Bureau

is a large population of Spanish style homes. This is somewhat surprising as these adobe style homes are often found in other areas of the west. Less surprising is the fact that there are not many New England style homes within Salt Lake County.

Geographically, Salt Lake City finds itself sandwiched between four distinct regions of the country—the Pacific Northwest, the Southwest, the West Coast, and the Midwest. It is probably fair to say that the dominant housing style in the Salt Lake Area more closely resembles the homes in the Midwest than any of the other areas. A caveat must be added to this observation as mountain-style homes have started to successfully penetrate the market within the past ten years. These mountain-style homes have been so successful in the nearby alpine communities of Park City, Deer Valley and Heber City that they have started springing up in parts of the Salt Lake Valley.

Some of the more traditional building materials used on home facades in the Salt Lake Valley are brick, stucco and aluminum siding. Recently, a synthetic river rock has become a popular treatment for local homes. It is less common to see the clapboard siding that is often seen in parts of the New England. Roofing materials generally are asphalt shingles or wooden shingles in the more expensive homes. The heavier terra cotta tiles found in part of California and the Southwest are rarely found in the Salt Lake area.

One important aspect that should be mentioned that makes the Salt Lake City housing stock unique is that the majority of the homes have full basements. Not all areas of the country have basements simply because it is too difficult to excavate the soil. The geography and soil quality in Utah allow for the basements in most homes. The native soil, softened for generations by the irrigation lines of early farmers allows builders to easily create a basement when building a home. It is estimated that ninety to ninety five

percent[i] of homes in Salt Lake County have a basement. Salt Lake area basements amount to much more than just a crawl space. The basements generally function as extra living space, recreation space or often just as storage space.

The basements found in most Salt Lake area homes directly influence the market valuation of the homes. In the new home market, the basement is generally left unfinished so that the buyers can get into the home for less money. Even in re-sales, many times the basement is either unfinished or even just partially finished. This is simply another factor that home buyers must think about before purchasing a home.

Most of the houses in Salt Lake have a front or side-loaded garage. The majority of the more recently built homes have an attached garage. The rear-loaded style garage that is found in many parts of California is noticeably absent in Salt Lake City. Three-car garages have become extremely popular in the last ten years as bigger cars and SUVs have made their presence felt on the size and shape of area homes.

From an industry perspective, the building climate in Salt Lake County is highly fragmented. On the one end of the spectrum are the large Utah builders like Ivory Homes, Woodside Homes and Perry Homes. On the other end are the individuals who serve as their own general contractors and are often characterized as "owner-builders". Statistically, owner-builders are actually in the majority in Salt Lake County. Consider that in 2002, of the 11,578 issued for single family homes, 1015 were for owner-builders.[2] The next closest single builder was Ivory with 615 home permits. This statistic highlights the individuality of the home buyers in the Salt Lake area. It should come as no surprise that home buyers in Salt Lake have largely eschewed the large national builders like Pulte Homes or Centex Homes. Both companies made brief forays into the

[2] "Construction Monitor-Weekly Building Permits", www.constructionmonitor.com

Salt Lake market in the late eighties but later pulled out due to poor performance. Centex has re-entered the markets only recently but does not even make top ten of builders within Salt Lake County.[3] Thus, in the Salt Lake area, the builders that have had the most success are local companies with in-depth knowledge of what local buyers want. The national home building companies have not yet mastered the art of understanding local buyer demand in the Salt Lake region.

After this brief summary of housing style in Salt Lake City one might question the relevance of such information. Why is it important to understand the built environment in the Salt Lake City housing market? What relevance does it have to me if I am buying a home tomorrow? The answer is that the current built environment significantly impacts local housing demand. The prospective home buyer, whether looking to buy an existing home or a newly-constructed home will always make comparisons with what is already built. Even if the home buyer doesn't like what is out there, he is constrained by what is already there. Today's buyer is affected not only by today's builders and buyers but by those from ten years ago, and even by those from 100 years ago.

This brief overview of various characteristics of homes in the Salt Lake valley helps depict the environment a prospective buyer encounters when looking to buy a home. It is easy to simply attribute today's built environment to the past decisions of local builders and buyers, but there is more to it than just that. While what is built today has a great deal to do with what builders have offered and what buyers have asked for, it also has to do with the history of the Salt Lake Valley, its unique geography, and the people that have called this area home.

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[3] "Construction Monitor-Weekly Building Permits", www.constructionmonitor.com

2.2 Understanding the Unique Character of Salt Lake City

Salt Lake City remains relatively anonymous when compared with other large cities in the United States. It is not as well known, or large as New York City. It is not as famous as its mountain neighbor Denver, nor is it as glitzy as nearby Las Vegas. Nevertheless, Salt Lake has its own story to tell. Part of the story is that Salt Lake has a unique character that keeps most locals within the state and attracts a modest number of outsiders as well. There is obviously something about Salt Lake that sets it apart from all other living areas of the country.

A fuller account of the story of Salt Lake is necessary to understand who lives here and why. This story must include pertinent details about Salt Lake's geography, history, demographics, climate and culture. Once this story is told, it becomes easier to understand the aggregate buyer demand in the area.

2.3 Making the Desert Bloom

When you are known for the having the "greatest snow on earth" and for successfully hosting the most recent Winter Olympics, it is natural that most people assume that Utah is a state with plenty of moisture. With bodies of water like Lake Powell and stretches of the Colorado River running through the state, water shortages usually don't cross outsiders' minds. While Utah benefits from such positive images in many ways, these images obscure an essential element of Utah's ecology: Most of the

state is one big desert. In fact, the Salt Lake Valley makes up the eastern end of the Great Western Desert that stretches from the Wasatch Mountains to eastern Nevada.

The land was so harsh and uninviting that it was passed over routinely by many settlers on the trek to Oregon and California in the 1840's. In1847, Brigham Young, the leader of the Church of Jesus Christ of Latter-day Saints entered the valley in middle of summer through what it known today as Emigration Canyon. When Young and the group of Mormon pioneers that he was leading laid eyes on the Salt Lake Valley they saw a harsh, uninviting locale. One historian noted, "When the first Mormon pioneers set eyes on the Great Basin in July 1847, they saw barren wilderness that previous travelers had dismissed as uninhabitable."[4]

Undaunted, on July 24, 1847, Young declared, "This is the place" and countless wagon trains heeded his beckon call as thousands of members of the Church of Jesus Christ of Latter-Day Saints made the treacherous crossing of the Great Plains and came to Salt Lake to settle in the desert valley.

2.4 In Desert Denial

Today, residents of the Salt Lake Valley are the direct benefactors of the hard work of the Brigham Young and other early Mormon pioneers. The legacy of the pioneers is noticeable today as older areas of the city benefit from tree-lined streets and

[4] "Ingenuity, Hard Work, and Cooperation: The Story of Early Utah Irrigation"; www.lds.org

the soil is now soft enough to easily dig basement foundations for the majority of new homes.

What is perhaps, more remarkable is that Brigham Young seems to have convinced residents of Salt Lake ever since that this actually is not a desert. Judging from the homes, the yards and the landscaping found in Salt Lake, you would never guess that the area is a desert. It is rare to see a home that does not have both a front and back yard with a full, green lawn.

By irrigating the soil, planting trees, and in general making the desert bloom, Young and the early Mormon pioneers indirectly influenced the types of homes that would later be built in Salt Lake City. The argument could be made that had the region been settled by someone else, it would not have taken on the form that it takes today. Taken to a logical extreme the argument could be made that the Salt Lake Valley today would look more like a desert than it actually does. Under this scenario, the housing stock would probably look much different—instead of a Midwest feel to the homes, the southwestern style home would almost certainly be in vogue.

2.5 Development in the Early Years of the Valley

Salt Lake City is hemmed in by mountain ranges on all four sides. Though the mountains have canyons and passes that allow roads in and out of the valley, the amount of developable land is finite. If you go a certain distance in any one direction you are most likely to run into mountains. If you avoid the Oquirrh Mountains to the west, you will end up either in the Great Salt Lake, or the Great Western Desert—neither is conducive to building a home. It comes as no surprise then that since the Mormon Pioneers arrived in the valley in the summer of 1847 that development has slowly but surely been pushing closer and closer to the natural boundaries of the valley—namely the mountains. If development continues at its current pace, most developable land will, in all likelihood, be gone within fifteen to twenty years.

Going back to the first years of Mormon settlement, many key decisions were made that affected the development of the entire Salt Lake Valley. Perhaps one of the most important decisions was the creation of a standardized city grid. Under BrighamYoung's supervision, this grid system was laid out.

In the center of the city, Temple Square was founded. This is the city's most important block. All addresses are numbered from this point. 100, is equal to one city block. Each block was arranged in a grid pattern in 10-acre squares. All the streets were made 132 feet wide. This was deemed "wide enough for a team of 4 oxen and a covered wagon to turn around."[5]

[5] "Salt Lake City History", www.saltlakecityutah.org

The Mormon Temple which Young and his people began constructing in 1853 would become the center coordinate for the city's grid system. Today, the temple that was completed in 1892 is situated in the heart of downtown Salt Lake. Brigham Young's grid system remains intact and in use. The grid serves not only Salt Lake City proper but all the major cities within Salt Lake County. (The terms Salt Lake County, Salt Lake Area and Salt Lake Valley will all be used synonymously in the thesis) All of the local addresses indicate a rough distance from the cornerstone of the temple in downtown Salt Lake City.

2.6 The Current State of Development

Today, the only sizeable tracts of land that are left to develop in Salt Lake County are found in the southwest quadrant of the valley. Nearly everywhere else in the valley is largely built out.

For many years, Salt Lake Valley felt a little bit like what Dallas feels like today. There was the feeling that you could just build and build and never really worry about running out of supply. Today, development is pushing homes towards the natural boundaries of the city. Slowly but surely, developers and land sellers alike are realizing that the supply of buildable land is indeed finite in the Salt Lake Valley. The city eventually will start to experience the same growing pains that cities like Boston and Los

Angeles went through a generation or two ago. Both of these cities have natural barriers on two or three sides (Boston is a peninsula and Los Angeles is bordered by the Pacific Ocean and mountains as well).

Currently, however, the Salt Lake Valley seems blissfully unaware of the adjustment will have to be made as the current supply of land runs out. Right now, the city finds itself somewhere in between the extremes of two larger U.S. cities: Boston and Dallas. The Salt Lake Valley is like Dallas in the Southwest quadrant of the valley in that construction continues at a feverish pace as remaining land gets gobbled up. It is like Boston in other areas of the city where the neighborhoods are already built out and there is really no land left for large-scale development. In these areas, infill projects and renovations of existing homes have become the norm. Eventually, the local residents will have to come to terms with the fact that the city is indeed like a Boston or Los Angeles. There are natural geographic limits that affect land and home values tremendously. The probable effect will be a supply-constrained market that will experience the same sort of appreciation patterns that the city of Boston and its outlying suburbs have seen.

While the Salt Lake area struggles to come to terms with the fact that land is indeed finite in the valley, there is another interesting dynamic at work in the valley that heavily influences market outcomes: Buyers must deal with the so-called East-West divide.

2.7 East versus West: The Great Divide

Though Brigham Young probably never intended this to happen, the grid system he laid out in shortly after settling here eventually has become a dividing line that separates the city into what most people know as the East side or the West side. In general, addresses that have an east coordinate mean that the property is more valuable than those addresses with a west coordinate. The main reason for this is that as you travel east from the center of the grid, Salt Lake City rises slightly in elevation towards the foothills of the Wasatch Mountains. These foothills ring the city on the north, east and south sides. The longest stretch of the foothills is on the east side of downtown; hence the term, "East side", or the "East Bench." The west side, therefore suffers partly from the imaginary boundaries that Brigham Young drew up but mostly from the fact that this part of the city does not benefit from a rise in elevation like the east side does. The rise in elevation provides a view, and for some reason, a difficult-to-measure level of prestige to property owners who live on the East Side.

The description of the region's geography serves an important purpose: As in most areas of the county, location has a direct impact of home values in the Salt Lake area. Whether you buy a home in a newly created neighborhood in the southwest quadrant of the valley or in an old, established neighborhood near downtown, the value of the home will vary. As in any city, location plays a significant role in the valuation of homes in the Salt Lake area.

2.8 Future Development

Development in the Salt Lake Valley has traditionally been as fragmented as the building industry. Generally, sites have been less than 30 acres in size and have been developed and built upon by a local builder.[6] This trend seems to be shifting though as many new master-planned communities have received approvals in the past few years. Many are already underway, while some are still in the planning stages. These communities are quite unique in that they offer home buyers the option of living in a neighborhood with a collection of different home sizes and different sized lots. U.S. zoning has traditionally segregated different size lots into different neighborhoods. In Salt Lake, these master-planned communities are a relatively recent phenomenon and only time will tell if they become the preferred type of residential neighborhood.

Without exception, these planned communities are located in the southwest quadrant of Salt Lake County underscoring the point that this is the only area in the valley that contains large tracts of usable land. These master-planned communities should result in "an ultimate slower build-out of current agricultural land."[7] This should slow the consumption of the remaining land that will eventually be developed.

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[6] "Utah's Residential Construction: The Impact of Changing Economics and Demographics on the Characteristics of New Homes and Housing Densities."

[7] "A Forecast of Rents, Prices, and Construction for the Salt Lake-Ogden Area."

2.9 Unique Demographics

Salt Lake County is the largest county in the state of Utah in terms of population. As of the latest 2000 Census the county had 904,331 residents[8]. The residents of Salt Lake County represent roughly 40% of the population of the entire state. The area of the county comprises 737 square miles. As of the 2000 census, Salt Lake County had 310,998 housing units. This number represents about 40% of the housing units in the entire state.

The average household size in Salt Lake County was 3.0. This household size, though lower than the state average (Utah had an average size of 3.13 in 2000) was much larger than the national average of 2.59 persons per household.

The data points to the fact that family size is an important issue in Salt Lake County. In this sphere, the influence of the LDS Church continues to be felt 150 years after the first settlers arrived in the valley. The Mormon Church has always placed an emphasis on the importance families. One of the tenets of the LDS religion is that parenting and bringing children into the world is one of the most important roles for members of the church. The result of this counsel is that the sizes of Mormon families tend to be above the national average.

Many of the church members that live in Salt Lake County contribute to the larger family sizes in the valley. Salt Lake, however, is not entirely populated by members of the Church of Jesus Christ of Latter-day Saints. Recent estimates in Salt Lake City proper put the ratio of members of the Mormon Church to people of other religions at 1:1.[9] In

[8] 2000 U.S Census; U.S. Census Bureau
[9] "Salt Lake City, Utah"; www.wikipedia.org

the suburbs the number is probably closer to sixty on seventy percent of the population who are members of the LDS Church. Though the exact ratios remain elusive, the simple fact remains: the LDS Church directly influences average family size in Salt Lake County.

Salt Lake County's unique demographics play a crucial role in explaining market outcomes. For instance, many Salt Lake homes typically have five and six bedrooms. This quantity of bedrooms seems quite high at first glance. However, understanding that Salt Lake buyers place a higher value on the number of bedrooms because of the larger family size helps explain this particular market outcome.

2.10 The Impact of Local Municipalities

A sometimes overlooked factor in aggregate buyer demand is the exact municipality in which the home is located. This factor cannot be overlooked in Salt Lake County precisely because there are numerous municipalities, of differing sizes, that make up the 737 square miles of the county.

Each of the local municipalities affect what can be built in a given area of the Salt Lake County. As an example, take two cities within Salt Lake County that are on the opposite ends of the spectrum in how they approach housing. The planning department of Riverton City is much more conservative than the planning department of Salt Lake City. Riverton generally does not allow lots that are less than ten thousand square feet. The city makes a conscience effort to maintain and preserve the pastoral, country-like feel of this southwest suburb of Salt Lake. The Salt Lake City planning department, on the other

hand, concerns itself with smart growth and with more of the issues that larger cities throughout the country face all the time. What is built in Salt Lake City looks much different than what is built in Riverton. Through zoning and ordinances, each city within Salt Lake County directly affects what type of home can be built, and what rights the owners of that home have.

