History and Analysis of the Las Vegas Housing Market

By

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

MASTER OF SCIENCE
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Abstract

This thesis looks at the historical growth indicators of Las Vegas and compares this data with the indicators of classic models of growth economics. Based on these comparisons, a determination of the type of growth experienced by Las Vegas will be made.

Once the type of growth model has been determined a set of equations based on the equilibrium of supply and demand will be devised. These equations will then be used to build a stock flow model that will extrapolate economic indicators into a forecast of price and production of homes for the coming years. Finally, based on the stock flow model and a number of economic scenarios, the future of the Las Vegas housing market will be investigated.

Thesis Supervisor; William Wheaton
Title; Professor of Economics and Urban Studies and Planning

Acknowledgement

I would like to thank the following people for their generous assistance during this project.

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All of the folks at the UNLV Center for Business and Economic Research, without their help I would have gotten nowhere.

And most importantly, my wife Julie who during the time I wrote this paper, and with almost no help from me, managed to coordinate our move to St. Louis, the birth of a baby, and running a household.

1. INTRODUCTION

1.1. Introduction

For the past ten years, "Build it and they will come" has been the mantra of homebuilders in Las Vegas. With Clark County's population increasing from 588 thousand in 1986 to nearly 1.2 million in 1997[1], development companies have been able to schedule projects based solely on production logistics, and available land. However, this explosive growth cannot last forever. Therefore, in the coming years (if not already), the successful companies will look past current projects and wonder: "How long will the boom last, and when should we rethink production?" To answer these questions, one has to understand the parameters driving the current market. Where are the buyers coming from? Who are they? Why are they buying in Las Vegas? What factors have made them choose buying a home over their current housing? And finally, In both timing and volume, what has been their effect on the housing market?

This paper will try to answer these questions. To do so, it will start by looking at the fundamental forces driving the influx into Las Vegas. Is this influx

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[1] Historical Perspective of Southern Nevada, Center for Business and Economic Research, University of Nevada, Las Vegas.

due to an increased demand for services produced in Las Vegas, and thus the local economy has "pulled" people from other areas? Or, has the influx been due to exogenous factors that have in effect "pushed" newcomers into the area? This thesis will try to discern the underlying factors driving this migration, in addition it will also look at the correlation between the demographics of the influx and the type and location of product demanded. Finally, this thesis will use the observed correlation of influx, to economic indicators, and housing to forecast the Las Vegas housing market.

1.2. Outline of Paper

This paper will be divided into five sections: 1) Introduction, 2) History of the Las Vegas Valley, 3) Analysis of the Las Vegas economy, 4) Analysis of the Las Vegas housing market, and 5) Conclusion. The first section, Introduction, has introduced the topic and goals of the paper. In this section the reader has been exposed to the questions that the paper will raise, and the answers that will be investigated. The second part of the introduction, Outline of Paper, will present the manner or path that the paper will take to answer these questions. Below is a listing of the five sections of the paper and a brief description of their contents. In addition, this section will give a general overview of how these topics interrelate to each other, and how the progression of each topic will establish the path to answer the questions posed in the introduction.

Chapter two will look at the history of Las Vegas, and explore the events that culminated into the modern Las Vegas metropolitan area. Chapter three will begin the analysis of the Las Vegas economy. This chapter will explore the type of growth that the valley has seen. Based on these results, at set of equations can be devised that will forecast market expectations. Chapter four begin the analysis of the housing in the Las Vegas area. from the analysis presented in chapter three, this chapter will build a set of stock flow equations that will forecast the housing prices and production. Following the derivation of these equations, the final section of chapter four will "play-out" a couple of economic scenarios, and look at the response of the area's housing market. Chapter five will briefly summarize the results of chapter, and present a conclusion.

2. HISTORY OF THE LAS VEGAS VALLEY

2.1. Spanish/Mormon Trail

Las Vegas Springs was an artesian well in the middle of the Mojave Desert. Because it was the only water for miles in any direction, it became one of the most welcome stops along the Spanish Trail. The Spanish trail was an overland trade route that linked Los Angles to Santa Fe from about 1830 to 1847. When the United States took the area from Mexico, the Spanish trading era ended and the trail died off. However, soon after, the Mormons, who had settled in Utah, starting to use a portion of the Spanish Trail as to supply their missions in California. Eventually the route from Salt Lake City to Los Angeles became known as the Mormon Trail, and the portion of the Spanish trail from Las Vegas to Los Angeles was so renamed.

As part of the Mormon Trail a fort was built next to the Las Vegas Springs

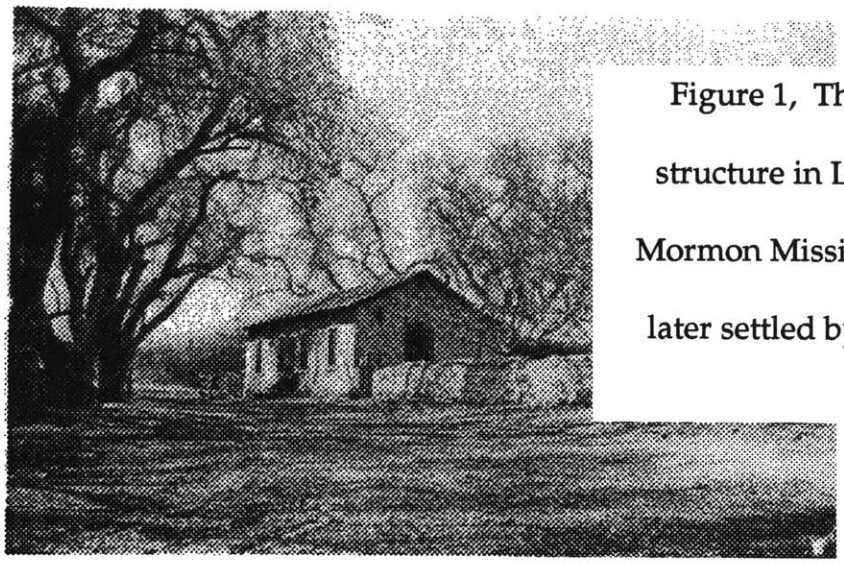


Figure 1, The first permanent structure in Las Vegas. Built by Mormon Missionaries in 1848, and later settled by O.D. Gass in 1865

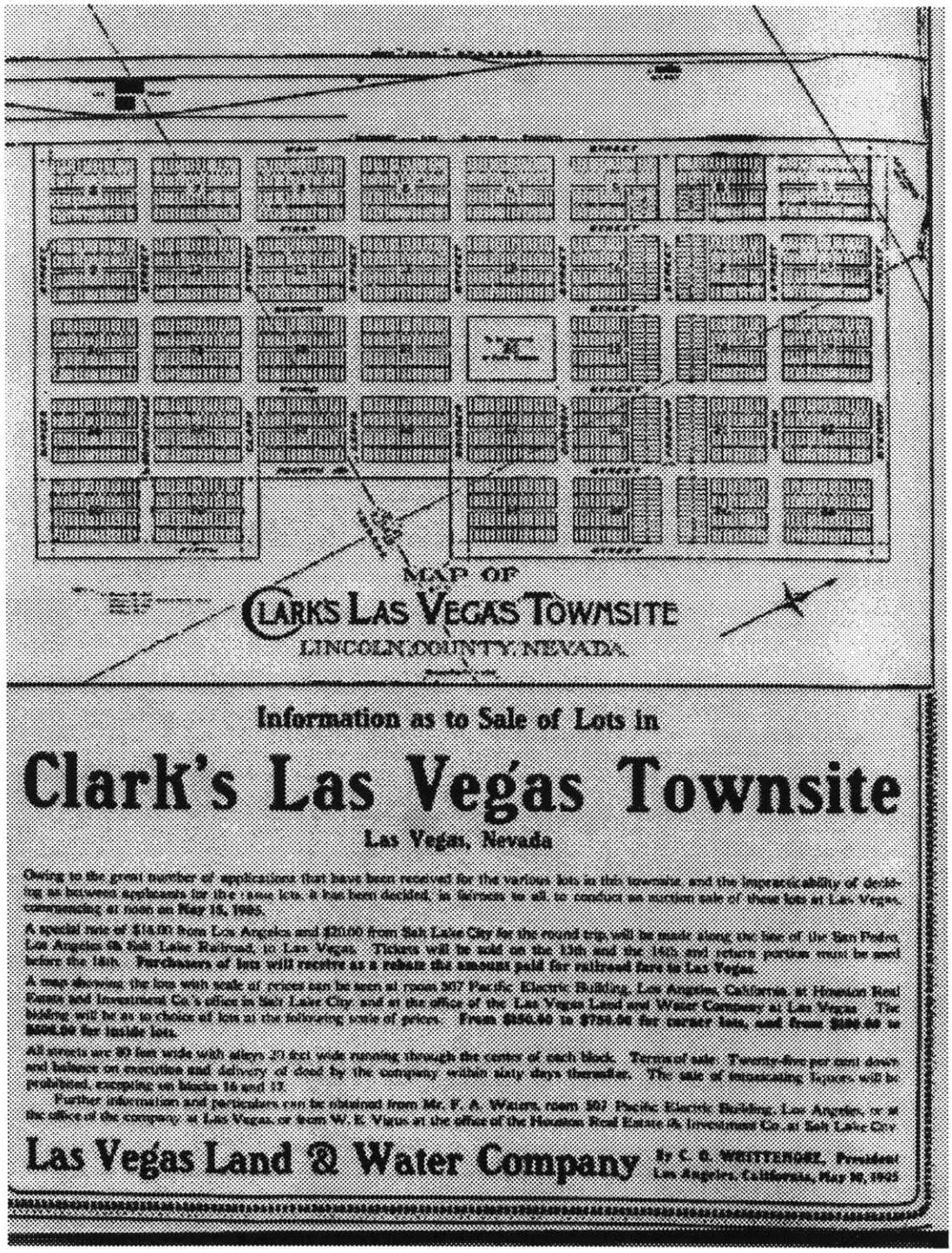
stop. This fort became the first permanent building in the Las Vegas Valley figure 1.

However, for unclear reasons, By 1858 the Mormons had abandoned the fort. Some say the reason for this abandonment was lack of supplies, and others say it was due to uncertainty of the Las Vegas Mission's leadership. In either case, the fort was left to the elements. Except for a brief mining boom shortly after the Mormons left, The fort sat empty until 1865. In 1865, Octavius Decatur Gass, rebuilt the wrecked Mormon fort, and started the Las Vegas Ranch. From that time, the Las Vegas Ranch was continuously occupied until the early part of the twentieth century, when the railroad came to town.