The cities also play a crucial role in deciding the mix and density of lots that real estate developers can create. Recently there has been a noticeable trend towards smaller lots (from 5000-8000 square feet) in some of the master-planned communities that have recently been approved. However, many of the cities within Salt Lake County balance such approvals with other subdivisions that have 10,000 and 14,000 square foot minimums. Oftentimes, the cities approve such large lots to encourage higher quality homes and to keep property values from slipping.

In regulating both what type of home gets built and the size of lot that the home is built on, cities play an increasingly important role in influencing market outcomes in the Salt Lake area.

2.11 Cultural Effects

Aside from the influence of the LDS Church which has already been discussed, there are other cultural influences that affect the housing stock in Salt Lake. For instance, there is a definite outdoor culture in the Salt Lake Valley. People are enamored of the playgrounds that the state of Utah has to offer. With numerous lakes and reservoirs for fishing and boating, and beautiful mountain ranges and canyons for camping and hiking,

Utah has plenty of outdoor recreation space. The State also offers renowned national parks like Zions and Bryce Canyon that entice local residents to visit. With such recreation areas close by, SUVs, RVs and boats are all extremely popular with the residents of Salt Lake County. These luxuries tend to mean, in many cases that more and more space is needed in terms of garage space and RV pads.

THE DATA SET

3.1 Collecting the Data

The data used in this thesis is a collection of individual home sale transactions from 1996 until May of 2003 within Salt Lake County. I gathered the data from the Wasatch Front Multiple Listing Service. The data is put together by the realtors and brokers that list homes who earn a commission once a home is sold. Unfortunately, the nature of this type of data is that is generally does not cover more than five or ten years (as is the case with my data). Still, in sum, I collected over 70,000 transactions of home sales from approximately seventeen different cities and thirty-one different zip codes.

3.2 Organizing the Data

Once I assembled the data, the next task was to divide the data up into reasonably homogenous sub areas. How I decided to do this was by separating the data out into distinct zip codes. There were thirty-one zip codes in all, so the data was subdivided into these thirty-one groupings. At this point, I ran some descriptive statistic analyses on each of the grouped areas. I calculated the mean, the mode, the median, the standard deviation, the minimum, the maximum and the range of all the data from these zip codes. The results were not that surprising in that I found that there were certain contiguous areas that resembled each other quite closely. It made sense to combine these areas into one

large sub area. At the end of the process, I had created seven sub areas that I could begin to input into a hedonic regression model.

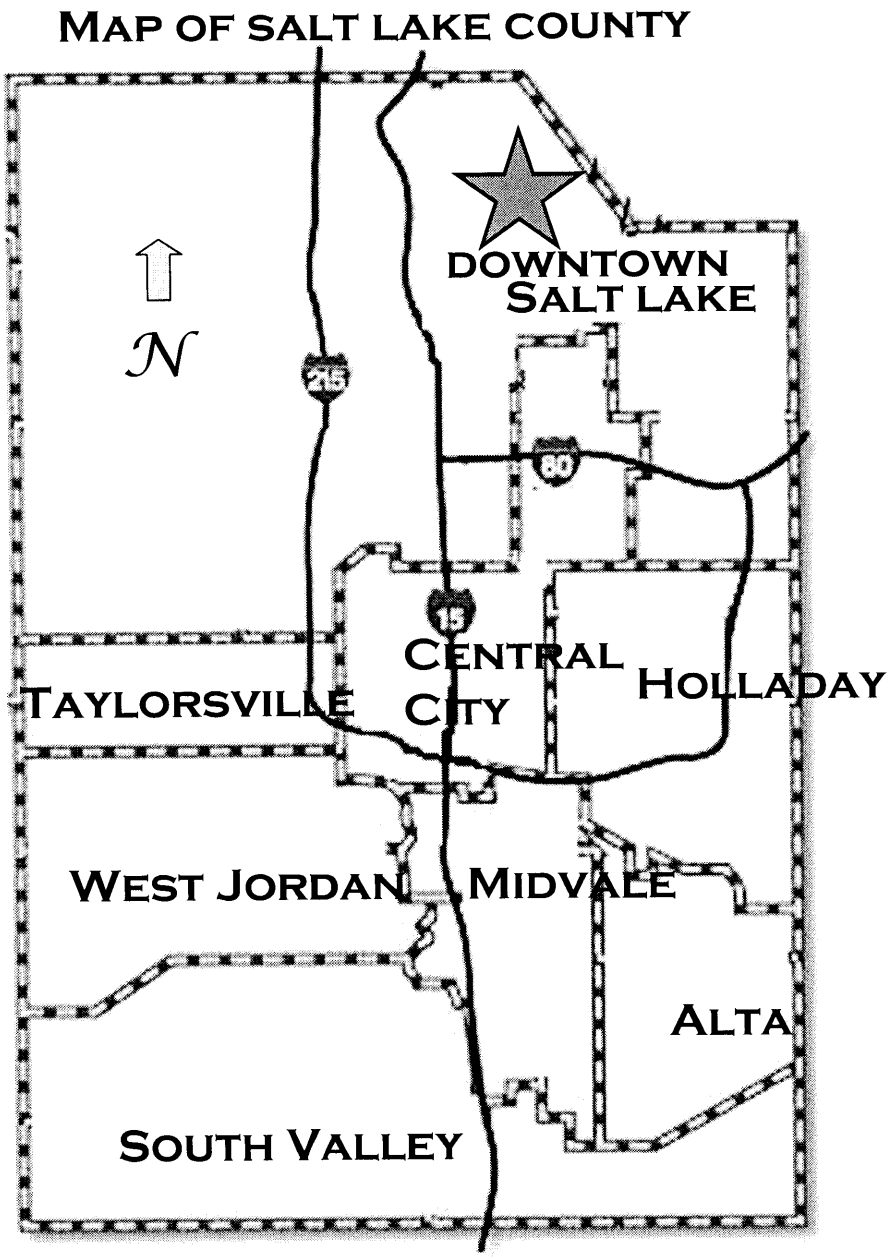
3.3 The Creation of Seven Sub Areas of Salt Lake County

The seven sub areas cover large portions of Salt Lake County. The names of the sub areas are as follows: South Valley, West Jordan, Midvale, Alta, Holladay, Central City, and Taylorsville. Table 3.3 identifies which zip codes make up the separate sub areas. Figure 3.3a is a map that shows where the seven sub areas are located in relation to each other.

TABLE 3.3

SUB AREAS	ZIPS
SOUTH VALLEY	84020, 84065, 84095
WEST JORDAN	84084, 84088
MIDVALE	84047, 84070, 84094
ALTA	84092, 84093
CENTRAL CITY	84105, 84106, 84107, 84123
HOLLADAY	84117, 84121, 84124
TAYLORSVILLE	84118, 84120, 84119

Figure 3.3 a


MAP OF SALT LAKE COUNTY
N
DOWNTOWN
SALT LAKE
215
80
15
CENTRAL
CITY
HOLLADAY
TAYLORSVILLE
WEST JORDAN
MIDVALE
ALTA
SOUTH VALLEY

My rationale for grouping the data in this way was largely based on the statistical analyses of the home prices within these zip codes. I grouped the zip codes with similar average home prices and standard deviations into the larger sub areas. I also made sure that the sub areas I grouped together were contiguous.

There are areas, of course, that simply did not fit into any one sub category, and for this reason were left out of the data set that I ended up using. The zip codes that were not used in this thesis were the following: 84108, 84109, 84103, 84102, 84112, 84113, 84044, and 84006. The zip codes ending in 108, 109, 103, 102, 112, and 113 were not used because the descriptive statistics from these areas just did not fit into any logical geographic zone. The data from these zip codes was too disparate and the standard deviation of the home prices was simply too high. These zip codes did not have enough data to stand on their own as individual areas. The zip codes 84044 and 84006 were areas that had to be eliminated because they were geographically isolated from the main body of the other sub areas.

3.4 A Statistical Overview of the Seven Sub Areas

A statistical overview of the seven sub areas is shown in Table 3.4a.

Table 3.4a	SUMMARY TABLE: THE SEVEN SUB AREAS			
	SOUTH VALLEY	**WEST JORDAN**	**MIDVALE**	**ALTA**
Sample Size	7901	7976	5176	5444
Average Home Price	$215,780	$147,122	$151,148	$249,422
Average Age	3.89	11.85	24.96	15.77
Average Lot Size	0.43	0.22	0.21	0.30
Average Number of Beds	3.89	3.65	3.75	4.51
Average Above Grade SF	1906	1396	1350	2187
% of Two Story	28.45%	10.76%	11.79%	40.30%
% of Rambler	51.02%	35.46%	38.45%	27.74%
% of Split-Entry	2.61%	18.76%	18.18%	12.45%
% of Tri-Level	15.95%	34.10%	24.13%	14.53%
%of Bungalow	n/a	n/a	6.65%	n/a
% of Other	0.00%	0.00%	0.81%	4.98%
Bedrooms	3.89	3.65	3.75	4.51
Bathroom	2.75	2.20	2.27	3.18
Garage	2.36	1.84	1.54	2.30
Age	3.89	11.85	24.96	15.77
Fireplace	0.91	0.61	0.88	1.53
Family Room	1.15	1.00	1.03	1.42
Deck	0.47	0.43	0.42	0.77
Patio	0.64	0.56	0.61	0.68
Basement	0.97	0.98	0.92	0.98
	CENTRAL CITY	**HOLLADAY**	**TAYLORSVILLE**	
Sample Size	7783	5359	6088	
Average Home Price	$163,556	$256,670	$120,333	
Average Age	52.47	29.82	22.37	
Average Lot Size	0.18	0.29	0.18	
Average Number of Beds	3.37	4.18	3.57	
Average Above Grade SF	1295	1933	1175	
% of Two Story	10.93%	22.26%	5.21%	
% of Rambler	26.93%	48.78%	45.66%	
% of Split-Entry	3.66%	9.27%	25.61%	
% of Tri-Level	9.20%	10.97%	21.93%	
%of Bungalow	44.08%	n/a	n/a	
% of Other	5.19%	8.71%	1.59%	
Bedrooms	3.37	4.18	3.57	
Bathroom	1.96	2.87	1.87	
Garage	1.34	1.87	1.20	
Age	52.47	29.82	22.37	
Fireplace	0.85	1.55	0.87	
Family Room	0.84	1.27	0.62	
Deck	0.29	0.65	0.39	
Patio	0.61	0.78	0.50	
Basement	0.90	0.87	0.84	

Trends

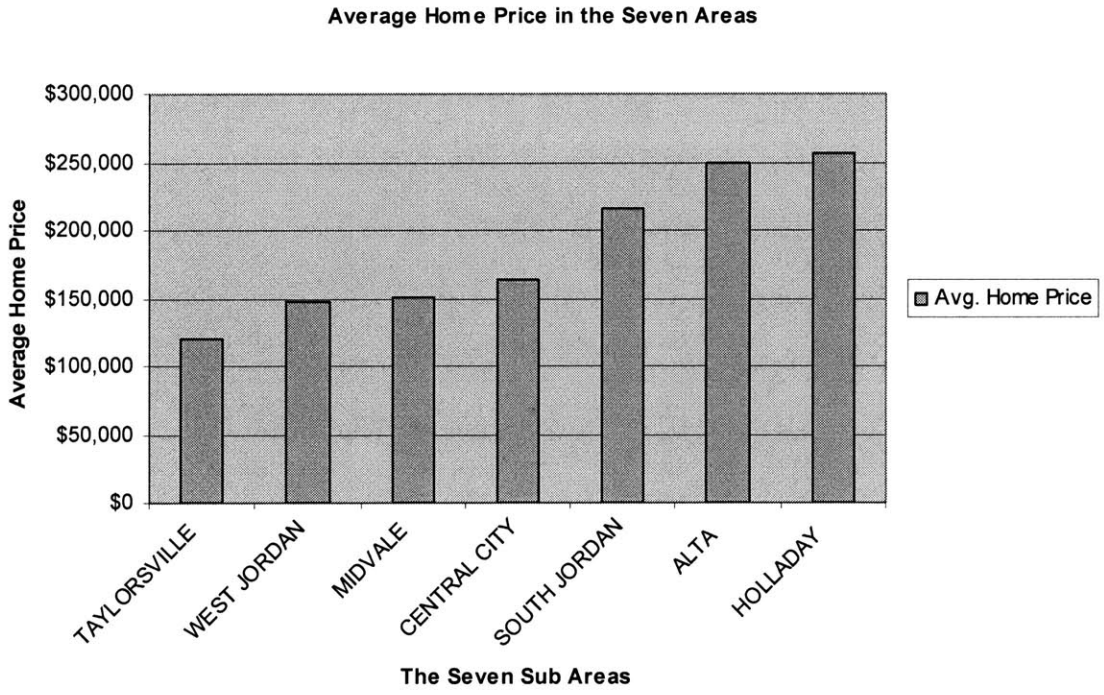
There are certain trends in the data set that are worth mentioning before proceeding to each individual area. Briefly describing and analyzing trends found in the aggregate data will establish a context in which each of the individual areas can be analyzed.

-**Sales Price:** The top three areas in terms of average sales price are Alta, Holladay and South Valley with averages all over $200,000 (See Table 3.4b). Not surprisingly, Alta and Holladay are on the "east side" of the Salt Lake Valley. Both of these areas are entirely east of State Street (the zero coordinate between east and west in Salt Lake County) giving all of the residents east coordinates, rather than west coordinates, in their addresses. Another salient feature about these two areas is that they are situated on the east bench. Both areas experience a gradual rise in elevation as they move from west to east towards the Wasatch Mountains.

The South Valley area is a bit more puzzling as it is really the only area that spans from the furthest east portion of the east bench all the way to the furthest development on the "west side". It is worth pointing out that the South Valley area also incorporates what might be termed the "south bench". The south bench consists of an area in the city of Draper known as Traverse Mountain. This area of foothills represents the southernmost portion of Salt Lake County. This south bench has essentially the same characteristic of the other benches in the valley—namely it provides excellent views and a "bench address" offers an intangible level of prestige to home owners in these areas. The fact that

South Valley contains portions of the east and south bench is probably why its home values are similar to Alta and Holladay.

Table 3.4b



There is another possible reason that explains why the homes in South Valley have similar values to the eastside areas of Holladay and Alta: It is possible that the home values on the west side are starting to catch up with the east side. The numbers don't necessarily back this assertion up though. By looking at the west-side cities of South

Jordan, Riverton and Herriman and dividing them into their respective zip codes (84095 for SJ and 84065 for Riverton/Herriman), the mean home prices are $216,000 and $184,000 respectively. Compared to the mean values in Draper which register at with $255,000, the numbers just simply do not compare. However, when comparing the South Jordan, Riverton and Herriman against other west side areas such as West Jordan and Taylorsville, the differences are telling: The average home prices in West Jordan and Taylorsville are $149,000 and $123,000. It becomes apparent that South Jordan, Riverton and Herriman have much higher average home prices than West Jordan and Taylorsville. Part of this may have to do with the fact that the homes in these South Jordan, Riverton and Herriman are newer than their counterparts to the north. Whatever the reason, the trend is clear: the negative effect of living on the west side is dampened the further south you go.