2.2. Railroad

In 1905 the first true development began when the Las Vegas land & Water Company, a subsidiary of the Union Pacific Railroad, auctioned subdivided parcels adjacent to their soon to be constructed train depot(fig 2). With these parcels the developers promised to provide water to each lot and grading and oiling to the streets. Because there had been a rebirth in the mining industry in the area, and the railroad planned to place a major maintenance yard just behind the Depot, the short term economic future for the area, now called simply Las Vegas, was bright. Because of this, some of the lots sold at four times the expected price. The lots that went for an especially high premium were in blocks 16 and 17. These lots were the only ones without a deed restriction prohibiting the sale of liquor.

Figure 2



MAP OF
CLARKS LAS VEGAS TOWNSITE
LINCOLN COUNTY, NEVADA.

Information as to Sale of Lots in

Clark's Las Vegas Townsite

Las Vegas, Nevada

Owing to the great number of applications that have been received for the various lots in this townsite, and the impracticability of deciding as between applicants for the same lots, it has been decided, in fairness to all, to conduct an auction sale of these lots at Las Vegas, commencing at noon on May 15, 1905.

A special rate of $14.00 from Los Angeles and $20.00 from Salt Lake City for the round trip, will be made along the line of the San Pedro, Los Angeles & Salt Lake Railroad, to Las Vegas. Tickets will be sold on the 13th and the 14th, and return portion must be used before the 16th. Purchasers of lots will receive as a rebate the amount paid for railroad fare to Las Vegas.

A map showing the lots with scale of prices can be seen at room 807 Pacific Electric Building, Los Angeles, California, at Houston Real Estate and Investment Co.'s office in Salt Lake City, and at the office of the Las Vegas Land and Water Company at Las Vegas. The bidding will be as to choice of lots at the following scale of prices. From $50.00 to $750.00 for corner lots, and from $25.00 to $200.00 for inside lots.

All streets are 80 feet wide with alleys 20 feet wide running through the center of each block. Terms of sale: Twenty-five per cent down and balance on execution and delivery of deed by the company within sixty days thereafter. The sale of intoxicating liquors will be prohibited, excepting on blocks 16 and 17.

Further information and particulars can be obtained from Mr. F. A. Waters, room 807 Pacific Electric Building, Los Angeles, or at the office of the company at Las Vegas, or from W. E. Vigus at the office of the Houston Real Estate & Investment Co. at Salt Lake City.

Las Vegas Land & Water Company By C. O. WHITTEMORE, President
Los Angeles, California, May 10, 1905

For some time after the auction the mines produced as expected and the small town of Las Vegas flourished. However, by the twenties the mines were petering out and the future of the Las Vegas Valley began to fade. If something didn't happen Las Vegas would shrink to a small railroad town like Calente[2] to the north.

2.3. *Hoover Dam (originally Boulder Dam)*

In the late twenties rumors of building a dam somewhere along the Colorado River began to abound, and by 1928 Congress passed the Boulder Canyon Act which placed the massive project in Las Vegas's back yard. Finally, on July 3, 1930 President Hoover signed the appropriation bill that started the mammoth project. The economy of Las Vegas was saved.

With the construction project just 20 miles away, and no other town within a hundred, most of the activity centered around Las Vegas. In addition, most of the workers were housed in a construction camp named Boulder City. The laws of this encampment excluded liquor or gambling within the Boulder

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[2] Calente is a small railroad town about 200 miles north of Las Vegas. It was founded about the same time as Las Vegas, and was also built around a Union Pacific railroad stop. However, Calente never grew to much more than the homes and business directly adjacent to the stop.

City limits[3]. Thus, these laws created a perpetual migration of construction workers to the Saloons and nightclubs in Las Vegas.

In 1931 the State of Nevada legalized gambling, and the nightly migration changed from saloons and nightclubs to saloons, nightclubs, and casinos. As the dam construction progressed, the Las Vegas area grew along the corridor between the dam and the train depot. The development consisted of mostly material suppliers and bars along the Boulder Highway[4] and gambling halls, hotels, and residences around Fremont Street[5]. One of the first clubs to initiate gambling was the Boulder Club, built in 1929, it was the start of a wave of clubs that fronted on Fremont Street with the specific purpose of serving the Hoover Dam clientele. Eventually, this area has come to be known as "Downtown", or "Glitter Gulch", or just plain Fremont Street.

By 1935 the dam was completed and many feared that Las Vegas's fate would again revert to that of Calente's. However, with the draw of gambling, and a mature row of clubs that incubated during the Dam's construction. The core of Las Vegas pulled through the lull following the dam construction and built itself as an entertainment draw.

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[3] These laws are still enforced in Boulder City .

[4] the stretch of US 95 between the dam and Fremont street

[5] Through a loophole in the original deed restriction, if an establishment that was not on block 16 or 17 but was considered a hotel it could sell liquor. Eventually the railroad gave up trying to enforce the poorly worded restriction and rescinded the clause.

2.4. Destination Resorts/Mafia Ties

By 1941 almost the all the gambling clubs were centered along Fremont Street. While these clubs were doing a healthy business, not much growth in the area had occurred since the dam's completion. About this time, Thomas Hull opened the El Rancho Vegas on Las Vegas Blvd. Far south of the original train depot core, the El Rancho was very different from the clubs of Fremont street. With acres of land the El Rancho was a sprawling plush resort that was designed to be a vacation destination in itself.

The El Rancho was an instant success. A testament to this success is the string of duplicate resorts that it spawned over the next ten years. These duplicates created a growth spurt in the Las Vegas Valley that eclipsed even the Hoover Dam project. However, many of the resorts to follow were backed by organized crime. The first and probably most famous of these "Mafia" resorts was the Flamingo. Built in 1946 by Bugsy Siegel the Flamingo proved to the under world that there was money to be made in the Las Vegas desert. Shortly thereafter, the Sands, the Desert Inn, the Tropicana, and the Stardust were all built with questionable backing, and each was in competition to "outdo" the other. However controversial the funding for this construction, it resulted in high paying construction and casino jobs. The investment into these resorts drove Las Vegas's population from 8,422 in 1940 to 64,406 in 1960.

2.5. Corporate Ownership

By 1969 many of the club owners on the Strip were looking toward greener pastures, and to get out of Las Vegas. At that time Howard Hughes stepped in and purchased the Desert Inn, the Thunderbird, the Castaways, the Landmark, and the Sands. This purchase changed the way Las Vegas resorts were thought of among the financial community. Before this time the clubs in Las Vegas were privately held, and run by the whim of their owners. With the Howard Hughes purchase, the resorts became publicly held. With quarterly accountability, the philosophy of management for the hotels changed dramatically. Decisions became weighted upon net present value rather than ego, and the one-upmanship so prevalent in the 50's and 60's abruptly came to and end. Consequently, from the seventies to through the early eighties very little new construction occurred.

2.6. Family Destination/Theme Resorts

By the early eighties visitor volume and revenue began to decline. With their "numbers" dropping, the corporate owners began to realize that the one-upmanship played in the 50's and 60's, while motivated by questionable intentions (ego) created a continual rebirth that brought back visitors time and time again. However, the club owners also recognized that much had changed since the glamour days. The market of the 50's, 60's was much smaller and could depended on the "high roller" segment as its major source of income. On the other hand, the market of the future would have to be much larger, and therefore

could not be filled by the already saturated "high roller" segment. Therefore, for the club owners to return to the one-upmanship game, they would have make sure that their efforts would increase the market, otherwise they would be caught in a zero sum game in which nobody would win.

A precursor to the direction that Las Vegas was headed in could then be seen at William Bennett's Circus-Circus. The Circus-Circus was in a mediocre portion of the Strip. However, while the other resorts were seeing revenues flatten, the Circus-Circus was doing exceptional. The Circus-Circus differed from the other resorts in that it catered to the family traveler that viewed gambling as only one of a number activities while on vacation. With rides and entertainment for the family, along with gambling for the parents. the Circus-Circus targeted its market toward a whole new segment that had been completely neglected.

With the strategy of targeting the family vacationer, as well as the traditional gambler, Las Vegas set off on a building spree of "mega resorts" that has dwarfed anything the valley has ever seen. In the last three years, with the completion of the MGM Grand, the Treasure Island, the Luxor, the New York New York, and the Monte Carlo, more new hotel rooms have come online than the entire stock of rooms that preexisted 1970[6].

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[6] With these new rooms, Las Vegas has more hotel rooms than Los Angeles and New York combined.

An example of the new approach toward the casual gambler can be seen in the layout of the modern casino floor. While the new complexes are huge[7], the amount of floor space that is dedicated to live games (craps, twenty-one, etc.) has increased very little since the 60's. Now, with most of the guests casual gamblers who prefer video gaming, almost the entire acreage of the casino floor has been allocated to video poker and slot machines..

[7] The MGM has over 5,000 rooms, and the Luxor and New York New York have over 3,000 rooms each.

3. ANALYSIS OF THE LAS VEGAS ECONOMY

3.1. Three Sector Model

The growth of any region can be attributed to one of two phenomenon, demand induced growth or supply induced growth. The first of these is when the major industries in the area enjoy a competitive advantage, and thus need people to fulfil the growing demands placed upon their business. The second type of growth occurs when the attributes[8] of an area, such as mild winters or clean air, is the demand that causes an influx of people.

What is the cause of the growth in Las Vegas? Is it the warm sunshine or the explosive growth of the gaming industry? Based on a Three Sector Model this chapter will try to define the driving force behind the growth of Las Vegas. The sectors of the economy that will be investigated are employment, housing, and exports[9]. Below, this chapter will start with an illustration of the two driving forces discussed above, and look at the interaction of the three sectors when subjected to growth forces. The remainder of the chapter will then compare the expected response of three sectors to the data collected for the same sectors of the Las Vegas economy. Then based upon a "litmus test", a determination of the forces driving Las Vegas will be made.

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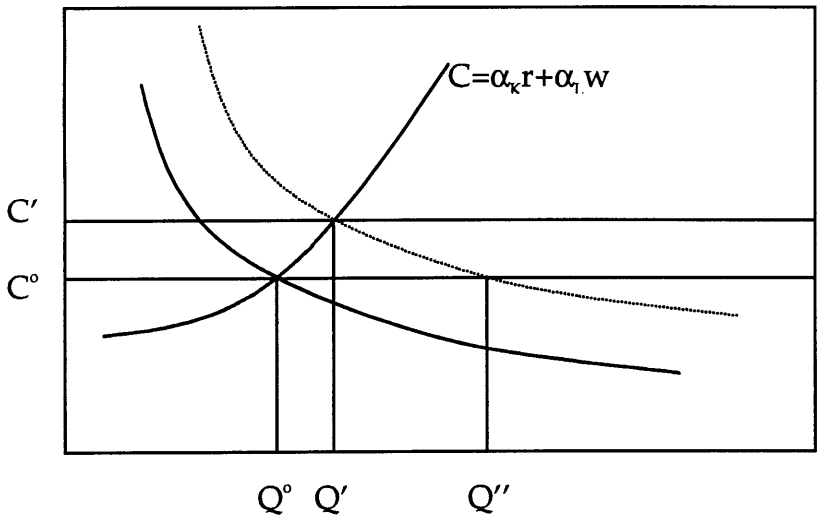
[8] or perceived lack of negative characteristics that may afflict other areas

[9] The export that will be used for the Las Vegas economy is visitor revenue.