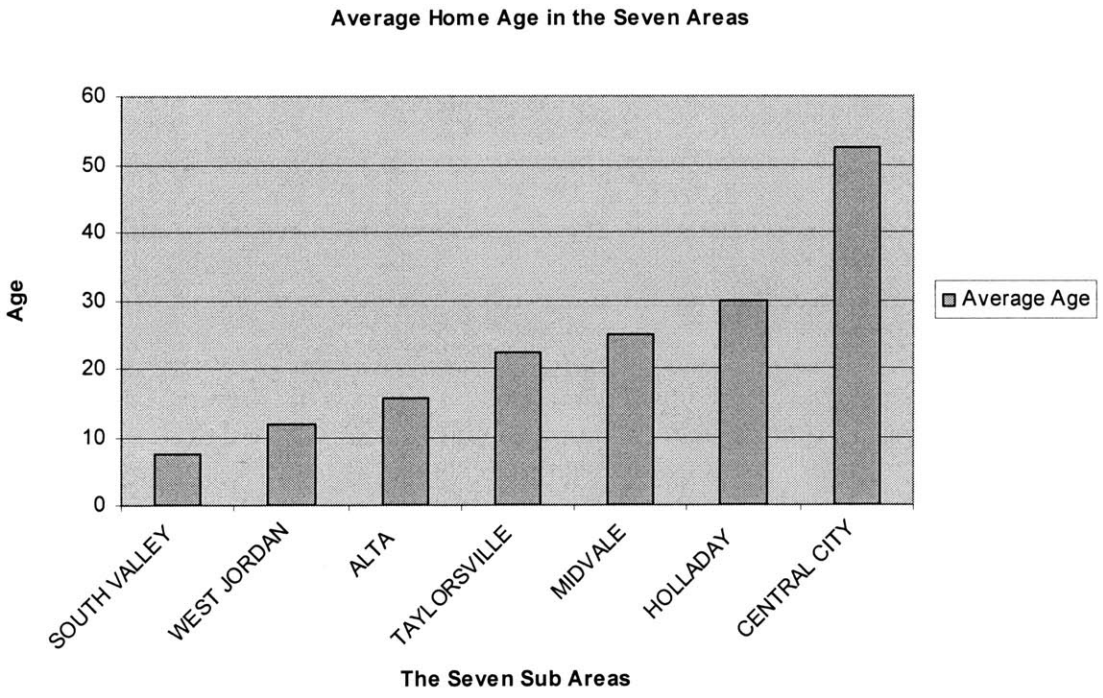
The remaining four areas within Salt Lake County in order of average home price are Central City, Midvale, West Jordan and Taylorsville. These four areas fall in the $125,000 to $175,000 average price range.

Looking at the entire data set, there is a fairly uniform pattern of price appreciation as one moves further east and of price depreciation as one moves west. The only exception to this is the South Valley area which includes both east and west sides. Though the homes positioned in the west portion of South Valley show signs of helping remove the stigma of living on the west side, the data still shows that there is still a considerable premium attached to living on the east side.

-Age: Turning to the age data, there is an obvious trend that mirrors that historical pattern of development in the Salt Lake Valley (See Table 3.4c). Basically, the further

south you travel from the city center of Salt Lake, the newer the homes become. South Valley is the furthest to the south of the city center and it has, on average, the most recently built homes. On the other end of the spectrum, the oldest area—Central City—contains homes that are within 1-2 miles of downtown. The age data illustrates that development has moved steadily out of the city center over the last fifty years.

Table 3.4c

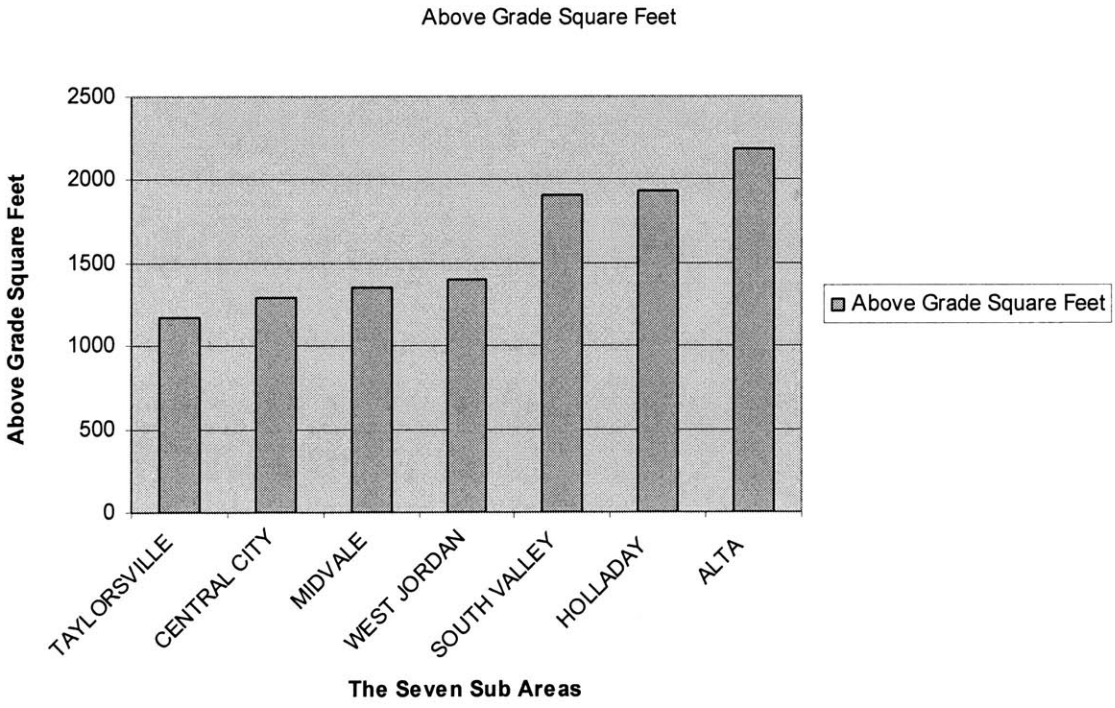


Another interesting trend is that there is no real correlation between the age of the house and the price of the house. South Valley contains the newest homes and it is only third on the list of average price. Central City lays claim to the oldest homes yet ranks fourth on the list of average home price. Clearly some homes that age well appreciate

over time while other homes steadily deteriorate in average worth. House age, therefore, is somewhat of an enigmatic measure of housing value.

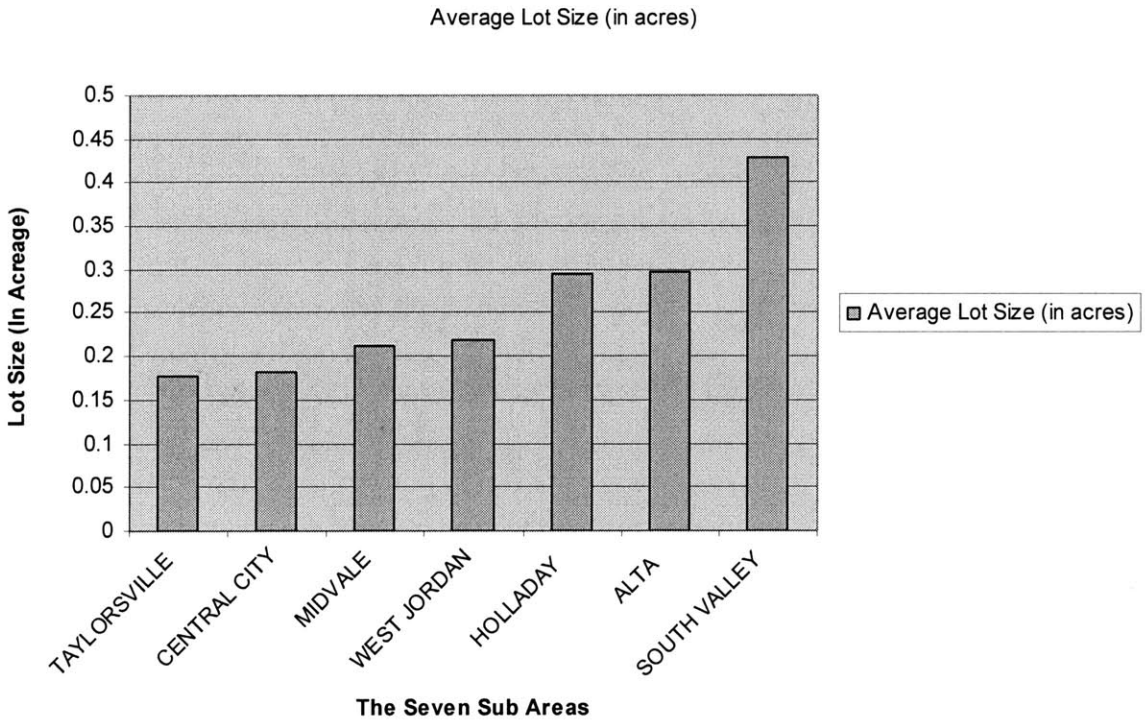
-House Size: When looking at the total above grade square feet in the seven sub areas, the patterns revert to being quite intuitive and easy to identify. Table 3.4d illustrates the different distributions of average square footage throughout the seven sub areas. The similarity between this graph and the chart of average home price is obvious. Not surprisingly, square footage roughly correlates with the average sales price.

Table 3.4d



-Lot Size: The seven areas exhibit a compelling trend when compared by lot size. (See Table 3.4e below) Perhaps the most striking statistic is the average lot size in the South Valley area. The average lot size in the South Valley area is .43 acres. It is important to also point out that the standard deviation is .58 acres indicating a sample that is quite dispersed. Still, South Valley's average lot size easily outdoes the average lot size of the next closest area, Alta. The Alta area's average lot size is .3 acres.

Table 3.4 e

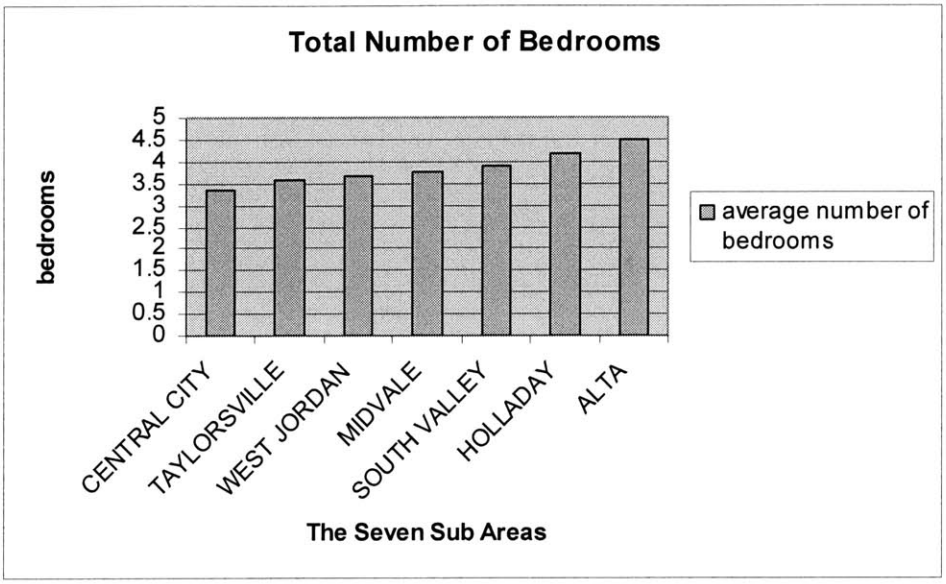


The larger lot size in South Valley may also mean that home buyers are spending a bigger proportion of their money on the building lot rather than on the actual physical structure.

It is somewhat troubling to discover that South Valley, the area with the most developable land left in Salt Lake County also happens to be the area with the largest lots. One possible explanation is that many of the hilly regions of the South Valley are so steep that many lots had to be made quite large in order to carve out a usable building envelope. Another possible factor is that three of the cities in this area—namely Draper, Riverton and South Jordan—have, in the past, consistently rejected higher density developments. One positive trend is that these cities have begun to embrace master planned communities that tend to create a mixture of lot sizes that average to much less than .43 acres. Still, there still exists within most of these three cities a strong resistance to higher density single family homes.

-Number of Bedrooms: The data shows a clear correlation between the number of bedrooms in a home and how expensive the home is. The three area leaders in home price, Alta, Holladay and South Valley also lead the way in total number of bedrooms. Table 3.4f on the next page shows how the different areas compare in terms of bedrooms.

Table 3.4f


Total Number of Bedrooms
bedrooms
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
CENTRAL CITY
TAYLORSVILLE
WEST JORDAN
MIDVALE
SOUTH VALLEY
HOLLADAY
ALTA
The Seven Sub Areas
average number of bedrooms

3.5 A Look at Each of the Sub Areas

-South Valley: The South Valley area includes three zip codes worth of data: 84095, 84065, and 84020. These three zip codes pertain to four different cities: South Jordan, Riverton, Herriman and Draper. Each of these cities has seen a substantial amount of development in the past 10-15 years. South Valley lays claim to being the area with the newest homes. The average age of a typical home in the South Valley area is just under eight years old. The average sales price of homes in the South Valley area is approximately $216,000 with a standard deviation of nearly $35,000. This average sales price places South Valley in third place compared to the other groups in the sample set.

-West Jordan: West Jordan is the next sub area in the sample. It happens to be the lone area that neatly pertains to only one city. Both zip codes, 84088 and 84084, belong solely to the residents of West Jordan. Like South Valley, West Jordan is found in the southwest quadrant of the Salt Lake Valley. This is the area of the valley where the great majority of the developable land remains. West Jordan has also experienced substantial development in the past ten years. Struggling to keep up with all the new development, West Jordan city placed a temporary hold on all proposed subdivisions in the summer of 2002 that it has since lifted.

It has already been pointed out that the average home price in West Jordan is substantially lower than in the neighboring South Valley area. This is somewhat puzzling as both areas are relatively flat and similar in their geographies. The only exception is Draper in the South Valley area which rises up into the east foothills and is considered

part of the east side. Even without Draper in the equation, the property value difference between the cities of West Jordan and South Jordan is quite large. The average home price in West Jordan is $149,000, while the average in South Jordan is $216,000. For some reason, these two west side cities have quite divergent home prices.

-Midvale: The third sub area is Midvale. The Midvale area is located in the southern portion of the Salt Lake valley and consists of zip codes 84070, 84047 and 84094. Midvale straddles the east-west dividing line. Statistically, Midvale generally ranks somewhere in the middle of the pack for every important category. The average price for homes in Midvale is $151,000 and the average total square feet is 1350.

Interstate I-15 cuts through Midvale and the area both benefits and suffers from having access to the interstate. State Street also divides this area in two. State is a street that attracts mainly commercial and office properties. The new light rail system also cuts through the center of Midvale. The commercial activity that State Street, Interstate 1-15 and the light rail attract creates a significant amount of noise and congestion for the Midvale area. This obviously is a factor that affects property values and influences buyer demand.

-Alta: The next sub area is Alta. This area is located in the southeast portion of the valley and is comprised of two zip codes—84093 and 84092. The area has been developed fairly recently as the average home age is just under sixteen years. The average home price in this area is $249,000. The average for above-grade square feet

approaches 2200. In home price and above grade square footage, Alta ranks second and first, respectively, among the groups.

Alta benefits from being located on the east bench of the Salt Lake Valley. It is also located at the entrance to two of the Utah's most pristine canyons—Big and Little Cottonwood Canyons. Residents of the Alta area are closer to local ski resorts such as Snowbird, Brighton, Solitude, and (fittingly) Alta, the area's namesake.

-Central City: The fifth area of the data set has been labeled Central City. It is comprised of the following zip codes: 84123, 84107, 84105, and 84106. The name Central City is a bit of a misnomer as the area does not take in any area from the actual downtown of Salt Lake City. However, looking at the map, portions of the area (zip codes 84123 and 84107 in particular) are positioned in the heart of the Salt Lake County. For this reason, the area garnered the moniker of "Central" city.

The average home price in this area is $163,000 and the average above grade square footage is 1295. Central City is the oldest area of all the groups. One type of home that is prevalent in the Central City is the bungalow. The prevalence of bungalows in the oldest area and the absence of these homes in the rest of the areas indicate that bungalows are a fairly dated style of home. For some reason, these homes are just not being built anymore. It is safe to say that the bungalow has gone out of style in the Salt Lake area.

-Holladay: The sixth area is Holladay. The zip codes that make up this area are 84124, 84117 and 84121. The average home price in the Holladay is $257,000 which

places it just ahead of Alta. Holladay homes have an average above-grade square footage of 1935.

Holladay is very similar to Alta due to the fact that it is also located on the east bench of the city. The Holladay area also provides excellent access to local area ski resorts. Holladay is closer to Parleys Canyon which is where ski resorts such as Park City, the Canyons and Deer Valley are found. These resort areas hosted a many of the Olympic skiing events in 2002. Interstate I-80 slices though Parleys Canyon and provides locals access to the ski resorts as well as to Wyoming and Colorado. Holladay, it should also be noted, is much closer to downtown than the Alta area. These positive locational externalities have helped make Holladay the most expensive area within the data set.

-Taylorsville: The final sub area is Taylorsville. It includes only one zip code: 84118. The average sales price for homes in Taylorsville is $120,000. The average above-grade square footage is 1175. In both categories, Taylorsville ranks last.

Taylorsville is located entirely on the west side of the Salt Lake valley. This partly explains its poor performance compared to the other areas. It is also located further to the north than other west side areas. As has been pointed out, as a general rule the further north and west you go in Salt Lake County, the less the value of the home. One possible explanation for this is that as you go to the west and the north you eventually run into three negatives externalities: the Salt Lake international airport, a concentration of industrial properties and the Great Salt Lake. The noise of the airport, the pollution of the industrial areas and the smell of the lake significantly affect property values in this area of the valley.

Table 3.5a provides a descriptive summary of each of the seven sub areas.

Table 3.5a

DESCRIBING THE SEVEN SUB AREAS

Sub Area	*Pop.*	*Avg. Price*	*Avg. SF*	*Avg. Age*	*East or West Side*	*Land to Develop?*	*Comments*
SOUTH VALLEY	88,752	$215,780	1906	3.89	MIX OF BOTH	ROOM TO GROW	Mix of elevated east bench with flat, low lying west side.
WEST JORDAN	83,193	$147,122	1396	11.85	WEST SIDE	ROOM TO GROW	Lots of new development in this fast-growing city
MIDVALE	79,705	$151,148	1350	24.96	MIX OF BOTH	BUILT OUT	Area near lots of commercial, freeway, noise, etc.
ALTA	55,543	$249,422	2187	15.77	HIGH EAST BENCH	BUILT OUT	Homes on the hillside; Largest # of bedrooms
CENTRAL CITY	123,020	$163,556	1295	52.47	MAINLY EAST, PART WEST	BUILT OUT	Most populous region; Oldest homes in the valley
HOLLADAY	88,073	$256,670	1933	29.82	HIGH EAST BENCH	BUILT OUT	Most expensive homes; Second oldest area.
TAYLORS-VILLE	64,537	$120,333	1175	22.37	WEST SIDE	BUILT OUT	Least valuable homes Area furthest to the northwest

3.6 What the Data Contains and What it Does Not

The data set contains a number of categories that describe basic home properties that an average buyer would consider when evaluating a home for purchase: Total bedrooms, total bathrooms, total acreage, garage spaces, fireplaces, patios, decks, basement square footage and home style to name a few. There are other categories that provide clues to the buyer about the value of the house: how old it is, the zip code of the home, and how much of the basement is unfinished. This information can be accessed by a potential buyer using the Wasatch Front Multiple Listing Service.

While the data does point out different trends and patterns among home buyers, it is essential to realize what the data does not include. The data gives no indication of the level of finish within the house. The potential home buyer will be very interested in the quality of the light fixtures, the plumbing fixtures, the carpet, the tile, and a whole host of other minute details. The data also makes no mention of what shape the house is in. Has it been kept up well? Is it run down? It is impossible to tell looking solely at the numbers. The data tells us nothing about whether the house has been remodeled or significantly altered. It also gives no information regarding possible hazards in the home such as lead-based paint or previous damage due to flooding or fires.

Another important bit of information that the data does not include is how the house is internally configured. For instance, where are the other bedrooms in relation to the master bedroom? Is the kitchen just inside the door from the garage? Is there a "great" room? (Great rooms seem to be extremely popular in Salt Lake right now) These are all important considerations that do not appear in the data.

A problem that often arises with a data set like this is that individuals who sell their homes and agents take the listings tend to stretch the truth as much as possible. If a seller is calculating how much of the basement is actually finished space, he will probably give himself the benefit of the doubt. The problem again, is that there are no real ways to ensure that the data is 100% accurate—and if anything there is an upward bias because people tend to want their homes to sound just as impressive as the neighbors down the street. It would be helpful if there were some sort of uniform definition for each of the categories but with a data set like this it simply is not possible.

From the big issues of remodels or new additions to the house to the less important items such as the particular shade of stucco on the outside of the home, there are innumerable details that the best statisticians in the world would have a difficult time collecting and incorporating into a data set. The data that I have collected is valuable for what it does account for. It is important, however, to realize what shortfalls and vulnerabilities it inherently possesses.

AN IN-DEPTH LOOK AT LOCAL HOME STYLES

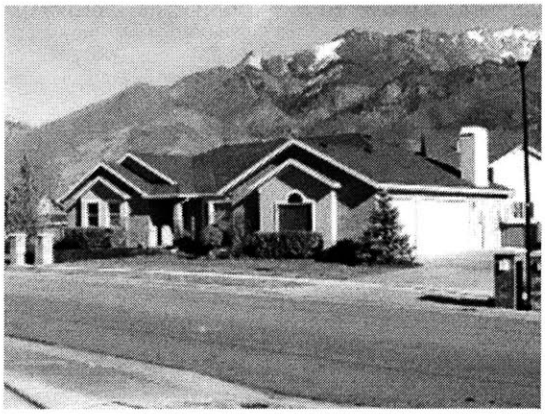
4.1 Home Styles: Ramblers, Two Stories and Everything In-Between

One category of the data that is of particular interest for this thesis is home style. For the sake of simplicity, I have delineated six different classifications for the different styles of homes found within Salt Lake County. The six categories are two-story, rambler, split-entry, tri-level, bungalow and "other". Since each of these styles will be analyzed in depth, it will be helpful to define each of these styles to the extent possible. Such definitions will provide a baseline to be able to refer back to when discussing buyer demand in relation to these different home styles.

A. The Rambler/Ranch Style Home

Without exception, the rambler is the most prevalent type of home found in each of the seven sub areas. The rambler consists of one floor of above-grade living space. The foundation of the ramblers commonly found in Salt Lake extends 8-10 feet underground in order to create a basement. The foundation supports the structure walls which only extend up one story. Generally the amount of above-grade square footage is nearly identical to the available basement square footage. This is largely a function of the fact that it makes more economic sense to align the foundation walls with the first floor walls during stick framing. In this way, there is little wasting of material. An example of two different typical Utah ramblers is shown here in Exhibit 4.1a.

Exhibit 4.1a



B. The Two Story

This type of home is also quite common in the Salt Lake area but it does not dominate sales as the rambler does. The two-story is similar to the rambler in that the foundation starts 8-10 feet underground and ends just above grade. The key difference between the rambler and the two-story is that the two-story has two levels of above grade living space, creating three levels of potential living area. On the whole, this means that the two-story generally contains more above grade square feet than the rambler. Two renderings of typical two-stories are shown on the next page in Exhibit 4.1b:

Exhibit 4.1b

C. The Split Entry

The split entry is a little more difficult to define. As the name implies, the split entry home divides the house into a side that is partially above grade and into another than is partially below grade. The idea is that the home buyer gets the maximum amount of built space out of the structure. Generally the second floor of the home cantilevers out over the 1st floor and basement. Exhibit 4.1c shows different examples of a split entry home.

Exhibit 4.1c

D. The Tri-Level

The tri-level home is similar to the split-entry home in that it attempts to maximize the amount of space built on a given lot. The main difference between the tri-level home and the split entry is that the tri level adds one more floor of built space. This generally means that this style of home is a bit larger than the split entry home. The tri level homes also are generally taller than the split entry homes. Another obvious feature of many tri-levels is the varying roof lines. Two examples of tri-level homes are shown in Exhibit 4.1d.

Exhibit 4.1d

E. The Bungalow/Cottage

This type of home is quite similar to a rambler in its structure. One key difference is that the bungalows and cottages seem to have very simple roof lines with only one basic truss set. The name bungalow seems to convey an older style of one-story home, while the name cottage implies a smaller, cozier type of home. Within the data set, these homes are both smaller than the ramblers on average, and older. Exhibit 4.1e shows different examples of what a bungalow or cottage-style home might look like.

Exhibit 4.1e

F. "Other" Style Homes

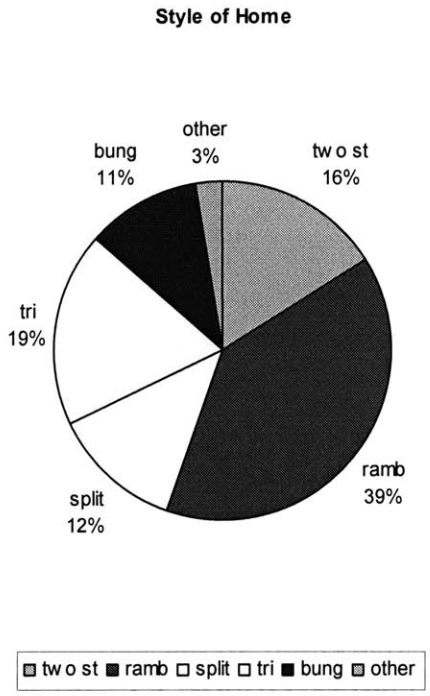
This category was created to group together all of the types of homes that just did not fit into one category. These non-conforming home styles did not create a sufficient sample size on their own to be considered individually. Among the different styles included in the other category are Cape Cod, Colonial, Spanish, A-Frame, Victorian, Tudor, and even Mansion. Exhibit 4.1f depicts two types of homes that would be included in the other category.

Exhibit 4.1f

Statistical Overview

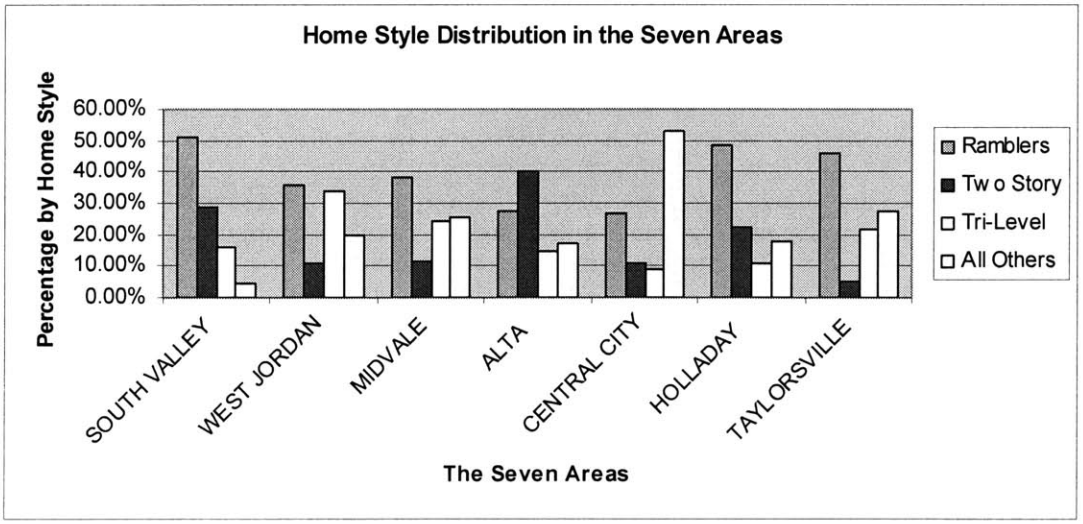
-Using the entire data set, the following pie graph (Illustration 4.1a) shows the dominance that ramblers have as the home of choice within the Salt Lake market. According to the data, ramblers make up 39% of all the homes that were sold from 1996 to 2003.

Illustration 4.1a



-In five of the seven sub areas, a similar pattern exists: Ramblers overshadow all other styles of homes.

Illustration 4.2a



METHODOLOGY

5.1 Understanding Hedonic Regression Analysis

When looking at the valuation of houses, it becomes clear that different properties (of the houses) command different prices. For this reason, housing is an example of a *differentiated good.*[10] In 1974, a model was model was created that "described the workings of markets for differentiated goods."[11] This model, created by Rosen and labeled hedonic regression analysis, will be the type of model used in the thesis.[12]

A primary requisite of performing a hedonic regression is to have a viable data set. The data set must include characteristics of the product being sold that are recorded in some meaningful and measurable way. It is also essential that the data set contain the market price for each sold item. Using the language of economists, the characteristics are referred to as the independent variables and the market price is labeled the dependent variable. Prior to applying the necessary mathematical rigor that is involved in running a hedonic regression analysis, the data must be analyzed, sorted and cleaned so that the regression output can be as precise as possible. Having properly prepared the data, the regression analysis is performed and a hedonic price equation is formed.

The hedonic price equation that is generated assigns what can best be described as a "shadow" price to the item that is being analyzed. The shadow price tells us what a typical buyer values when buying an automobile or a home. The power of the hedonic

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[10] The Theory of Modern Hedonics, Chapter 1
[11] The Theory of Modern Hedonics, Chapter 1
[12] "Hedonic Prices and Implicit Markets: Product Differentiation in Pure Competition", Rosen 1974

price equation is that it allows its user to see just exactly what it is that an average buyer values when making a purchases.

The way to do this is by manipulating the different independent variables. Take for example, the bedroom variable in the data set from Salt Lake County. A typical hedonic equation would generate a coefficient to explain the value of each additional bedroom in a home. The coefficient tells us, ceterus parebus, the value of adding an additional bedroom to a given home. The key though is holding all the other variables constant. Thus, the value of an additional bedroom can be compared to the value of, say, an additional bath. The hedonic price equation will tell us which variable affects the implicit price more significantly.

It is critical to realize that hedonic regression analysis is not a pure supply or demand analysis. It integrates both supply and demand into one equation by using the market outcomes provided by the data set. For this reason the hedonic equation is labeled a "reduced form" equation. Another important caveat to remember when using hedonic regression analysis is that it is never perfect. Even if the data set is exceptional and the hedonic math works as it should, there are still limitations to what the hedonic equation tells us. It is still just a model that is a predictive tool based on past transactions in a given market. Nevertheless, employed properly, the hedonic gives a fairly accurate snapshot of the current conditions in the market.

In the case of the Salt Lake County housing data, a hedonic regression was an appropriate way to add another layer of analysis to the thesis. The idea is that the hedonic equation can help estimate an optimal mix of home style for some of the different areas of Salt Lake County.

5.2 Cleaning the Data

Removing the Errors and Irrelevant Data Points

Before dividing the data into the component areas, there was some cleaning that needed to occur. Most of what was removed from the data set was the data points that had obvious errors. Any transactions that had a sales price less than $30,000 were eliminated. Also, any homes that had less than five hundred square feet of above-grade living space were removed. I cut out all lot sizes that were less than .05 acres (under 2200 square feet) as this size is simply not realistic for the Salt Lake area. Lot sizes involving ten or more acres were also eliminated.

Certain home styles were deleted because they did not seem pertinent to the question at hand. For instance, homes labeled as basement, townhouse, modular and manufactured were all rejected because they were not relevant to the detached single family home market.