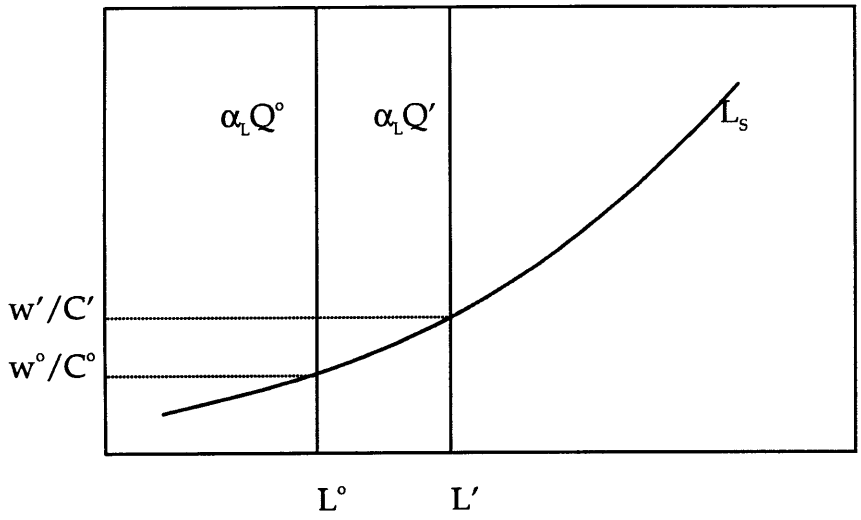
3.1.1. Demand Induced Growth

When the major export of an area begins to realize a competitive advantage over producers in other areas, orders begin to rise and production must be increased to fulfil demand. This competitive advantage is shown in fig. 3a as an upward shift in the demand curve. If production of the export is thought of as a combination of labor, materials, and real estate, the effect of an increase in production on other sectors can be analyzed. For this thesis

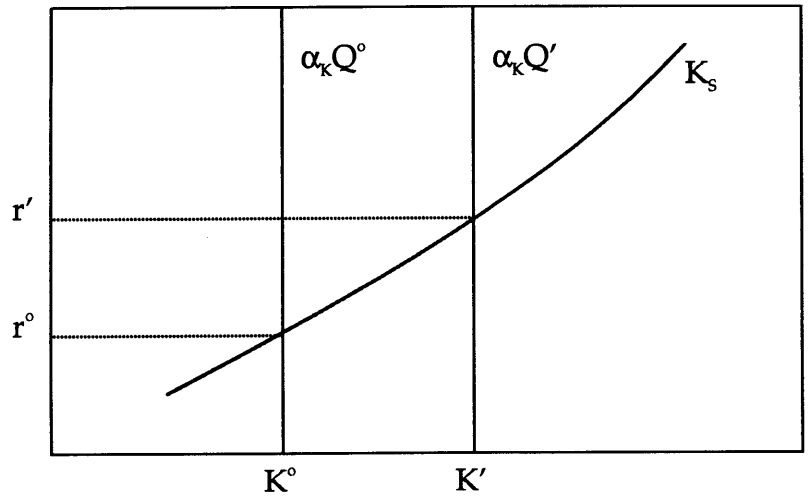
Figure 3, Demand Induced Growth



3a, Output



3b, Labor Market



3c, Real Estate Market

materials are assumed to be an import, and as such, has no effect on the local economy. However, labor and real estate are definitely a local product that must be consumed by the production of the export. Figure 3a shows that the cost (C) of locally produced goods for each item consists of a combination of real estate and labor. Assuming the ratio of labor cost and real estate cost for the production of each item are fixed, the cost of production for locally produced portion of the product is $C=\alpha_K r+\alpha_L w$, where (r) is the cost of real estate in the area, and (α_K) is the fraction of real estate that must be used in the production of each export item. Similarly, (w) is the cost of labor in the area, and (α_L) is the fraction of labor that must be used in the production of one item. Therefore, the total cost of production for all items will be Q*C or $Q^*(\alpha_K r+\alpha_L w)$. Because the relationship between labor and real estate is fixed, if export production is to be increased, inputs from the labor and real estate sectors must be increased in direct proportion to the increase in production. Therefore, as figures 3b and 3c show the inputs demanded by the producer from the labor and real estate sectors will be completely independent of the labor and real estate sectors and as such, an inelastic demand (shown as a vertical line in figures 3b and 3c).

Assuming a shift in export demand as shown by the dotted line in figure 3a the new output demand would shift from Q° to Q'. Because the demand of labor and real estate is inseparable from an increase in production figure 3 shows that in a demand driven economy we can expect the following to always occur:

1. Because the growth starts with an increase in demand, output (exports) will grow.
2. Because the demand curve has moved outward, real prices for exports will grow.
3. Because labor is an inseparable portion of output, real wages will grow with the increase in production/labor. This increase is shown in figure 3b as the positive slope on the labor supply curve. This slope is positive because as more labor is needed, a company will have to draw people from other sources. In order to successfully draw these people, the producer has to provide compensation that will make an employee better-off by changing positions. This is a real increase in wages.
4. Because real estate is a factor of production, when production increases demand for real estate increases. Like all goods, when demand for an item increases, the cost for that item increases. However, because the producers of the export goods have to make incoming employees better off by moving into the area, wages will increase faster than real estate prices.

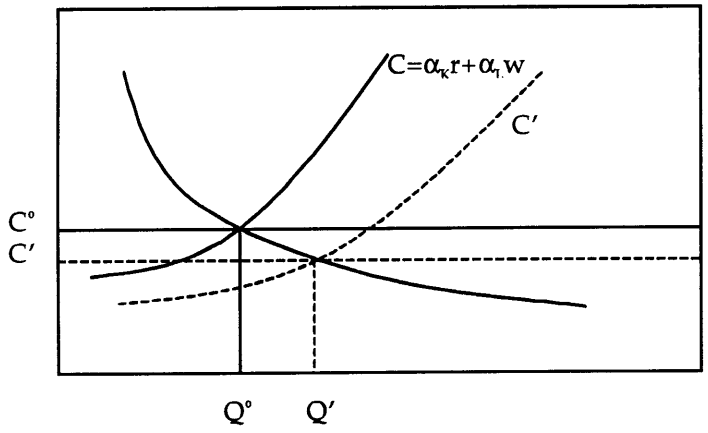
Depending elasticity of the real estate market and the labor market, demand induced growth can have two extremes. In the first extreme, if the labor and real estate markets are almost perfectly elastic the supply curves in figures 3a,b,and c will be almost horizontal. Therefore, a large increase in production will cause very little increase in real wages or real estate prices. On the other

hand, if real estate and labor are inelastic, a very small increase in production will cause a very large jump in wage rates and real estate prices.

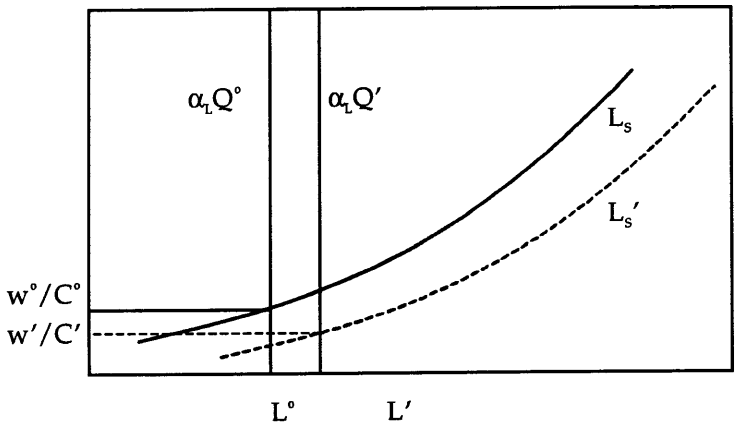
3.1.2. Supply Induced Growth

The departure from equilibrium for supply induced growth is due to a net inflow into the workforce (this can be seen as an outward movement of the labor supply curve, figure 4b, L_s to L_s'). With more labor in the workforce, the cost of supplying the same amount of labor as the equilibrium condition diminishes. Therefore the equilibrium shifts to the new point at the intersection of (L_o) and (L_s'). Because this new point represents a savings to the manufacturer, the manufacturer begins to enjoy a competitive advantage. This advantage is shown as a shift in the supply curve in figure 4a (the shift is from line C to line C'). As shown in figure 4a This advantage creates growth in orders, and thus a new equilibrium. This equilibrium is achieved by riding up the supply curve (C') in figure 4a, from the intersection point of line Q^o and L_s' to the point C', Q'. Just as in demand induced growth, when demand for an export has increase, the factors that produce the export must also must be increased. Therefore, as the equilibrium point moves up along the supply curves of figure 4b & c, the increase in demand moves the equilibrium to points L', L_s' for labor, and K',K_s for real estate. As shown in figure 4b, with this move some, but not all, of the wages lost due to an increase of workforce are recovered. In addition, as figure 4c shows, because the demand for real estate is dependent only upon the output market, the factor that drives real estate prices ($\alpha_K r$) increases with the

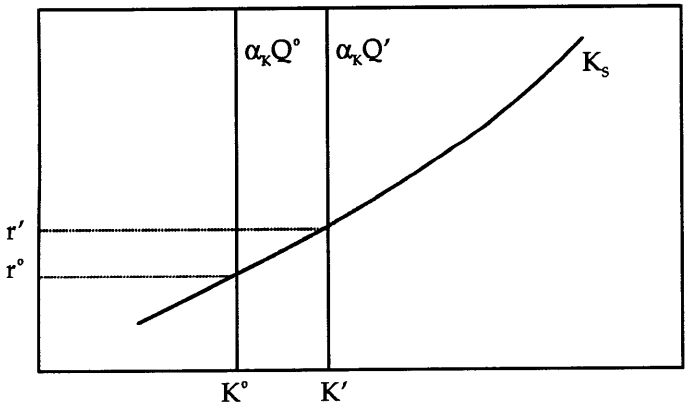
Figure 4, Supply Induced Growth



4a, Output



4b, Labor Market



4c, Real Estate Market

increase in production. Therefore, because production has increased, the price for real estate will increase, even though real wages have declined. Although at first glance this result is not intuitive, one has to remember that the net influx of people into the area is positive. Therefore, the demand for housing has risen and thus the price for housing must also rise.

When supply induced growth has occurred, one can expect the following to always happen:

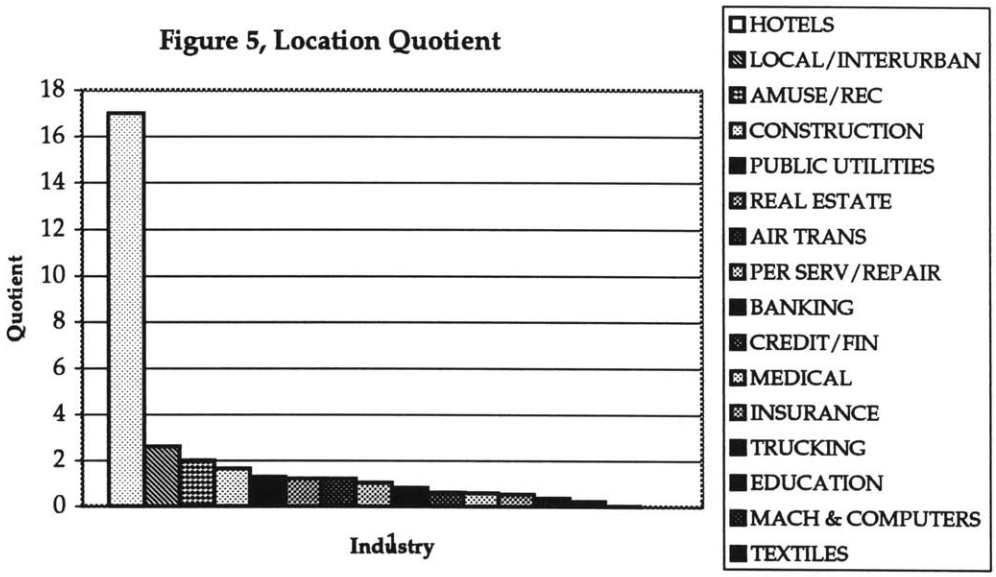
1. When growth is due to an abundance of labor, output prices and wages will fall. Because of this fall in output prices, demand will rise causing a rise in employment and a partial recovery of wages. However, this recovery will not exceed the original equilibrium level.
2. Because real estate is dependent only upon demand, and as a factor of production, real real estate prices will increase even though real wage rates have fallen.
3. The elasticity of the region's products will have a very large effect on the wage and real estate sectors of the area. If the demand for exports is very elastic, the advantage gained by the lower labor costs will cause a large increase in production and therefore the number of new jobs needed. This increase in jobs will allow the real wage rate to rise to the point that it almost reaches the original equilibrium point. At the same time if the real estate market is also elastic the rise in housing cost will rise very little, while the production of housing will increase greatly. On the other hand if the output

market is inelastic, very few new jobs will be created. If this is the case then real wages will plummet because there will be a large supply and very little demand. In this situation because real estate prices will remain constant or even increase a little, the over supply of labor will be temporary as people who can't find a job or decent housing will be forced to move to other areas.

3.2. Observed Data on Las Vegas's Three Economic Sectors

3.2.1. The Output Sector

Figure 5, Location Quotient



The export market for Las Vegas is tourism. In 1996 visitor revenue for the area was over 21 billion dollars, dwarfing the rest of Clark County's output combined. Figure 5 is a graph of the location quotient[10] for the Las Vegas area. This figure dramatically shows that gaming and tourism is by far the largest

[10] A location quotient is the ratio of the amount of worker in a particular industry in a particular area to the amount of workers in a particular industry to the nation as a whole.

employer of the area. Therefore, visitor revenue will be used as the indicator for export sales, and visitor volume will be used as number of orders. This paper is assuming that visitor volume can be used in substitution for sales orders. When a visitor comes into an area they will consume approximately the same amount of services regardless of the amount of gambling the person does. Therefore, like an order for a sale, a relatively a fixed amount of resources are expended per unit sold. In the case for Las Vegas, these resources are lodging, meals, and capital expenditures to create a "draw" to each particular resort[11] Using these two indicators, a determination can be made as to the cost of a unit sold. In other words, when a visitor comes to Las Vegas, this is considered analogous to the sale of an durable export good from a manufacturing based economy. Next, the amount that each visitor spends while in Las Vegas is considered analogous to the price of one order. Therefore, using these indicators it can be determined whether the real cost of a stay in Las Vegas is rising, falling, or holding steady.

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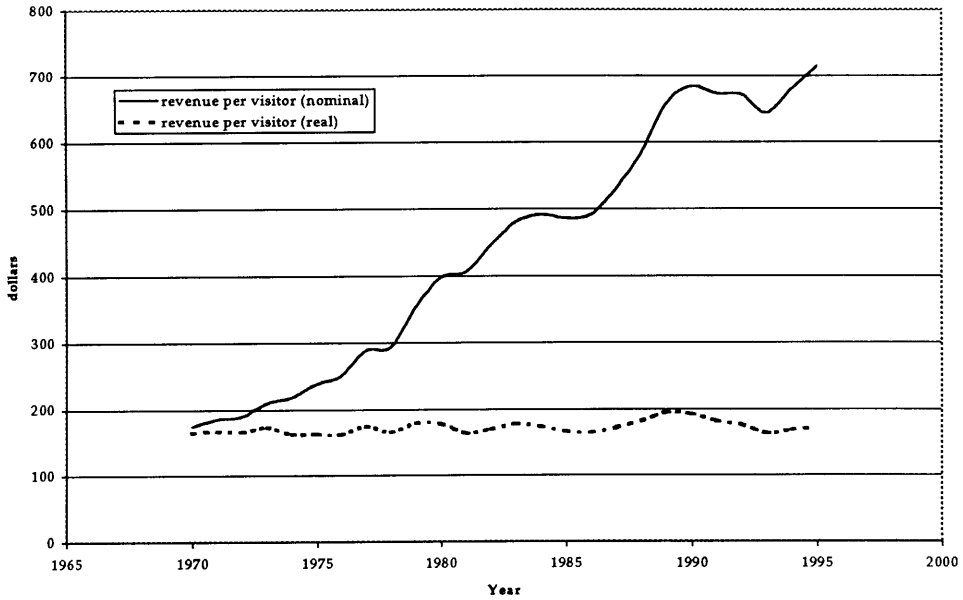
[11] An example of this capital expenditure is the millions of dollars that the Mirage invested to create a "Pirates of the Caribbean" atmosphere for their Treasure Island resort.

3.2.1.1. Visitor volume

Figure 6 is a graph of the visitor volume in the Las Vegas area over the last

Figure 6, Revenue Per Visitor



26 years. As one can see the volume of visitors, or orders has more than quadrupled during this time. This growth represents a annual increase of 5.4%. Therefore, as expected in a growing economy, the number of orders has risen.

3.2.1.2. Visitor revenue

Figure 7, Visitor Revenue

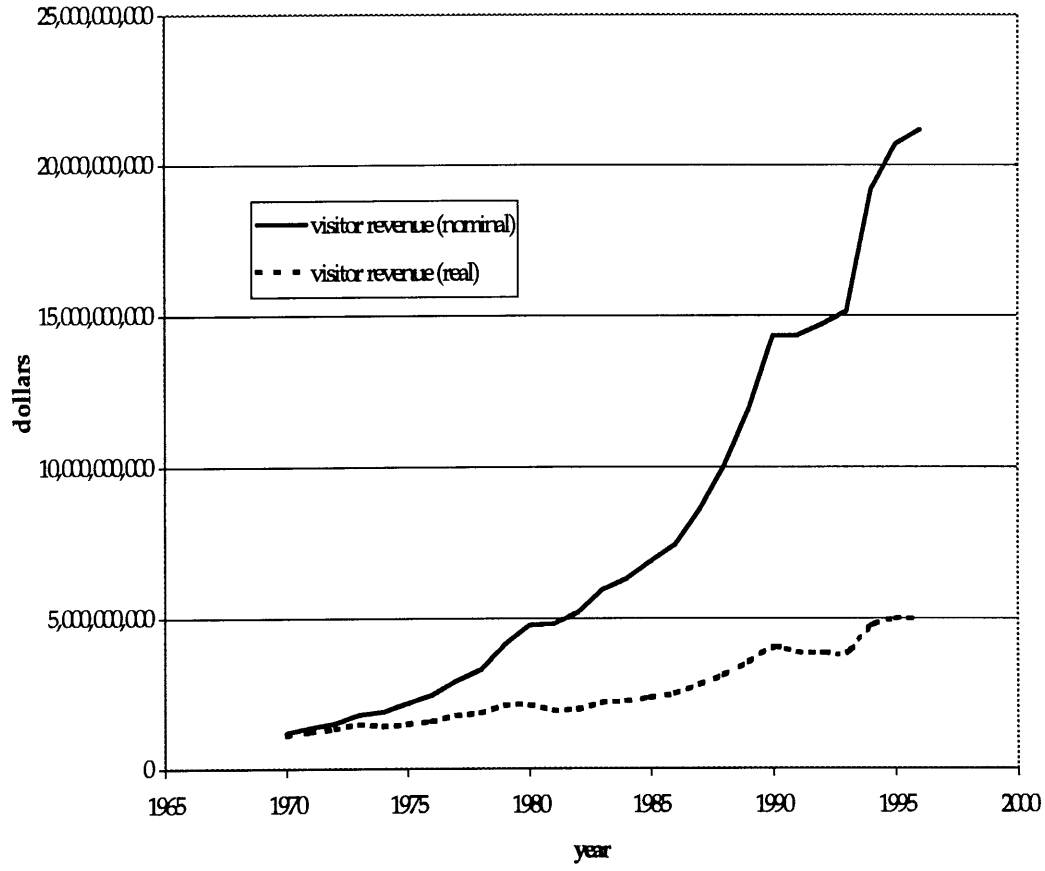
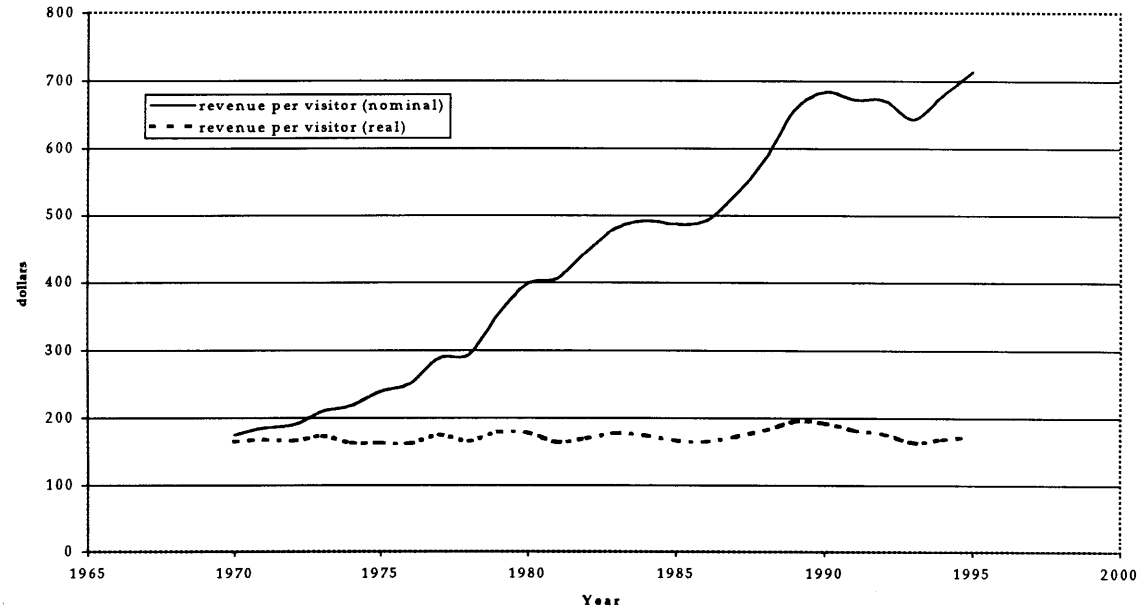


Figure 7 shows that visitor revenue has increased from $1,182,543,972 in 1970, to $21,184,586,588 in 1996. In real terms, this increase is from $1,116,451,661 in 1970, to $4,950,133,236 in 1996. The real growth in visitor revenue represents a 5.67% annual increase in revenue.