If a home had less than two beds it was taken out of the data sample. If the home had no baths it was also removed. In terms of age, any home that was over 100 years old was eliminated. In general, for all of the categories, transactions were eliminated if they were missing an important variable. A summary of those transactions removed due to error or because they were deemed inappropriate is found in Table 5.2a (see next page).

CLEANING THE DATA SET

Table 5.2a

REMOVING THE ERRORS AND INAPPROPRIATE DATA POINTS

category	removed	reason for removal
price	any price < $30,000	probable error
square footage	anything < 500	probable error
lot size	anything < .05 acres	probable error
	anything > 10 acres	extreme outlier
home style	basement, townhouse, modular, manufactured	not pertinent to question
beds	anything< 2	probable error
baths	anything <1	probable error
age	anything > 100 years old	extreme outlier

In general, I was fairly conservative in what I cut out of the data set. It was somewhat difficult to determine what a realistic cut off point for home price, square footage, and acreage. The cut offs that I chose, though somewhat arbitrary, were on the moderate side giving the benefit of the doubt to the data rather than to my personal judgment. The large sample size that I had collected in each area allowed me to be more lenient in what I chose to do away with.

Trimming and "Untrimming" the Data

Once I had removed the erroneous, missing, and irrelevant pieces of data I separated the remaining data into its corresponding sub area. Having run descriptive

statistics for each of the variables in the seven areas, I started looking for obvious outliers. The easiest way to do this was to take the mean of each variable and remove any data points that were more than two standard deviations away. The only problem with this method was that I quickly approached the point where I would be removing more than five percent of the data set—something which would cast doubt on the validity of my eventual results. I ended up altering my methodology a little bit so that I removed the obvious outliers but did not cut more than five percent of the data. While it was not a perfect system, it was the best rough approximation that I could make of what should stay and what should go.

As I began to run regressions on the trimmed data, it became apparent that, despite my efforts, I had still possibly trimmed too much. The results of the regressions were showing signs of "compressed" data. The question arose as to whether it was simply better to leave the outliers in. Testing this idea out, I put all of the removed data back into the sample. After running a couple of regressions, it became clear that the "untrimmed" data set provided the same results as the trimmed data signaling that removing the outliers was indeed, unnecessary. Due to my large sample size, the trimming of outliers ended up being unnecessary. The results showed that the data was robust enough that the data did not need to be trimmed.

5.3 The Variables

There are two types of variables used in the hedonic regression model. The first type of variable includes those home characteristics that were original components of the data set. These variables have not been altered in any way. Examples of these variables are the price, the total above-grade square footage, lot size, and total bedrooms. The second type of variable that is found in the regression is the dummy variable. Various dummy variables were created in order to compare one subset of a variable to another. For instance, the category for home style is a dummy variable. If a particular home is a rambler its value is "1" in the rambler category and "0" in the two-story, split, tri, bungalow and other categories. The variables used in the hedonic model are listed in the accompanying chart and described in the next section. (See Chart 5.3a on the next page)

Chart 5.3a

Variable name	Variable description
finsf	Above grade square feet
finsfsq	Above grade square feet squared
acres	Lot size in acres
acrsq	Lot size squared
twost	Dummy variable for two story
ramb	Dummy variable for rambler
split	Dummy variable for split-entry
tri	Dummy variable for tri-level
bung	Dummy variable for bungalow
other	Dummy variable for other
totbeds	Total beds
ba1	Dummy variable for one bath
ba2	Dummy variable for two baths
ba3	Dummy variable for three baths
ba4	Dummy varialbe for four baths and up
fireplace	Dummy variable for fireplace
totfamily	Dummy variable for family room
gar0	Dummy varialble for no garage
gar1	Dummy variable for one garage
gar2	Dummy variable for two garages
gar3up	Dummy variable for three garages and up
deck	Dummy variable for deck
patio	Dummy variable for patio
evapcooler~f	Dummy variable for evaporative cooler (roof)
evapcooler~w	Dummy variable for evaporative cooler (window)
centralair~c	Dummy variable for central air conditioning
refrigairw~w	Dummy variable for refrigerator ac unit
new	Dummy variable for new homes
age5	Dummy variable for ages 1-5
age10	Dummy variable for ages 6-10
age15	Dummy variable for ages 11-15
age20	Dummy variable for ages 16-20
age25	Dummy variable for ages 21-25
age25up	Dummy variable for all ages 25 and up
age30	Dummy variable for ages 26-30
age35	Dummy variable for ages 31-35
age40	Dummy variable for ages 36-40
age45	Dummy variable for ages 41-45
age45up	Dummy variable for ages 45 and up
age65	Dummy variable for ages 46-65
age65up	Dummy variable for ages 65 and up
Jun-96	Dummy variable for home sales Jan-June 1996
Dec-96	Dummy variable for home sales July-Dec 1996
Jun-97	Dummy variable for home sales Jan-June 1997
Dec-97	Dummy variable for home sales July-Dec 1997
Jun-98	Dummy variable for home sales Jan-June 1998
Dec-98	Dummy variable for home sales July-Dec 1998
Jun-99	Dummy variable for home sales Jan-June 1999
Dec-99	Dummy variable for home sales July-Dec 1999
Jun-00	Dummy variable for home sales Jan-June 2000
Dec-00	Dummy variable for home sales July-Dec 2000
Jun-01	Dummy variable for home sales Jan-June 2001
Dec-01	Dummy variable for home sales July-Dec 2001
Jun-02	Dummy variable for home sales Jan-June 2002
Dec-02	Dummy variable for home sales July-Dec-2002
May-03	Dummy variable for home sales Jan-May 2003
bsment	Dummy variable for existence of a basement
finished bsmnt	Variable for finished basement space
_cons	Constant

A Brief Description of the Variables

Above-grade square footage: An essential variable that is defined as the total amount of above-grade square footage that is included in the sale price of the home. It does not include any below grade square footage located in the basement. The below-grade basement space is often unfinished or of a lesser quality than the above-grade space. A separate variable was created for the below-grade finished space.

Above-grade square footage squared: This variable is used in the hedonic equation to show the diminishing marginal utility of an incremental increase in square footage.

Lot size: A straightforward variable that measures the size of the lot in acres.

Lot size squared: Similar to the squared square footage variable, this variable takes into account the diminishing marginal utility of greater lot size.

Dummy variable for home style: This variable identifies all of the homes as being a rambler, two-story, split-entry, tri-level, bungalow or of some other style.

Total Beds: The number of bedrooms in the home.

Dummy variable for baths: Tells us whether the home has one bath, two baths, three baths, or four baths or more.

Dummy variable for fireplace: This variables explains whether the home has a fireplace or not. In the rare occasion when the home had more than one fireplace, it counted simply as having a fireplace.

Dummy variable for family room: Like the fireplace variable, tells whether the home has a family room or not. A house with more than one family room is counted as one unit.

Dummy variable for garage: This variable informs us if the house has zero, one, two, or three or more garage spaces.

Dummy variable for deck: Just like the variables for fireplace and family room, this variable counts whether a home has a deck or not. If the total number of decks is greater than one, it is still only counted once.

Dummy variable for patio: This variable serves exactly the same purpose as the deck variable but is used for counting patios.

Dummy variable for air conditioning unit: This variable measures what type of air conditioning system the home has; it also tells us when the home does not have an air conditioning unit. The four types of air conditioning systems are roof evaporative coolers, window evaporative coolers, central air conditioning and refrigerator air conditioning.

Dummy variable for age: A variable that describes when the home was built. I created this variable by subtracting when the home was built from the year of sale. For instance, if the home was built in 1979 and was sold in 1996 then the age of the home would be seventeen. It is important to remember that age is measured from the year the home was sold and not from the current year (2003).

A few examples are worth explaining to clarify the meaning of the variables. Take for example, the dummy variable labeled "new". This variable includes those homes built in the same year they were sold. The variable "25andup" refers to any homes that are twenty five years or older at the time of sale. It is somewhat confusing, but many dummy

variables were necessary to account for the varying ranges of home ages in the seven sub areas.

Dummy variable for date sold: This variable breaks the home sales down into six-month intervals separating the transactions by when they occurred. As the data set starts in January of 1996 and ends in May of 2003 it was necessary to include one five-month interval at the end.

Dummy variable for basement: This variable tells whether or not a home has a basement.

Finished basement variable: This variable represents the total amount of finished below-grade square footage.

5.4 Regression Results

	REGRESSION OUTPUTS FOR THE FIRST FOUR AREAS							
	SOUTH VALLEY		WEST JORDAN		MIDVALE		ALTA	
	Coeff.	*stand err.*	*Coeff.*	*stand err.*	*Coeff.*	*stand err.*	*Coeff.*	*stand err.*
finsf	0.000376	7.39E-06	0.000235	8.29E-06	0.000143	1.85E-05	3.10E-04	1.15E-05
finsfsq	-1.75E-08	1.03E-09	-1.44E-08	1.73E-09	1.31E-08	5.10E-09	-1.33E-08	1.81E-09
acres	0.141798	0.005656	0.383936	0.012006	0.311692	0.027405	0.441643	0.017217
acrsq	-0.0128	0.000903	-0.04764	0.003064	0.031657	0.017521	-0.06413	0.005684
twost	-0.04936	0.004537	-0.02664	0.003702	-0.01286	0.005951	-0.03391	0.006136
split	-0.02838	0.009784	-0.0342	0.003208	-0.0219	0.004695	-0.02652	0.006617
tri	-0.08798	0.004602	-0.04472	0.002646	-0.03549	0.004595	-0.06481	0.006285
bung	-0.05608	0.015389			-0.06451	0.007848		
other	-0.09406	0.017092	-0.09196	0.009984	-0.05277	0.015785	-0.00127	0.008946
totbeds	-0.01777	0.002186	-0.00086	0.001497	0.000883	0.00214	-0.01576	0.002241
ba2	0.021034	0.008835	0.031489	0.003061	0.032278	0.00537	0.052761	0.01933
ba3	0.041727	0.009559	0.052663	0.004032	0.049835	0.006803	0.07252	0.019559
ba4	0.06699	0.011288	0.080217	0.007507	0.06641	0.010308	0.093417	0.020414
fireplace	0.039903	0.003844	0.029691	0.002074	0.037198	0.003474	0.041339	0.008136
totfamily	-0.00086	0.005299	0.015642	0.002773	0.006472	0.00448	-0.00815	0.008844
gar1	0.015658	0.01798	0.02013	0.004719	0.033431	0.005476	0.055118	0.020196
gar2	0.007376	0.007787	0.054143	0.003625	0.060803	0.004346	0.038843	0.012408
gar3up	0.112044	0.008483	0.140239	0.004981	0.142498	0.007609	0.107151	0.013386
deck	0.026905	0.00326	0.011539	0.002227	0.014378	0.003461	0.021591	0.003916
patio	0.01541	0.003209	0.01397	0.002087	0.017365	0.00311	0.015404	0.003826
evapcooler~f	0.01727	0.005027	0.007333	0.002927	0.020338	0.004512	-0.02718	0.006129
evapcooler~w	0.019559	0.00942	0.010372	0.00506	0.021326	0.006796	-0.06673	0.012485
centralair~c	0.054744	0.004005	0.0396	0.003172	0.036618	0.005157	0.032137	0.00599
refrigairw~w	0.062527	0.00856	0.037115	0.006056	0.050397	0.00876	0.01251	0.013452
age5	-0.05367	0.00438	-0.04858	0.003875	-0.09755	0.010285	-0.14576	0.011729
age10	-0.12738	0.005705	-0.09949	0.004492	-0.18417	0.010459	-0.25184	0.011646
age15	-0.17174	0.008371	-0.15017	0.004749	-0.24936	0.010946	-0.33217	0.012204
age20	-0.20681	0.008461	-0.17766	0.005006	-0.30651	0.011096	-0.39129	0.012383
age25	-0.22974	0.008859	-0.2069	0.005372	-0.33082	0.010943	-0.43148	0.01253
age25up	-0.18531	0.009222	-0.22368	0.005846			-0.46229	0.013505
age30								
age35								
age40					-0.35416	0.01077		
age45								
age45up								
age65					-0.40217	0.011378		
age65up					-0.43329	0.013414		
Dec-96	0.013243	0.008684	0.037676	0.005232	0.033536	0.007495	0.010244	0.008811
Jun-97	0.031607	0.008905	0.06101	0.005158	0.065359	0.007813	0.031145	0.009498
Dec-97	0.02721	0.008308	0.073217	0.005146	0.059657	0.007392	0.036949	0.0086
Jun-98	0.057647	0.008477	0.097768	0.005034	0.086544	0.00759	0.088727	0.00917
Dec-98	0.07871	0.009635	0.101746	0.006111	0.111417	0.00888	0.130139	0.013807
Jun-99	0.098062	0.008203	0.134574	0.005081	0.136181	0.007509	0.113368	0.008774
Dec-99	0.109759	0.00821	0.154262	0.004942	0.144326	0.007418	0.112875	0.008728
Jun-00	0.135896	0.008109	0.187307	0.005021	0.166597	0.007628	0.154903	0.009074
Dec-00	0.142868	0.008101	0.183288	0.005028	0.173348	0.007554	0.160829	0.009074
Jun-01	0.161342	0.007934	0.206834	0.004885	0.198452	0.007233	0.169967	0.009059
Dec-01	0.158662	0.008022	0.209008	0.004957	0.202626	0.007195	0.183375	0.008808
Jun-02	0.167575	0.008076	0.215789	0.005057	0.195337	0.007812	0.193241	0.010233
Dec-02	0.17072	0.008157	0.222992	0.004935	0.186615	0.008362	0.19706	1.03E-02
May-03	0.181828	0.010273	0.215708	0.006266	0.207719	0.009338	0.253745	0.014655
bsment	0.110559	0.009187	0.156664	0.007387	0.119974	0.006449	0.067347	0.016308
finished bsment	9.93E-05	3.86E-06	6.77E-05	3.58E-06	0.000064	5.15E-06	8.82E-05	4.03E-06
_cons	11.28626	0.016923	11.1763	0.012451	11.48454	0.0202	11.60799	0.030415