3.2.1.3. Revenue Per Visitor

Figure 8 shows that the real revenue per visitor has been essentially flat since 1970. This result is perplexing. In the mid eighties Las Vegas changed its emphasis from the true gambler (the high roller that comes to town just to gamble) to the casual gambler (the vacationer who comes with their family). Because of this change, the expectation would be that the real per visitor revenue would decrease, but the total revenue would increase because of higher total

Figure 8, Revenue Per Visitor



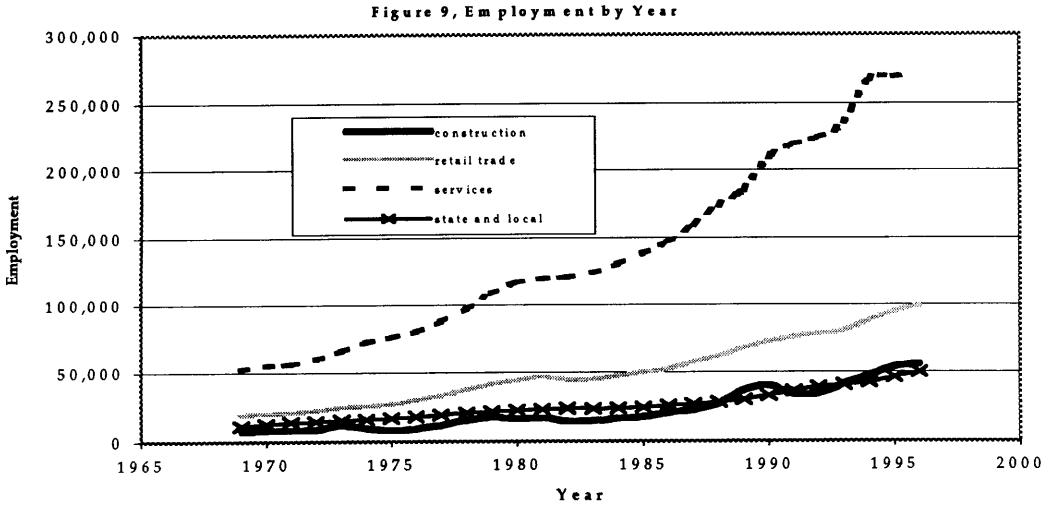
volumes. An interesting research topic would be to determine how the resorts have maintained their revenue per visitor, while catering to a lighter gambling clientele. Some thoughts on the subject, while not supportable at this time, are: With the expansion of video gambling, both spouses have become equal participants in gambling, while fifteen years ago only the husband gambled, while the wife either watched, or played a much smaller amount on slot

machines. Another idea is that fifteen years ago the casino was the only area that was expected to make money while the other portions of the resort were considered "lost leaders" used to keep the gambler happy and coming back. Today, it is assumed that each portion of the resort is a profit center that is required to maintain profitability as if it were a separate entity. Therefore, while the resorts of today don't make the same income per visitor in the casino, they make it up at the restaurants, theme parks, and arcades.

3.2.2. The Employment Sector

3.2.2.1. Employment by Sector

This thesis tracks the four largest sectors of employment in the Las Vegas area, construction, retail trade, state & local government, and services. These four sectors account for approximately 80% of the total employment in the area.



The services sector contains the hotel and related employees for the tourism industry. In addition because much of the retail trade occurs in tourist areas, this

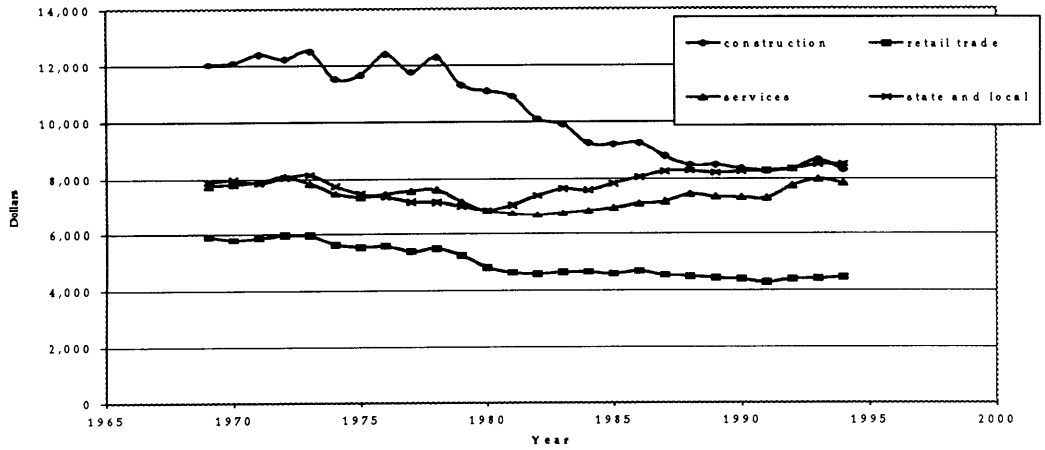
sector also contains a high percentage of employment catering to the tourism industry. Based on these four employment sectors the determination of the type of employment growth will be based.

Figure 9 shows the employment growth of the above mentioned sectors. As one can see the growth in these sectors has ranged from 3.8 fold for state and local government, to 6.4 fold for construction. Total employment for services has grown the most with 215,207 jobs from 1969 to 1994.

3.2.2.2. Income Per Worker

Figure 10 shows, the income of the four major employment sectors for the Las Vegas area. As one can see, the real income for construction and retail trade has markedly diminished, while the income for services has remained relatively

Figure 10, Income Per Worker



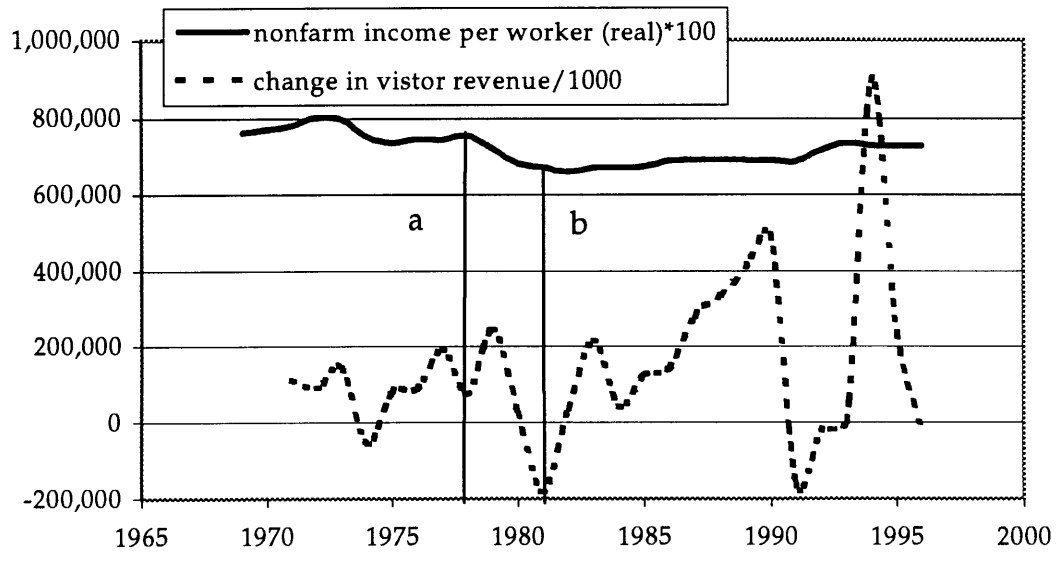
flat. Only the income for state and local government has seen a slight rise through the past 26 years. The fall in construction wages is a very important point. Because labor is such a large portion of the cost of a home, when this factor drops over 32% in a ten year span, a market response is inevitable. In

section 4, this thesis will put together a set of equations that will try to predict the cost and production of housing in the area. While formulating these equations a factor measuring the affect of labor costs will be a large portion of that process.

3.3. *Comparison of the Las Vegas Economic growth to Theoretical Growth Models.*

The data collected for the three sectors of Las Vegas can be summarized as follows:

Fig. 15 Income per worker Vs Change in Visitor Revenue



- Housing stock has grown over four fold in the last twenty five years, yet the real price of constant quality housing has remained flat. In addition, for much the timeline, the real price of homes has actually fallen even while construction has increased(see chapter 4, Analysis of the Las Vegas Housing Market).
- Employment has grown over four fold in the last twenty five years. However, the real wages for employees have dropped over this same time frame.
- Export production has increased over four fold, in real terms, in the last twenty five years. However, the real cost of a unit of production has remained flat.

The three sectors of the economy all point toward supply driven growth. However, one of the sectors is perplexing. For both the supply and demand driven models the real cost of housing should always rise. Yet the data for Las Vegas shows that the real cost of homes during much of the growth time has actually decreased. This seems strange, why would a builder actually continue to start new projects when the real selling price is actually decreasing (this topic will be discussed further in chapter four). However, because housing is a direct factor of production, and increased production is the first link in a demand driven economy, the above phenomenon is more likely related to supply driven growth than demand.

While indicators listed above point to a supply driven economy, there are a couple more tests that should be done. These tests will investigate the timing of visitor revenue, increase in population, and real wages. As shown in figure 3, a competitive advantage causes a shift in the product supply curve. This shift causes a real growth in wages that draws people to the area. Therefore, in a demand driven economy, if one were to graph real wages against visitor revenue, one would expect to see visitor revenue move on an upward trend, followed by real wages. Finally after real wages have risen to a point as to draw people into the area, population should begin to grow, and with this growth one should see the slope of the real wages trace begin to decrease.

In figure 15 visitor revenue versus real income is plotted. When you look at the relation of real wages vs. visitor revenue the demand wage scenario discussed above is not present. However, if you look at income vs. wages in 1978 and again in 1981 (lines "a" and "b") and follow wages vs. visitor revenue you see that revenue is increasing while real wages are decreasing. This is indicative of a supply driven economy. Furthermore as discussed in section 3.1.1.(Supply Driven Economy), an increase in output production should be proceeded by a drop in production wages. If we look at the right of lines "a" and "b" in figure 15 we see a slight drop in real wages proceeding an increase output production.

In a supply driven economy, an influx in population cause the real wages in the area to decrease. Therefore if one where to plot the real wages vs.

population, the graph should show an increase in population preceding a reduction in real wages. Figure 16 is the graph of population vs. real income for Las Vegas. As one can see, each spike in the change in population is followed by a decrease in real income.

Finally if we plot the change in population, revenue, and wages in percentage terms (Figure 17) we can plot the data with a common ordinate. If we follow the revenue curve of figure 17, we see that revenues climb in 1976, 78, and 86 while at the same time real wages are flattening. In addition, during these time spans the rate of newcomers is increasing. Therefore, during these time spans revenues are increasing, wage growth is decreasing, and the population is increasing.

Based upon figures 15 through 17, we see that in both timing and final position, the economic sectors of Las Vegas are performing as expected for a supply driven economy.

Fig. 16, Population Vs Income Per Worker

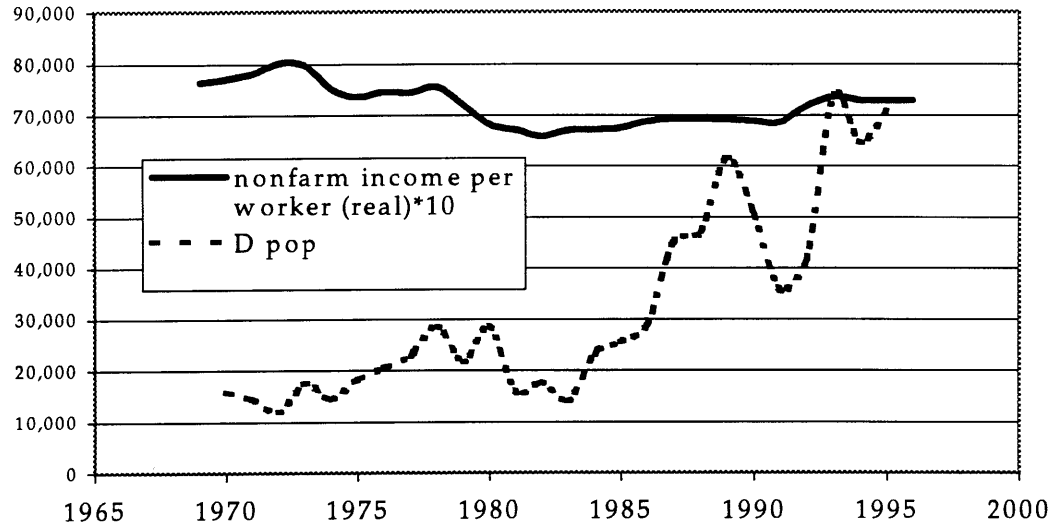
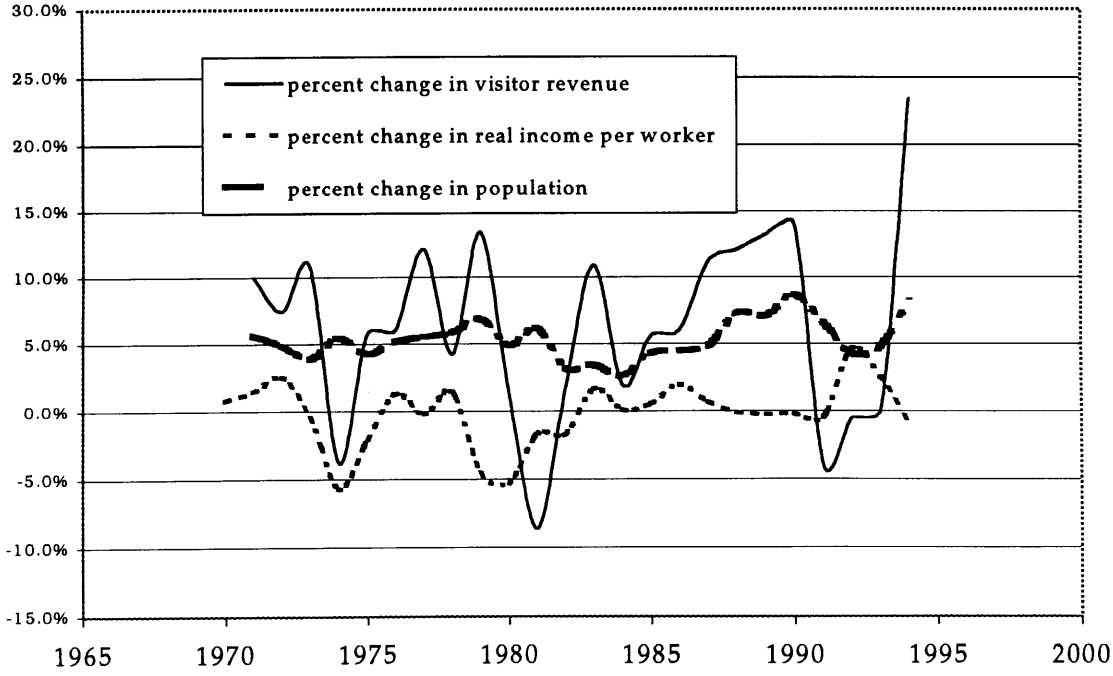


Fig. 17 Indicators by percent change

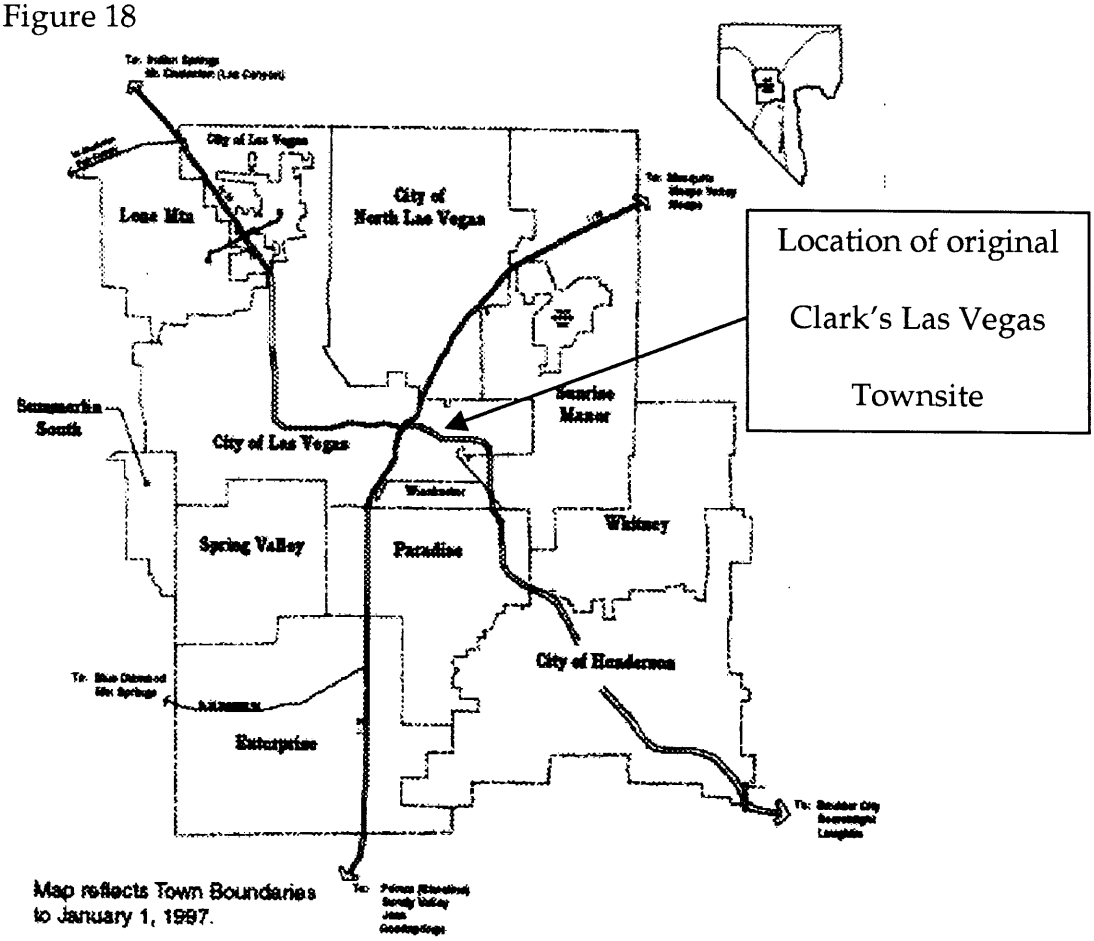


4. ANALYSIS OF THE LAS VEGAS HOUSING MARKET

4.1. History of Las Vegas Housing Development

4.1.1. Cities

Figure 18



4.1.1.2. Las Vegas

If one were to think of the Las Vegas Valley as a wheel, the city of Las Vegas would be the hub. Starting at the train station at the intersection of Main and Fremont streets, Las Vegas grew mono-centrally for the early part of its existence.

An illustration of this start location can be seen in the fact that almost all of the structures built in the Las Vegas Valley before 1940 are located within two miles of the original Clark's development(fig. 2). Because the age of the city of Las Vegas, almost all of the residential development has been completed many years ago. Except for a few bastions of gentrified areas, the clubs along Fremont Street, and new development in the far northwest corner (see Lone Mountain below) the City of Las Vegas is long past its prime, and ready for the next phase of redevelopment.

4.1.1.3. North Las Vegas

Formed as a product of racial segregation, North Las Vegas is a community that has struggled with a reputation of being the "other city". In recent years however, with the large influx of people, the northern portions of the city has seen numerous large-scale developments of middle income housing.

4.1.1.4. Henderson

The city of Henderson was started as an industrial town during the Second World War. Basic Magnesium started the development of Henderson by placing their wartime refining operations on the extreme southeast portion of the Las Vegas valley. Eventually the development around the Basic plant became the City of Henderson. Not long after Basic Magnesium, came Stauffer Chemicals. Stauffer placed production facility along side the Basic plant. These facilities became a very large complex just off of US 95, and almost in the middle of town.