REGRESSION OUTPUTS FOR THE LAST THREE AREAS						
	CENTRAL CITY		HOLLADAY		TAYLORSVILLE	
	Coeff.	*stand err.*	*Coeff.*	*stand err.*	*Coeff.*	*stand err.*
finsf	0.00033	1.24E-05	0.000345	7.72E-06	0.000188	1.86E-05
finsfsq	-5.99E-09	2.36E-09	-1.59E-08	6.77E-10	-4.27E-09	5.44E-09
acres	0.134508	0.035658	0.797055	0.020182	0.491526	0.035552
acrsq	0.073137	0.020635	-0.11709	0.005884	-0.06944	0.020564
twost	-0.02421	0.008542	-0.02677	0.008258	0.009556	0.006395
split	-0.04654	0.013612	-0.03483	0.009057	-0.01117	0.003884
tri	-0.07298	0.009799	-0.06004	0.008176	-0.0147	0.004283
bung	-0.00308	0.008847				
other	0.134033	0.011384	0.03414	0.008729	-0.02146	0.009882
totbeds	-0.012	0.002919	-0.02155	0.003005	0.002334	0.001971
ba2	0.073419	0.005608	0.054384	0.011943	0.029758	0.003248
ba3	0.084806	0.008925	0.101853	0.013539	0.066896	0.005772
ba4	0.092898	0.014927	0.114836	0.015983	0.102878	0.012757
fireplace	0.046739	0.004643	0.040337	0.008519	0.017929	0.002793
totfamily	0.02169	0.004896	0.014108	0.008108	-0.00072	0.00318
gar1	0.070762	0.005673	0.024734	0.009613	0.026831	0.003822
gar2	0.086807	0.005923	0.061193	0.007528	0.07571	0.003398
gar3up	0.118931	0.011199	0.117181	0.010976	0.147369	0.009193
deck	0.036821	0.004787	0.024805	0.004992	0.020895	0.003215
patio	0.035248	0.00413	0.030884	0.005143	0.022012	0.002709
evapcooler~f	0.034684	0.005453	-0.00415	0.007405	0.043325	0.003732
evapcooler~w	-0.00527	0.007505	-0.01987	0.01256	0.041197	0.005399
centralair~c	0.087054	0.006024	0.053447	0.007381	0.066054	0.005223
refrigairw~w	0.035255	0.008491	0.029972	0.013483	0.057543	0.008046
age5	-0.08286	0.017427	-0.09284	0.018595	-0.09276	0.011795
age10	-0.16844	0.018358	-0.14856	0.018806	-0.13562	0.011865
age15	-0.22025	0.019447	-0.2524	0.019972	-0.16865	0.011979
age20	-0.2858	0.019834	-0.32492	0.020256	-0.2021	0.011961
age25	-0.30049	0.019474	-0.36632	0.019624	-0.21774	0.011988
age25up					-0.26412	0.011927
age30			-0.34562	0.020013		
age35			-0.32703	0.019986		
age40	-0.24267	0.017593	-0.3091	0.019649		
age45			-0.31524	0.019839		
age45up			-0.32087	0.020439		
age65	-0.13617	0.016999				
age65up	-0.12162	0.017003				
Dec-96	0.024103	0.010156	0.041532	0.011697	0.030461	0.006712
Jun-97	0.054981	0.010406	0.063122	0.012138	0.065347	0.006705
Dec-97	0.0593	0.010359	0.052621	0.011524	0.086745	0.006834
Jun-98	0.085892	0.010337	0.084958	0.011743	0.098234	0.006791
Dec-98	0.122536	0.010931	0.111369	0.014547	0.11836	0.007757
Jun-99	0.102754	0.010347	0.114483	0.011867	0.143555	0.006541
Dec-99	0.121771	0.01053	0.121372	0.011618	0.171477	0.006407
Jun-00	0.124321	0.01024	0.115597	0.012115	0.203454	0.006613
Dec-00	0.127782	0.01019	0.115806	0.011813	0.205636	0.00655
Jun-01	0.137987	0.009892	0.136069	0.011818	0.220032	0.006496
Dec-01	0.158802	0.009872	0.150439	0.011447	0.220627	0.006381
Jun-02	0.149991	0.010608	0.142901	0.012467	0.224702	0.006507
Dec-02	0.162688	0.010969	0.1686	0.012933	0.197818	0.006422
May-03	0.208994	0.01139	0.190125	0.015883	0.180239	0.007374
bsment	0.142061	0.007458	0.085383	0.009188	0.08246	0.005093
finished bsment	0.000152	6.73E-06	0.000114	5.11E-06	9.23E-05	5.30E-06
_cons	11.16537	0.025269	11.38432	0.026883	11.18565	0.02102

5.5 Analyzing the Results

Looking at the regression output, the results are very robust. Due to the large sample size, the standard error is relatively small on all of the important variables making the results statistically significant. To gain a broader understanding of what the data means, it is necessary to briefly review the coefficients of the important variables and see how these coefficients vary by sub area.

Base case and the dummy variables: In the regression outputs from the previous pages, certain variables are not listed because they represent the base case—or in other words, the variable that all the dummies are compared to in that portion of the hedonic. The base case variable for home style is the rambler; the base case for bathrooms is one bath; the base case for garage space is zero; the base case for age is new homes; finally, the base case for date sold is June 1996. All of the other dummy variables are compared to these base case variables.

Above-grade square footage: It appears that this variable adds value to a house with each additional increment but that how much it adds varies greatly depending on the area. Homes in South Valley and Holladay benefit more from an incremental addition of extra above-grade square footage than do the homes in Midvale and Taylorsville. Generally speaking, the more affluent the area, the more above-grade square footage matters to the buyer.

	S. VALLEY	W. JORDAN	MIDVALE	ALTA	C. CITY	HOLLADAY	TVILLE
	Coeff.	*Coeff.*	*Coeff.*	*Coeff.*	*Coeff.*	*Coeff.*	*Coeff.*
fin sf	0.00038	0.00023	0.00014	0.00031	0.00033	0.00034	0.00019

Lot size: An increase in the size of a lot in Holladay or Taylorsville tends to add more value than a similar increase in size in the South Valley. For instance, if you added .05 acres or roughly 2200 square feet to a lot in Holladay it would raise the price of a $250,000 home up to $260,000.

	S. VALLEY	W. JORDAN	MIDVALE	ALTA	C. CITY	HOLLADAY	TVILLE
	Coeff.	*Coeff.*	*Coeff.*	*Coeff.*	*Coeff.*	*Coeff.*	*Coeff.*
acres	0.14	0.38	0.31	0.44	0.13	0.80	0.49

Home style: There is substantial variation among the different sub areas in terms of the premium or discount associated with different home styles. The overall trend seems to be that a premium is paid for a rambler. A more in-depth analysis of what the style coefficients tell us about how home style is valued within Salt Lake will occur in Chapter Six.

Bathrooms: Bathrooms serve as a proxy for wealth. For instance, the more affluent communities of Alta and Holladay value the fourth bathroom more than West Jordan and Midvale.

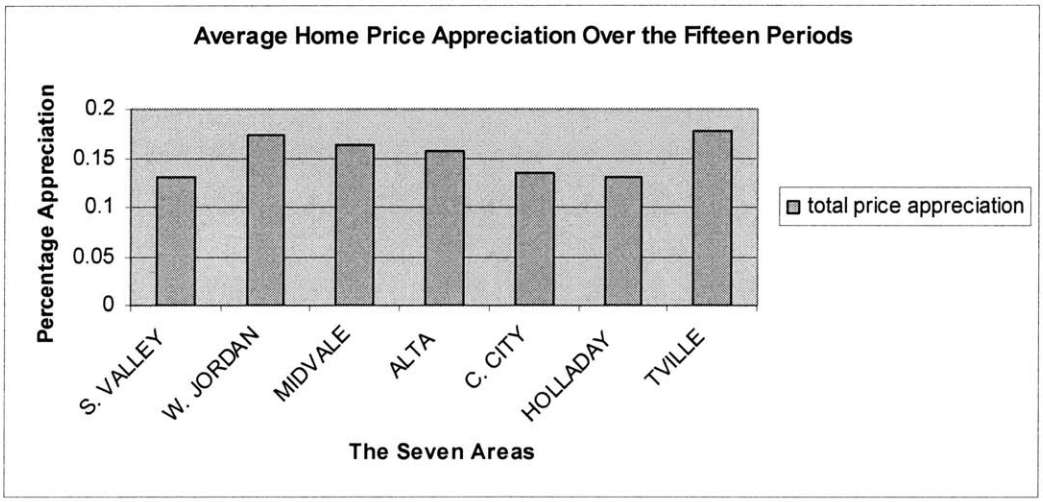
Fireplace: The additional value of having a fireplace versus not having one does not vary that much between the seven sub areas. However, it does seem that more affluent areas value the existence of a fireplace more than less affluent areas.

Garage Space: In all seven of the areas the addition of a third-car garage adds significant value. This is not that surprising especially given that bigger homes with more garage space seems to be the trends in new homes nationwide.

	S. VALLEY	W. JORDAN	MIDVALE	ALTA	C. CITY	HOLLADAY	TVILLE
	Coeff.	*Coeff.*	*Coeff.*	*Coeff.*	*Coeff.*	*Coeff.*	*Coeff.*
gar3up	0.1120444	0.1402394	0.1424978	0.107151	0.1189313	0.1171814	0.147369

Decks: The area that values having a deck the most is the Central City. For the most part, it seemed that sub areas on the east bench valued decks more than areas on the west side. Holladay, South Valley, Central City (this contain portions of the west side) and Alta generally place more value on having a deck than West Jordan, Taylorsville or Midvale. One possible explanation for the variation might be that decks are more valued in homes that can enjoy a view. Many homes on the east bench have decks specifically to take advantage of the views from the foothills above to the valley below. This could explain why decks are valued more by homeowners on the east side.

Date Sold: The date sold variable shows that home prices appreciate in all seven of the areas from 1996 until 2003.



It is interesting to note that two of the least affluent areas—West Jordan and Taylorsville appreciated the most on average over the seven years that the data covers.

Dummy Basement Variable: The hedonic model indicates that a basement adds considerable value to homes throughout the seven sub areas. West Jordan and Central

City value the basement the most while Alta seems to not value it quite as highly. This variable will be discussed more in Chapter Six.

Finished Basement Variable: The coefficients for this variable also indicate that buyers place a high value on finished basement space. Below grade (basement) space is generally considered to be of a lesser grade than above grade square footage due to the unknown nature of its quality. Despite the stigma that is attached to below grade space, it appears that buyer do value it. According to the model, buyers in Central City and Holladay place the highest value on finished basement space. This variable will be analyzed more thoroughly in Chapter Six.

TOWARDS AN OPTIMAL MIX

6.1 Why an Optimal Mix?

Having reached this point, one might question the relevance of finding an optimal mix of home style. After all, why not just build the home style that is valued most by the market? The answer to this is tied closely to the concept of aggregate buyer demand. At the very heart of this idea of buyer demand is the notion that buyers are inherently heterogeneous. As a home builder, you will never be able to satisfy everyone if you offer only one home style. However, you can strategize in a way to offer a mix of home styles that reflects what is perceived to be the current buyer demand in the market. By diversifying in this way, the home builder minimizes his risk. In theory, offering a mix of homes that matches buyer demand in a given area should mean a quicker sell-out period for the builder. Therefore, finding the optimal mix should give the home builder a competitive advantage in the marketplace.

The way to estimate the optimal home style mix for a given area is to look at two important sources of information. The first collection of information is the hedonic regression results. The hedonic results must be examined to see if there are differences between the areas with respect to home style. The results should also be scrutinized to see if there is a premium or discount associated with a given style. The second body of information that must be included in the analysis is the current building trends in the given area. It is important to factor in vital bits of data such as what is currently being built compared to what is already built. By collating the most important pieces of

information from these data sources, an optimal mix can be estimated for each separate sub area.

6.2 Evidence of a Rambler Premium

Examining the hedonic regression results, one trend that emerges immediately is the apparent premium associated with the rambler home style. A premium simply refers to something that the market values. In Salt Lake Valley, buyers apparently value ramblers because holding all other characteristics constant, they are willing to pay more for ramblers than for any other home style. This is what it means to say that ramblers experience a premium in Salt Lake County. The opposite of a premium is a discount. If buyers, holding everything else equal, pay less for ramblers then it would be said that a discount was attached to the ramblers. It is important to keep the definition of a premium and a discount in mind as the discussion proceeds.

Returning to the hedonic results, it appears that the Salt Lake area buyers place a premium on ramblers. In six out of the seven areas, the coefficient for the rambler is significantly higher than the other home styles. In these areas, the rambler is valued by home buyers more than any other home style.

For simplicity sake, the rambler premium will be compared specifically to one type of home style: the two-story. It makes sense to compare ramblers to two-story homes as two-story homes are the second most numerous style in the Salt Lake Area. Exhibits 6.2a and 6.2b shows the premium associated with a rambler compared to a two-story across the seven areas.

Exhibit 6.2a

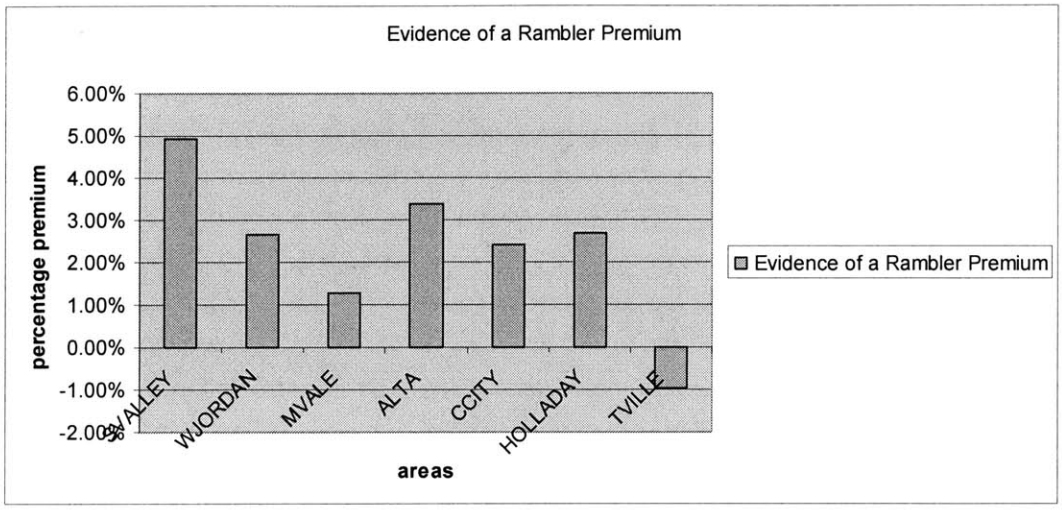


Exhibit 6.2b

QUANTIFYING THE RAMBLER PREMIUM							
	SVALLEY	WJORDAN	MVALE	ALTA	CCITY	HOLLADAY	TVILLE
rambler coefficient	4.94%	2.66%	1.29%	3.39%	2.42%	2.68%	-0.96%

The one area whose buyers do not place a premium on ramblers is the Taylorsville area. In Taylorsville, buyers seem to almost identically prefer ramblers, split-entries, and tri-levels. Two-story homes do not factor in to the equation as they make up only five percent of the sample in Taylorsville. For this reason, the discount associated with ramblers when compared with two stories in Taylorsville should be ignored. There are simply too few two-story homes for this coefficient to matter.

Once Taylorsville is taken out of the mix, the data shows that buyers place a premium on ramblers in the remaining six areas. This premium means that buyers will

pay a certain percentage more if the home is a rambler and not a two-story, split-entry, or tri-level.

A simple numerical example illustrates how the model predicts a premium for the rambler: A typical home in South Valley sells for $216,000. When it is a rambler, the model predicts that it will sell for $227,000. In Holladay, the increase in value is similar. A typical home sells for $257,000, but when it is a rambler, the model predicts that it will sell for $264,000.

To understand the rambler premium more completely, it is helpful to look at the issue of construction costs.

6.3 A Key to Understanding the Rambler Premium: Construction Costs

A key to understanding the rambler premium is the issue of the cost differential between building a rambler and a two-story. On a per square foot basis, it is more expensive to build a rambler than it is to build a two-story. There are two main reasons for this. The first reason is that a rambler contains a higher percentage of foundation walls than the two-story. These concrete walls are much more expensive to build than their stick frame counterparts. The second reason is that a rambler contains a higher percentage of roof (since it has a larger footprint) than the two-story.

One of the best things a two-story home has going for it is its construction efficiency. Generally speaking, it is cheaper to build up rather than out. Square foot for square foot, a two-story home is less expensive to build than a one-story home.[13]

The available literature on construction pricing[14] confirms this: it is more expensive to build a rambler than a two-story home on a per square foot basis. Table 6.3a puts this into perspective by providing actual numbers to compare.

[13] "Two-Story Home Plans—Our Most Popular Home", www.homeplans.com
[14] Residential Cost Data, RS Means 2003

Table 6.3a

COMPARING CONSTRUCION COSTS: TWO STORY VS. RAMBLER SALT LAKE COUNTY "Average Home" with unfinished basement Stucco on Wood Frame	*cost to build-per sq. ft*
1800 sq. ft rambler	$78.12
1800 sq. ft two story	$72.25
absolute difference	$5.87
percentage difference	8.12%
Source: RS Means Residential Cost Data 2003	

Table 6.3a quantifies the difference between building a rambler and a two-story in Salt Lake County. This cost differential immediately raises a pertinent question: Is the premium that buyers pay for ramblers related to this cost differential? Or, in other words, does the premium on ramblers have anything to do with the extra cost of building a rambler?