On the map (fig. 18) the "o" in "of" in the "City of Henderson" marks the approximate location of the plant. Because a portion of Stauffer 's manufacturing required working with sulfur, the plant gave off a noxious odor that held the real estate values in the area at rock bottom. During the early years of Henderson, the City was populated by mostly working class mill workers that were dependant upon the manufacturing of the nearby plants. However, in the mid seventies and early eighties as the plant began cleaning up its emissions, land values in the area began to rise. In addition, directly adjacent to the northwest border of Henderson is the unincorporated Township of Paradise. This potion of Paradise is one of the most affluent areas of the Las Vegas Valley. Eventually the jagged edge of the Paradise-Henderson border began to blur, and upscale development pushed southeast towards the center of Henderson. Today Henderson is an extremely fast growing community with new developments of up-scale tracts to multi-million dollar estates. However, these new upscale developments look toward a newly developed "downtown" that borders the Henderson Paradise town line as the anchor of their developments. This newly developed area is called Green Valley, and is one of the fastest growing areas in the Las Vegas Valley.

4.1.2. Unincorporated Areas

4.1.2.1. Enterprise

Still a somewhat rural area, Enterprise has been settled predominately by families who contract their own home. With four and five bedrooms these owner-built homes tend to be a larger than the average tract homes offered in other portions of the valley.

Because development of these homes has occurred on unit by unit basis, and has been peppered throughout a large portion of the Enterprise Township, there has been very little agglomeration of housing. Therefore, Even with the large population growth that Las Vegas has seen, the Enterprise area still appears relatively desolate with the homes spotting the landscape.

4.1.2.2. Lone Mountain

Like Enterprise Lone Mountain started as a bastion for the owner builder. However, in recent years large golf course, and retirement developments have chosen Lone Mountain for their setting. Currently, the southeast portion of Lone Mt. and the northwest portion of Las Vegas is one of the fastest growing parts of the Las Vegas Valley. The mix for these new developments range from apartments to upscale single family tracts. The target buyer for this area has been either the younger family or the retired empty nester. However, the explosive growth in this area has not come without its share of problems. The major artery for traffic flow for people that live in this area is US 95. Because this

road was built 20 years ago, when the population of the area was less than a quarter of what it is now, the capacity has not kept up with demand. Currently, the rush hour commutes along the western section of US 95 are horrendous.

4.1.2.3. Paradise

Portions of the Township of Paradise have seen development for almost as long as the original Las Vegas settlement. Because of its age, this area has a diverse mix of commercial and residential that runs the gamut of the social and economic scale. Currently, Paradise is seeing a mix of new custom and tract developments, with the tract developments tending to occur in the southwest portion of the area, and the custom developments occurring in the southeast.

With artesian wells in the early years, and private gated communities that house entertainers the social elite, The southern-central section of Paradise has long been a favorite area of Las Vegas. The upscale building that has occurred in this area started very close to the Henderson border, and because of the flight path of McCarren Airport has moved in a southeast direction. Currently, this type of development has moved well into city limits of Henderson.

The northern portion of Paradise is an older section that grew as a part of the mono-centric edge of the original Las Vegas. As part of this edge, the homes in this area tend to be middle income tract style. The typical home for the Northern portion of Paradise is a three bedroom two bath ranch style on a 60 x 100 building lot.

The far southern portion of Paradise is the youngest portion of the township, and currently represents the edge development for the Las Vegas Valley. Homes being built in this area are mostly of the middle income tract style. However, this area is seeing more of the larger move-up tracts in the areas closer to the southern-central portion of the Township.

The western portion of Paradise is home to probably one of the most famous "strips" of land in the world. Las Vegas Boulevard, "the Strip", runs just to the east and parallel to I-15, with its largest and most famous resorts cited in the Paradise township.

4.1.2.4. Spring Valley

Until the mid seventies the west side of the Las Vegas Valley was home to nothing but tumble weeds and jack rabbits. Then Par-Dee Homes, a division of Wearhouser, built a massive community, located miles from the nearest vestiges of civilization. That community was named Spring Valley. Today the Greater Las Vegas metropolitan area has grown around, and past the Spring Valley development. Since the first community, the Spring Valley township has seen its growth in predominately planned middle income tract developments. The homes in these developments have ranged from two and three bedroom starter units, to four and five bedroom move-up homes. One notable exception to the moderately priced developments in the Spring Valley area is the Spanish Trails development. Developed around two golf courses the homes in this

development are some of the most expensive in the Las Vegas Valley. Because of this development, the southern portion of the Spring Valley Township is now seeing more upscale developments that are similar to that seen in the southeast section of Paradise.

4.1.2.5. Sunrise Manor

Dependent upon the economy of nearby Nellis Air Force Base, Sunrise Manor is populated by mostly small three bedroom homes and two bedroom condominiums.. With the exception of small enclaves of high quality homes at the very eastern edge of the township, most of the development in this area has been targeted as moderately priced starter homes.

4.1.2.6. Whitney

Whitney has become the edge development for the quickly growing Henderson area. Separated from Paradise and Sunrise Manor by a large mesa Whitney has been isolated from the development of the late eighties. However, as Henderson has expanded, Whitney's southern border has become the developable edge of the Henderson metropolitan area. Currently, the developments in Whitney are luxury apartment complexes, and large tracts of up-scale starter homes.

4.1.2.7. Winchester

Developed as the edge of the original Las Vegas core, Winchester has seen most of its development occur during the 60's and early 70's. While there is still some

in-fill development occurring, the emphasis for large projects has long since moved to the Sunrise Manor, Whitney, Henderson, and Paradise regions.

4.1.2.8. Summerlin

The entire Summerlin is the brainchild and until recently the property of one company, The Howard Hughes Company. With holdings measured in the square miles The Howard Hughes Company was the largest private owner of land in the state. The area shown as Summerlin South was one of those holdings. Devised as a retirement/empty nester community, the entire shown on the map as Summerlin South is one single project.

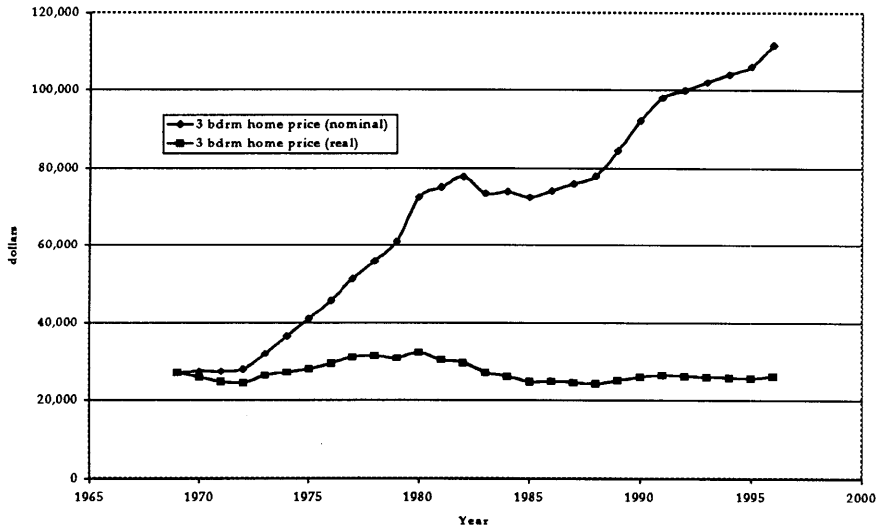
4.2. History of Housing Prices

This thesis will split the housing sector into two segments. Single family homes, and rental units. The reason that both markets are followed, is that in some regions, home and rental values do not track parallel courses. An example of this divergence occurred in San Francisco. Even though there was no vacancy control on rental property, during the feeding frenzy of the mid 80's, home prices appreciated as much as 40% during a single year, and as much, or more, than 100% over several years. However, at this same time, rental rates in the same areas remained relatively constant through both the boom of the eighties, and the crash of the early nineties.

4.2.1. Single Family Home Prices

Figure 11 shows the nominal and real prices of homes in the Las Vegas area for the past 28 years. These home values represent a three bedroom two bath home in a typical middle class neighborhood. These values are meant to "freeze" the type of buyer, such that the same type of individual that would buy the $27,000 home in 1969 would also be the of buyer of the $111,500 in 1996.

Figure 11, Single Family Home Prices



As the figure shows, the real price of a home in Las Vegas has remained relatively flat for the past 28 years, and has even dropped slightly since the eighties.

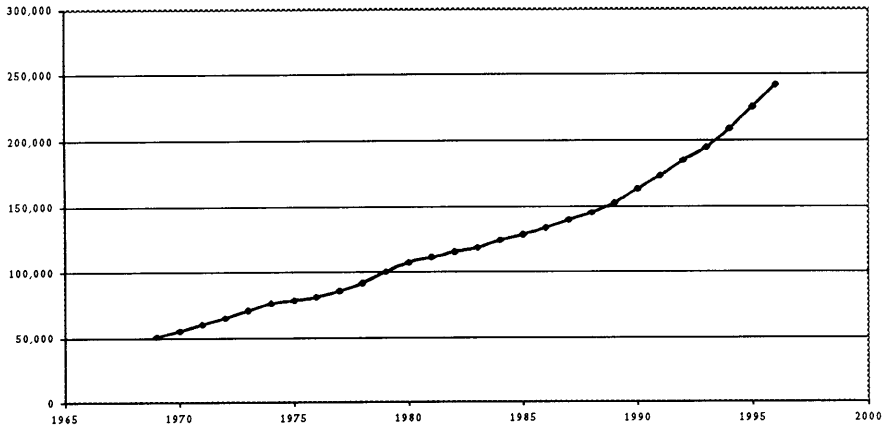
4.2.2. Timeline of Housing Stock

Figure 12 shows the timeline of single family housing in the Las Vegas valley. The figure shows that the stock of homes has increased five fold since 1969.

4.2.3. Timeline of Apartment Rental Rates

Figure 13 shows that the real rental for a two bedroom one bath apartment over

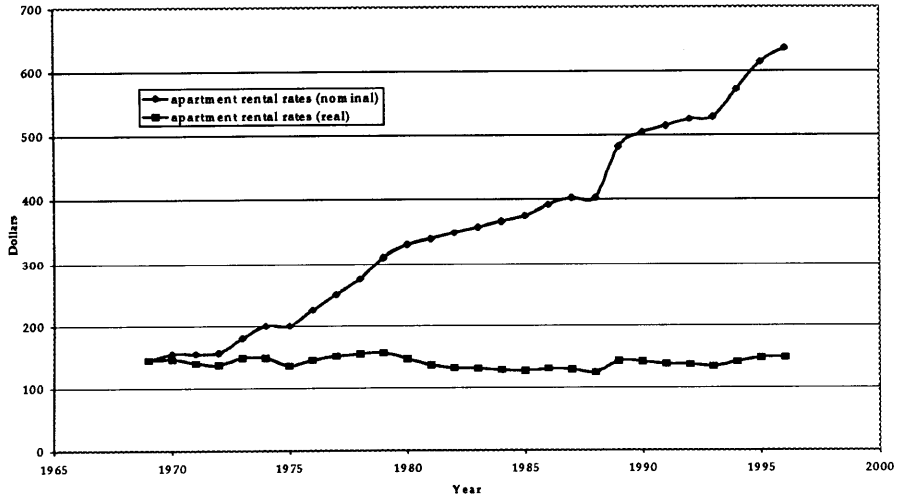
Figure 12, single family housing stock



the last 28 years has remained relatively flat.