The simple answer to both of these questions is yes: the difference in construction cost between the two home styles is closely tied to the rambler premium. It does not, however, cause the premium. In other words, buyers do not pay more for the rambler simply because it costs more to build.

The most important thing that the construction data shows is that the rambler premiums and cost differentials are in fact, quite similar. Table 6.3 b illustrates just how close the rambler premium and the cost differentials are in South Valley.

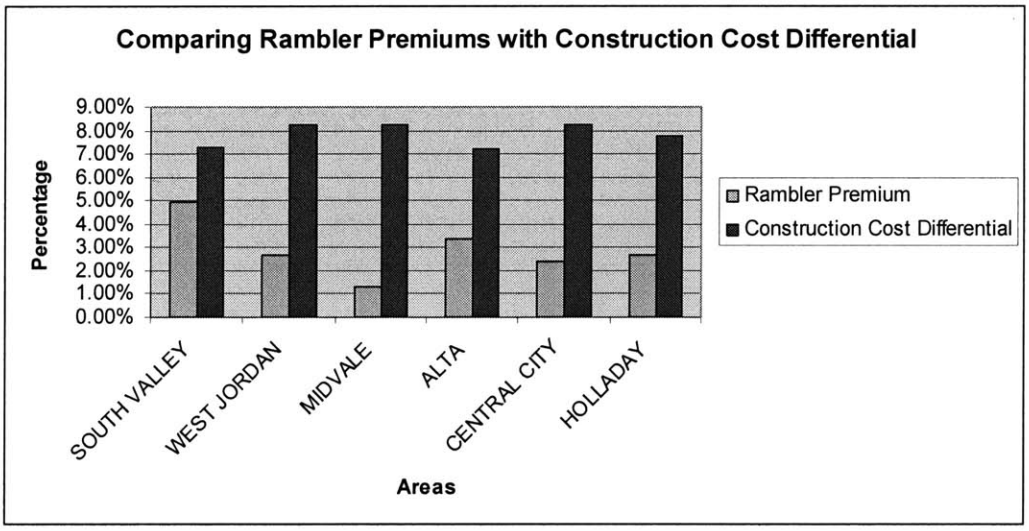
Table 6.3b

SOUTH VALLEY RAMBLER PREMIUM COMPARED WITH CONSTRUCTION COST DIFFERENTIAL	
RAMBLER PREMIUM	4.90%
CONSTRUCTION COST DIFFERENTIAL*	-8.12%
DIFFERENCE	-3.22%

**Source: RS Means Residential Cost Data 2003*

This table shows that only 3% separates the rambler premium from the extra cost of building a rambler in South Valley. When these two statistics are analyzed across all seven areas, the differences remain relatively small—ranging from 3% to 7%.

Chart 6.3c



Source: RS Means Residential Cost Data 2003

While 7% may seem like a large differential, the point is that these numbers are still roughly similar. They are in the same "ballpark".

The fact that these numbers are in the same ballpark is extremely important to understanding the rambler premium. The hedonic model predicts that buyers are paying anywhere from two to five percent more for ramblers. At the same time, the construction data indicates that it costs six to nine percent more to build ramblers. Therefore, the hedonic model predicts a certain percentage more that people will pay for ramblers (the premium) and the construction cost data confirms that this is premium is roughly equivalent to the extra cost to build a rambler. What this tells us is that the hedonic model is producing results that closely mirror reality. It tells us that people are willing to pay a premium that is about the same as the extra cost of building a rambler. It is remarkable that the numbers are this close.

Essentially, this means that buyers are willing to pay for the extra cost of building a rambler. The reason that the buyers pay this premium on ramblers has nothing to do with the fact that it costs builders more to construct rambler-style homes. The buyer is not interested in how much it cost to produce. The buyer is only interested in how much the home is worth to him. Apparently, ramblers are worth the extra money they cost to build. There is sufficient buyer demand that they continue to be produced. If there was not enough buyer demand, and if buyers were unwilling to pay the extra cost, then ramblers would not be constructed by builders. For some reason, buyers are willing to pay a premium for the rambler style home.

Now, the task becomes trying to understand why buyers are actually willing to pay the extra money for a rambler-style home. A few possible explanations will be discussed in Sections 6.4 and 6.5

6.4 Factoring in the Basement

The hedonic model takes into account two variables that relate to basement space: the dummy basement variable and the finished basement space variable. These two variables might provide some explanations as to why buyers will pay more for ramblers. Before delving into the rambler premium question though, these variables should be explained in greater depth.

The dummy basement variable will be discussed first. The dummy variable simply tells whether a home has a basement or not. For obvious reasons, this is an important variable. A basement has the potential to double the square footage that a buyer acquires when making a purchase.

The output from the hedonic model indicates that a basement adds significant value to homes across the seven sub areas. Table 6.4a shows how home buyers in the different areas value having a basement.

Table 6.4a

COEFFICIENTS FOR THE BASEMENT DUMMY VARIABLE							
	S. VALLEY	W. JORDAN	MIDVALE	ALTA	C. CITY	HOLLADAY	TVILLE
bsment	0.11	0.16	0.12	0.07	0.14	0.09	0.08

To understand the impact of these coefficients, it is helpful to show how the home increases in value when it includes a basement. For instance, the hedonic predicts that a home in West Jordan increases from an average price of $147,000 to 170,500 when it has a basement. In Alta, the average home price increases from $250,000 to $267,500.

The second variable having to do with basement space is the finished basement variable. This variable measures, in square feet, how much of a home's basement has been finished. The results of the hedonic indicate that the variable for finished basement space matters to buyers. Table 6.4b shows that finished basement space is quantitatively important.

Table 6.4b

COEFFICIENTS FOR THE FINISHED BASEMENT VARIABLE							
	S. VALLEY	W. JORDAN	MIDVALE	ALTA	C. CITY	HOLLADAY	TVILLE
finished bsment	0.000099	0.000068	0.000064	0.000088	0.000152	0.000114	0.000092

To understand how finished basement adds value to homes in Salt Lake, consider a couple of examples: In West Jordan, an average home sells for $147,000. With 800 finished square feet of basement space, the home increases in value to $155,000. In the Central City, an average home sells for $164,000. When 800 finished square feet of basement are added, the value increases to$184,000.

Given the increase in home values with the addition of finished basement space and with the addition of a basement, it is clear that home buyers in Salt Lake City value these two attributes of housing.

One limitation of these two variables is that they do not capture how much total space there actually is in the basement. A variable for total basement space had to be left

out of the hedonic model. The reason that the variable for total basement space was not included in the hedonic model is that it is too closely related to the above-grade square footage variable. It would introduce co-linearity into the model and this would result in less reliable results. This is a natural limitation of the hedonic model. There are certain variables that cannot be used together. For this reason, my hedonic model does not fully capture all of the essential information about basement space. In particular, there are two unique aspects of basement space that are not accounted for in the hedonic model. Both of these aspects are possible explanations for the rambler premium.

Basement Space that is not Accounted For

The first unique aspect of basements that could influence the rambler premium is the difference between rambler and two-story basements. Rambler homes possess an inherent advantage in terms of basement space compared to two story-homes. The inherent advantage comes from the fact that rambler basements are naturally larger than two-story basements.

Most real estate agents in the Salt Lake area would tell you that people seek out ramblers because they are an inexpensive way to purchase a sizeable amount of total square footage. According to these agents, buying a rambler is an inexpensive way to acquire a generous amount of square footage mainly because of the basement space in ramblers. Ramblers inherently contain a higher percentage of basement space than the other styles of home on the market. The reason for this is that ramblers are one-level dwelling units. The above-grade square footage is roughly the same size as the basement

below. In most cases, the basement on a rambler is approximately half of the size of the above-grade square footage. On the other hand, a two-story home has a greater percentage of above-grade space. A typical two-story home consists of two floors of above-grade space and one floor of basement space. In this simplified example, the basement area makes up roughly one-third of the entire living space in the home. It becomes evident that ramblers contain a higher percentage of basement space than the other home styles.

If a buyer wants the most absolute raw square footage out of a home, then the rambler is the home to buy. The buyer acquires more below-grade space than he would get in a two-story, split-entry or tri-level home. In theory, the buyer also pays for less above-grade space than he would pay for in any other style of home. The buyer gains a greater percentage of the below-grade space. Table 6.4c illustrates what a buyer gains, in absolute square footage by purchasing a rambler instead of a two-story. To simplify things, we will assume that these two homes are identical in every respect except for the price they sell for and their style.

Table 6.4c

UNDERSTANDING WHAT THE RAMBLER BASEMENT OFFERS **A 1400-Square Foot Home in West Jordan**		
	RAMBLER	TWO STORY
Price (predicted by hedonic)	$150,916	$147,000
Floor One	1600	800
Floor Two	0	800
Basement	1600	800
Total Above grade	1600	1600
Total Below grade	1600	800
Total Square Footage	3200	2400
Cost per above grade sq ft	$94.32	$91.88
Cost per total sq. ft	**$47.16**	**$61.25**

What this table illustrates is that although rambler buyers pay more per above grade square foot than two-story buyers ($94.32 compared to $91.88), the same rambler buyers actually acquire more total square feet than the two-story buyers. (3200 square feet compared to 2400 square feet) Not only that, but the rambler buyers acquire the square feet at a lower cost per *total* square foot ($47.16 compared to $61.25). It is not surprising then that buyers look for ramblers as a way to acquire as much square footage as they can afford. The key is that a high proportion of the square footage is below grade, and as such it is less expensive.

As a reminder, the total square footage of the home is not taken into account in the hedonic equation. Only the above-grade square footage and the below-grade *finished* square footage is measured. The finished square footage variable does partially explain how buyers value basements, but the variable does not fully account for all below-grade space. Therefore, the fact that ramblers offer more total square footage at a lower price is

not fully accounted for in the hedonic equation. Thus, ramblers provide more total square footage for less money than two-story homes. This is an intriguing possible explanation for why people pay a premium for rambler style homes. Basically, they are paying a premium to acquire more unfinished below-grade space.

In other words, it makes sense that people would pay a bit more for a rambler because in terms of total square footage, they are acquiring more space at a lower cost than if they were to purchase a two-story. Remember, looking back at Table 6.4a, the rambler buyer only pays $47 per *total* square foot, while the two-story buyer pays $61 per total square foot. Paying $47 for space compared to $61 dollars would be viewed by most as a bargain. Under this scenario the rambler buyer pays a *premium* for the rambler in order to gets more total square footage at a less expensive price.

The Option Value of the Basement

The second unique attribute of basement space in Salt Lake City is the option value it provides to buyers. This option value derives from the fact that many basements in the Salt Lake area are either unfinished or only partially finished. Part of the reason for this is that in new home construction leaving the basement unfinished is common practice for most Salt Lake builders. Since basement space is often unfinished or finished at a lower quality, the buyer pays less for the space than if it were standard, above-grade space. The buyer receives an added bonus by acquiring this below grade space--he can finish the space at a later date. This is where the option value comes in. Simply put, the basement space in Salt Lake area homes provides on option value of sorts for the buyer.

Assume for the sake of simplicity that a typical buyer likes the idea of the option value of the below-grade basement space so much that he searches for a house with an unfinished basement. The buyer acquires the below-grade space now for a fraction of the cost of above-grade space. This gives him the option to pay later to finish it and turn it into desirable living space. This is a valuable option for the buyer. The buyer might not be able to finish the space right now due to budgetary constraints. Or, he might not *need* to finish it right now as his family size is small enough that the above-grade space suffices. If the buyer's situation changes and he is able to finish the space due to an increase in income, or if he needs to finish it due to a change in family size, the basement provides the option to do so. The beauty of the basement is that it gives the buyer the option, but not the obligation to finish it off.

The option value of the basement only increases in a rambler compared to a two-story. The reason for this is that the rambler has a greater percentage of below-grade space that a buyer acquires at a less expensive price. This larger space can eventually be finished off. The added option value of the rambler basement is another possible explanation for the rambler premium found in Salt Lake area homes. Holding all else equal, with a rambler, buyers essentially get more space to finish at a later date than if they were to buy a two-story. In efficient markets, you rarely get something for nothing. It would make sense that a premium is paid for ramblers because they offer an added value in terms of a greater option value in the basement than the two-story homes.

The greater option value of the rambler basement and its larger size are two possible explanations as to why buyers pay a premium for this style of home. A third

possible reason that ramblers are so well liked has to do with the appeal of living on one level.

6.5 The Appeal of Single-Level Living

One final possibility to explain the rambler premium that should not be overlooked is the allure of living on one level. In a recent poll, American home owners expressed the sentiment that collectively, they prefer living on one level as opposed to two levels. According to the National Association of Home Builders, one story homes are preferred over two-story homes by a 52% to 35% margin.[15]

The one-story home has enjoyed a boost of popularity all over the country in recent years for several reasons. Baby boomers are aging; indeed our entire population is aging. More and more we prefer to live our lives on one level rather than clamber up and down the stairs every day.[16]

Though this idea cannot be backed up with hard data, it provides a compelling possible explanation for why people are willing to pay more for ramblers across all areas of Salt Lake Valley.

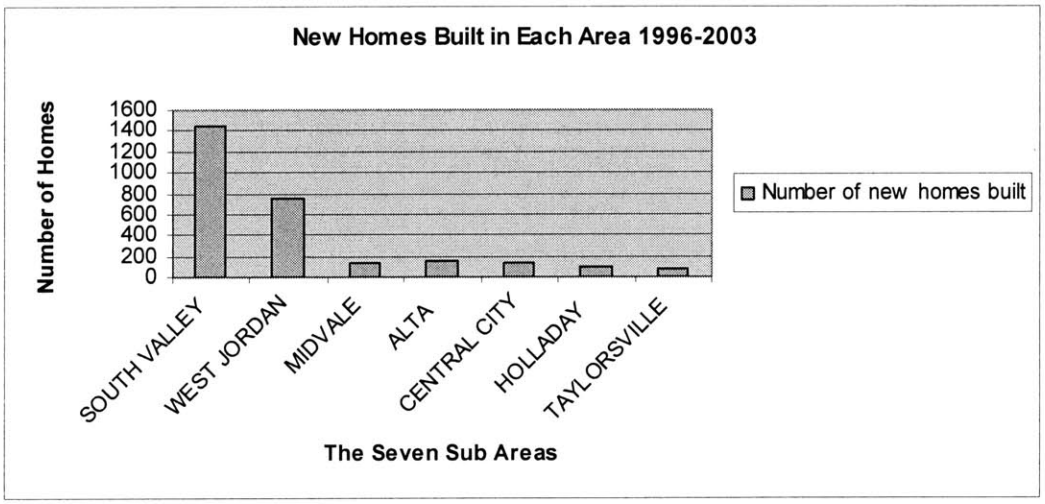
Now that we have set forth some possible explanations for the rambler premium, the remaining task is to estimate an optimal mix of home styles given the information about rambler premiums.

[15] "What 21st Century Buyers Want"; NAHB survey 2001
[16] "On the Level—the Growing Popularity of One-Story Homes"; James 2000

6.6 Estimating an Optimal Mix for South Valley and West Jordan

It is easier to arrive at an optimal mix by paring down the areas and choosing one or two locations to focus in on. It makes sense estimate an optimal mix in South Valley and West Jordan as these two areas are where the majority of new homes are being constructed. (See Chart 6.6a below)

Chart 6.6a

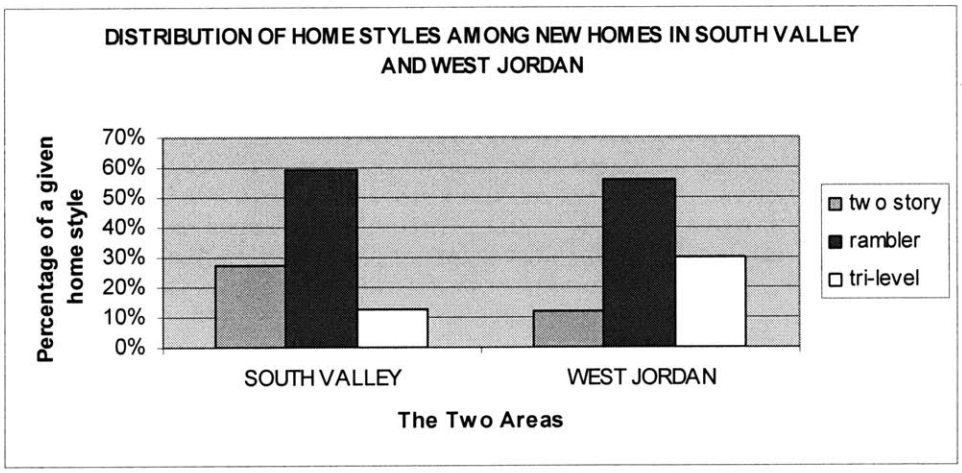


It also makes sense to choose South Valley and West Jordan as these are the two areas with large contiguous parcels of land that remain to be developed. These are areas where a mix of homes can actually be built in a subdivision or master-planned community of considerable size. In all of the other areas, there are not large enough

parcels of land to be developed; consequently learning the optimal mix of housing style is not as crucial.

In South Valley and West Jordan it appears that developers are not far off the mark. The developers are mainly building rambler style homes. (See Chart 6.6b) Even combining tri-level and two-story homes does not account for fifty-percent of what is getting built. Apparently, developers understand that there is a strong demand for ramblers in these areas of the Salt Lake Valley. The fact that so many ramblers are being built only reasserts the notion that there is a rambler premium.

Chart 6.6b



Given this information, it seems that the logical mix of home styles in South Valley and West Jordan should closely mirror what is currently being built there. Right now, that mix is roughly a 6:3:1 ratio of ramblers to two stories to tri-levels in South

Valley and a 6:3:1 ratio of ramblers to tri-levels to two stories in West Jordan. (See Chart 6.6b)

The reason for sticking with this ratio and building a majority of ramblers has to do with the fact that the rambler premium and the extra cost to build a rambler are roughly the same. If the premium and the cost differential were much different, the mix would need to be changed. For instance, if buyers were willing to pay 15% more to acquire a rambler and it only cost 5% more to build one, then it would make sense to flood the market with ramblers because the demand would be strong enough for this type of a mix. On the other hand, if buyers were only willing to pay 1% more to acquire a rambler at it cost 10% more to build it, then builder would stop producing ramblers. As it stands right now, buyers are willing to pay roughly the same amount for ramblers as the extra cost of construction. For this reason, it makes sense to mirror what is currently being done in the market by building ramblers in the aforementioned 6:3:1 ratio.

One caveat should be kept in mind when dealing with the notion of an optimal mix of homes in South Valley and West Jordan. The caveat has to do with lot size. Once land starts to become scarcer in this portion of the valley, builders should start introducing more two-story and tri-level homes into the mix of home styles. The reasoning behind this is that as land becomes less plentiful, lot sizes will almost certainly decrease. With the decrease in size, it makes more sense to shift away from a majority of ramblers to a healthy mix of ramblers, two-stories and tri-levels. The two-story and tri-level homes have footprints that will fit more easily on the smaller lots that will eventually arrive in South Valley and West Jordan. The shift to a more even mix of ramblers, two stories and tri-levels may not even be a conscious choice that builders

make. It might just be dictated by what size lots get approved by the various municipalities. The trend in other areas of the valley where land is already scarce has been that more and more two-story and tri-level homes are being built. Charts 6.6c and 6.6d illustrate how the mix of homes has changed dramatically. Chart 6.6c shows the mix of homes on the market right now in the other five areas. Chart 6.6d shows the mix of new homes that have recently come onto the market.

Chart 6.6c

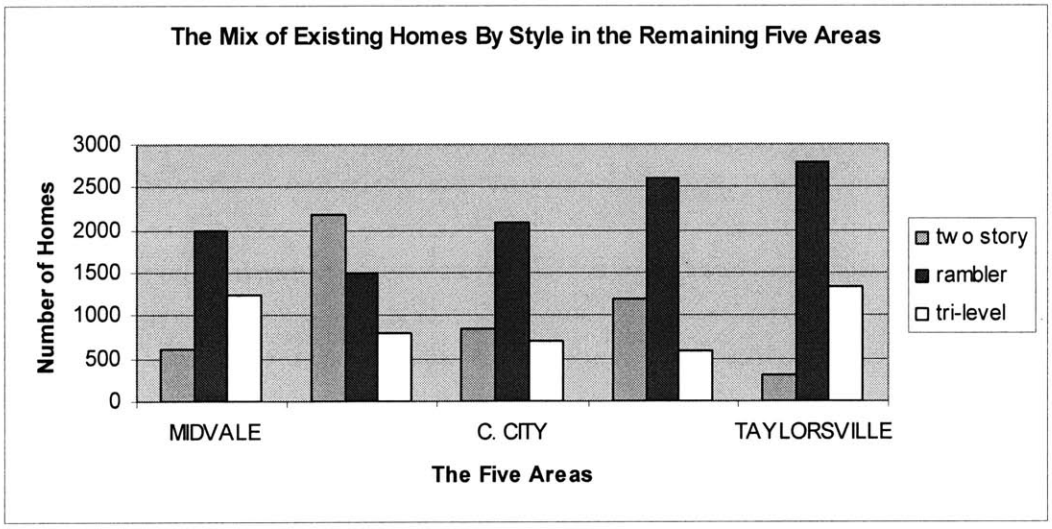
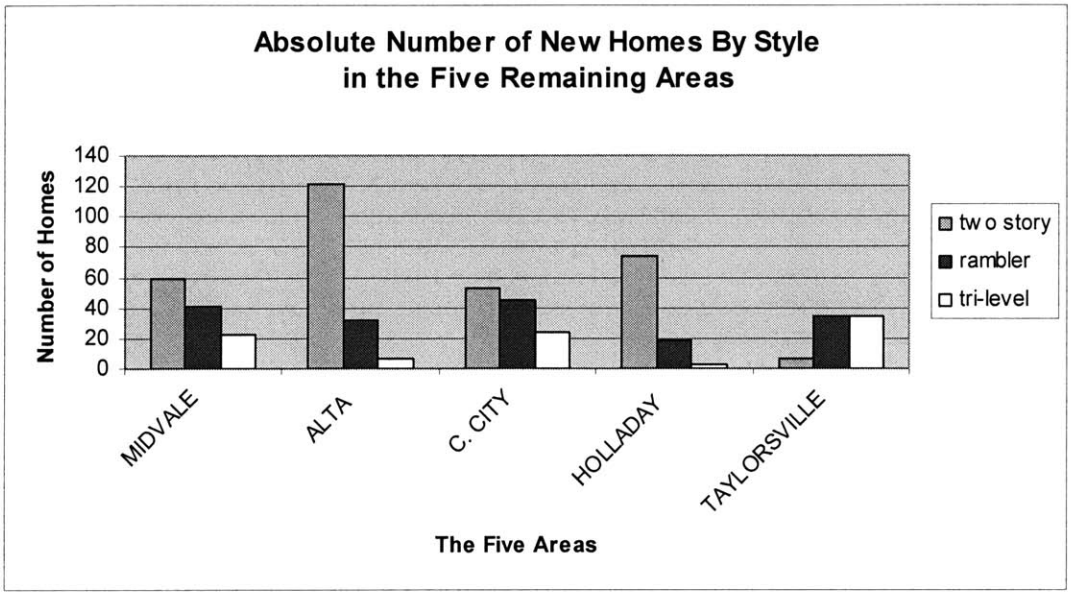


Chart 6.6d



Studying these two charts, it is clear that ramblers have lost a percentage of their share of the market in every single area. In Midvale, Alta, Central City, and Holladay the two-story home is now the predominant style. In Taylorsville, the rambler still holds a slim margin, but the tri-level home is poised to surpass it. These numbers are not definitive as they represent roughly one hundred home sales in each area. There are homes being built in these areas that do not show up in the MLS data. Putting the possible fallibility of the data aside for a moment though, the trend is quite striking: rambler-style homes are becoming less and less common in these built-out areas.

The builders in West Jordan and South Valley must be aware that there is a good chance that this trend will continue in these two areas as soon as land becomes scarce enough and lot sizes start to diminish. When this eventuality occurs, the builders will

have to change the mix of homes that they build. The savvy builder would be wise to alter the mix of home styles that he offers in anticipation of the coming changes.

Keeping the aforementioned caveat in mind, the optimal mix of home styles in South Valley and West Jordan should closely resemble what is being built currently. As long as ramblers command the types of premiums shown in the hedonic model, it makes sense to keep building them.

CONCLUSION

At the beginning of the thesis, the question was posed, "How do home buyers value different home styles in the Salt Lake area?" Another way to pose this question is given the existing supply of homes in an area, how much are buyers willing to pay for different home styles? Learning how much buyers are willing to pay for different styles of home is crucial because it largely determines the future mix of homes that will be built in response to the market signals.

The first step in understanding buyer valuation of home styles was to put Salt Lake City under a microscope. One reason for this was to gain a better understanding of the average Salt Lake area buyer. A second reason was to come to a better understanding of the unique building climate in Salt Lake County.

The logical next step, of course, was to test out data on home transactions in Salt Lake City. This would provide a set of market outcomes to help answer the question of how home style is valued by the typical buyer. After gathering, sorting and cleaning the home sale data, a hedonic model was created. The model proved to be quite robust. The main reason for the robustness of the model was the large data set that was inputted into the model. Another explanation for the robustness of the model was that the data was properly cleaned before being inputted. In the seven areas that were created from the Salt Lake home sales, the sample size ranged from five thousand to eight thousand transactions. These large sample sizes caused each variable to be measured with a high degree of precision.

The strong results of the hedonic made it a powerful explanatory tool. Naturally, the hedonic model did not explain all of the variation across the data set. It did, however, predict implicit prices for the housing attributes that seemed to coincide with reality.

The most intriguing implicit price that the model generated was the shadow price it affixed to ramblers. The hedonic results showed that Salt Lake buyers place a premium on rambler-style homes when compared to two-story homes. What this means is that, in essence, ramblers are something that the market values enough to pay extra for. Therefore, in Salt Lake, buyers pay a "premium" for a rambler meaning that they pay more for it than for a two-story, tri-level, split-entry, or any other style of home. The following table illustrates how much more buyers in the seven sub areas of Salt Lake value ramblers style homes holding all other attributes constant:

QUANTIFYING THE RAMBLER PREMIUM							
	SVALLEY	WJORDAN	MVALE	ALTA	CCITY	HOLLADAY	TVILLE
rambler coefficient	4.94%	2.66%	1.29%	3.39%	2.42%	2.68%	-0.96%

Applying these coefficients to some actual homes prices shows just how more people are willing to pay for ramblers. For instance, in the Salt Lake suburb of South Valley, a buyer would normally pay $216,000 for an average home. However, when it is a rambler, the buyer pays 4.94% more for a total price of $227,000. In Holladay, another area in Salt Lake, the numbers are similar: $257,000 for an average house and $264,000 for a rambler.

After seeing how much more buyers pay for a rambler, the next obvious question is what is causing this premium. To understand this question, it is crucial to realize that rambler-style homes cost more to build than two-story homes. Using the RS Means Cost Estimating Guide as a reference, it appears that the extra cost of building a rambler and

the premium buyers pay for a rambler in Salt Lake City are similar in value. While the values do not match up perfectly, they are in the same ballpark. The cost data serves as a reliable benchmark to show that buyers roughly paying for what they get. It is important to point out that if buyers refused to pay the extra cost of construction for the rambler then this style of home would not get built.

At this point, it is crucial to realize that buyers do not pay more for the rambler simply because it costs the builder more to build it. The buyer does not care what it cost the builder to construct the rambler. The rambler buyer pays more because there is something that the buyer likes about ramblers. In other words, demand for ramblers is great enough that buyers will pay for the extra cost of building this style of home.

What is it that fuels this demand for ramblers? Why do people like this style of home? Finally, why are buyers willing to pay more for ramblers?

One answer to these questions has to do with basement space. From a buyer's point of view, basement space in a rambler provides more benefits than basement space in other home styles. For instance, rambler basements are larger, on average, than the basements of the other home styles. The larger basement of the rambler could be one reason that buyers are willing to pay more for this style of home. Since basement space could not be fully incorporated in the model, it is possible that the rambler premium partly represents the larger rambler basements. If total basement space could be included in the model then it would partly or completely eliminate the rambler premium.

Another important issue with basement space is the option value it often provides buyers. When a buyer purchases a home with a basement that has a certain amount of unfinished space, the buyer gains an option value. The buyer acquires the unfinished

space a lower price and then has the option to finish the space at his own leisure. This option value increases in rambler homes because they generally have larger basements. On average, the rambler buyer receives more inexpensive space to finish at a later date than the two-story buyer. Since unfinished space is not fully accounted for in the hedonic, it is possible that the rambler premium is influenced by the fact that buyers feel that they get more option value from a rambler basement. Using this logic, buyers would be willing to pay slightly more for a rambler home in order to acquire the extra option value that a rambler basement provides.

A final insight into why buyers are willing to pay for the extra cost of a rambler is simply that buyers prefer to live on a single level. The logic behind this explanation is that buyers prefer single-level living so much that they are willing to pay a premium when purchasing a one-story home. This explanation is impossible to quantify, yet it provides another possible reason that people are willing to pay a premium for ramblers.

The last portion of the thesis deals with estimating an optimal mix of home styles in two of the sub areas of Salt Lake County—West Jordan and South Valley. These two areas are the only areas in Salt Lake where large parcels of developable land remain. For this reason, it made sense to forecast an optimal mix in these areas.

Based on the trends in the data and the hedonic output, it makes sense to continue building the mix that seems to work in these areas right now. The mix that works right now in South Valley and West Jordan is to build a majority of ramblers with some two-story and tri-level homes thrown into the mix.

The main reason that it makes sense to continue with the same mix is that the premium on ramblers and the extra cost of building a rambler are of roughly the same

magnitude. If the premium on ramblers was much greater than the extra cost it takes to build ramblers, then there would need to be an adjustment made in the mix of home styles. In this scenario, it would make sense to build as many ramblers as possible. Buyers in this scenario would be demonstrating that in addition to being willing to pay for the extra cost of construction, they would also be willing to pay an extra premium just because they liked ramblers that much more than other styles. In the opposite scenario, if the premium on ramblers was much less than the extra cost of building ramblers, then it would make sense to immediately stop building ramblers. In this case, it would make sense to stop building because people would no longer be willing to pay for the additional cost of building a rambler. Since the premium on ramblers and the extra cost of building a rambler are in the same ballpark, the mix that exists in the given area should be kept exactly the same.

On a final note, a point that should not be forgotten in the midst of the questions surrounding the rambler premium is the model that underlies it all. The hedonic model that was created to analyze how buyers value home style proved to be a powerful model. The results it produced were robust. This meant that we could have greater confidence in the implicit prices the model predicted. Compared with similar hedonic models, this model functioned remarkably well. The model did not produce outlandish results. Rather, the results were quite predictable providing a reasonably correct description of reality. There was no shocking news that the model informed us of. Though the model did not answer all of the questions posed in this paper it did identify a premium that buyers place on ramblers in the Salt Lake City area.

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