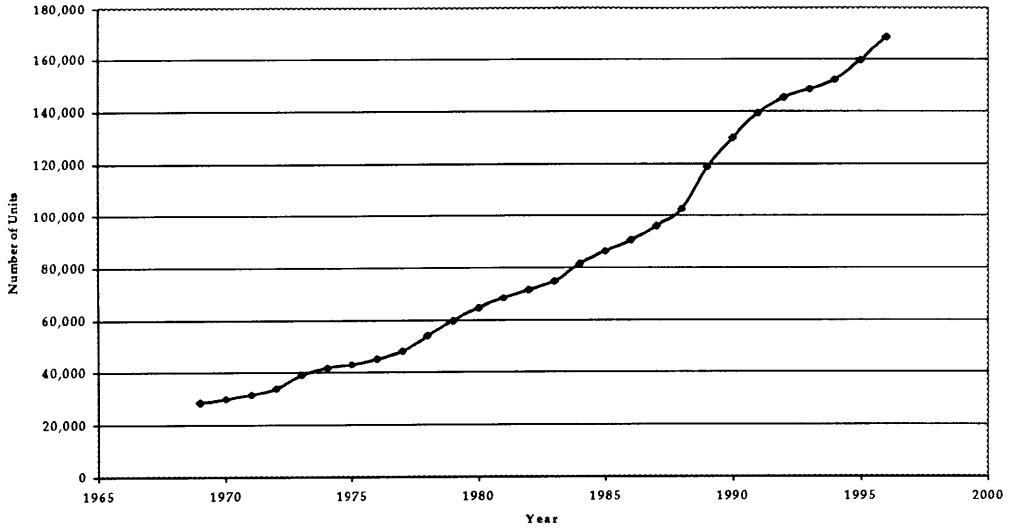
4.2.4. Timeline of Apartment Stock

Figure 13, Apartment Rental Rates



As figure 14 shows, the number of apartment units in Las Vegas has increased almost six fold since 1970.

Figure 14 multi family housing stock



4.3. Looking to the Future

4.3.1. Stock Flow Equations

To forecast the future the first step is to look at the past. However, if we use the past as the only indicator the best we can hope for is a rough trend line that will perpetuate the inertia of the current market. On the other hand, if we dig a little deeper, and discern the fundamental economic factors that underlie these past and current trends, we can build a model that will summarize and formulate the fundamental economic indicators into a reasonable prediction of the market we wish to forecast. In addition, with a model that predicts the market's response to basic underlying trends, we can learn the market's sensitivity to the varying economics of the area.

The following sections will attempt to assemble a model that will predict the single family housing market for the Las Vegas area. It is hoped that this model will use basic economic indicators like mortgage interest rates, employment rates, and population statistics to predict the amount of construction and the expected selling price for a three bedroom two bath tract style home.

Based on equating supply and demand, the model will track the parameters that contribute to each. Using regression analysis the model will scale and summarize basic economic indicators into two equations, one describing supply, and the other describing demand. Once suitable equations are found, a prediction for the following year can be made by substituting current housing data and economic indicators for that year. Then, based on the outcome of the equations, the next year's parameters will be a mix of the equation results, and the predicted indicators. Because each year's parameters are based upon the previous year's results, factors that could cause a change in the direction of a trend are considered. Therefore, the results of this type of model are not constrained to follow the trends set by the historical data, but rather, the results will depend on how the market has reacted to the different parameters, with different combinations and permutations of these parameters creating different results.

4.3.1.1. Demand Fit Equations

The demand for single family housing is first and foremost proportional to the number of households in the area. With the number of households as the prime variable, there is a proportionality factor that equates the number of households to the number of houses available.

$$\text{Demand} = \alpha * \text{households}$$

This proportionality factor α is a combination of housing and economic indicators that the following analysis will determine.

If single family homes were free, every household would demand one and the α term would be unity. Obviously homes are not free and therefore an important factor for α is the price of a home (price will be signified by "P"). If this equation was being formed for San Francisco, where homes are very expensive, the price factor would significantly reduce the demand for housing. In Las Vegas, this factor will probably be much less important. The next factor of the α term is closely related to price. Personal income like price determines those that are capable of buying a home (this factor will be signified by "Y"). Finally there is a third factor that effects the α term. This factor is the cost of borrowing money. Obviously, when money is cheap the effective price of the home is reduced and demand rises. In addition, the escalation rate of for housing is included in this term. When the escalation rate is high, the increased equity in the property offsets the cost of the loan. The cost of money for this thesis will be termed the user's cost of capital and defined as "U". The equation for U is as follows:

U=(1-.28)*(mort. rate) – ((house value time "t")/(house value time "t-2")-1)/2*100

The (1-.28) takes into account the fact that mortgage interest is deductible.

Putting these terms together, the α term becomes:

$$\alpha=(P-\alpha_0-\alpha_1 Y-\alpha_2 U)/\alpha_4$$

with the α_n terms to be determined by the regression analysis.

In addition to the α term multiplied by the number of households, the fit for the demand of Las Vegas housing is improved by adding a second term that makes demand proportional not only households, but also the population of the area. This term can best be described as a correction factor. Because the data for households was incomplete, employment was used as a substitute[1]. While the two are proportional, using employment as the indicator for households in a supply driven economy neglects the newcomers that are part of the housing demand, but are not yet employed. This second term takes these newcomers into account.

The complete demand equation for the Las Vegas valley is:

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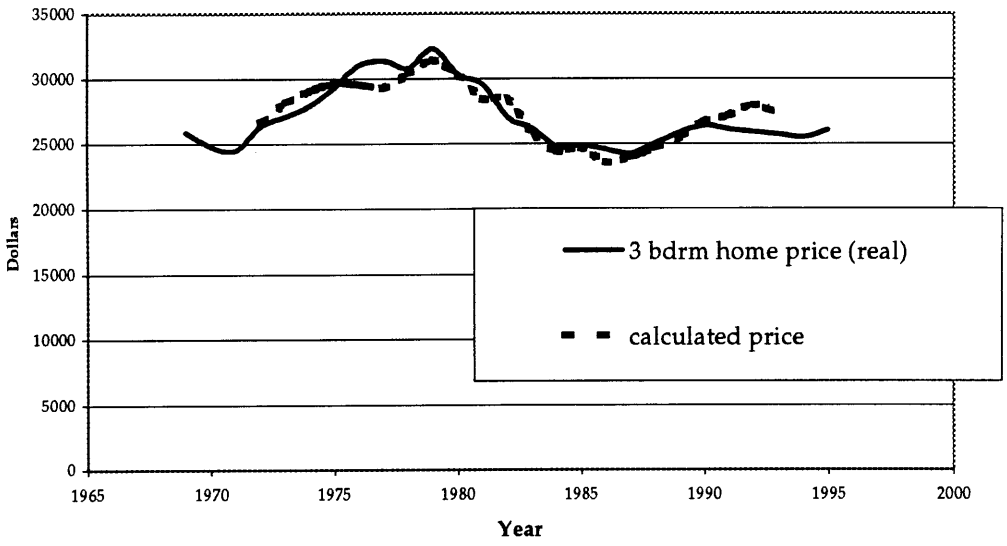
[1] Using employment to replace households is equivalent to assuming one job per household. While this is obviously incorrect, jobs and households are proportional, with a linear correction factor equating the two. Because this factor is linear, it will become part of the coefficients determined by the regression analysis.

Figure 17, Housing Demand, Empirical Vs Calculated Home Prices



$$Demand=(P-\alpha_0-\alpha_1 Y_{t-2}-\alpha_2 U_{t-2})(employment)/\alpha_4+\alpha_3(population)/\alpha_4$$ [2]

The "t-2" subscripts denote that there is a two year lag between the values and the effects of income and user cost of capital. Because we are making the assumption that supply equals demand we can set the demand equal to the stock of homes in the valley and solve for the coefficients.

Following some algebra to make the equation linear, a regression was run to determine the coefficients. The coefficients determined by the regression are:

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[2] The actual regression equation is $P=\alpha_0+\alpha_1 U_{\infty}+\alpha_2 Y+\alpha_3(pop/emp)+\alpha_4(stock/emp)$, the timing subscripts have been omitted for brevity.

α_0=15,815 (3.29 t-stat.) α_1=.745 (1.36)

α_2=-395 (-6.09) α_3=-.17,095 (-2.92)

α_4=94,950(3.82) R^2=.83

results of this analysis compared to observed data are graphed in figure 20. From the alpha coefficients, the price sensitivity for different economic indicators can be observed. For example α_1 signifies the sensitivity of housing price to personal income. With a value of 0.745 α_1 signifies that for every dollar increase in personal income the price of a home would increase 75 cents. Below is a table of the alpha coefficients, and the elasticity's that they represent.

α_0	15,815	Represents the value of homes if there were no economy at all. Its just the starting point to which economic indicators add to of subtract from
α_1	.7475	Represents the elasticity of personal income For every dollar change in income, home values change 75 cents
α_2	-395	Represents the user's cost of borrowing. For every point the U_{cc} goes up, the value of homes come down 395 dollars
α_3	-17,095	Created through the algebra of solving for price while making the demand equation linear, POP/EMP or POPEM is a combined indicator. The POPEM ratio is an indicator of persons per household. If population is

		rising but jobs are not, more people will have to live together. The more people that have to live together, the less number of households that form, and thus the less demand for housing. In this instance, for household growth of one person (POPEM increasing by a full point) the value of housing decreases 17,095 dollars

4.3.1.2. Supply Fit Equations

The supply of housing into a market is determined by the expectation that the builder can sell the product at a reasonable price. Therefore, much of what determines the demand for housing also determines the supply. For example, assuming, all else equal, if interest rates are lowered the demand for housing will increase. With this increase in demand, the builder will see a higher probability of selling more homes, and thus he will increase demand.

Deriving the supply equation for the Las Vegas area has been difficult. Normally, the supply function follows a set of indicators that track the real price of homes with in some manner. This is a reasonable assumption based on the fact that if home prices are rising, builders will build more home (and less if the price is falling). However, in Las Vegas a large portion of the construction occurred during a time when real home prices fell (this phenomenon was mentioned in section 3.3). Therefore, some method had to be devised in order to

ferret out a "profit" that would explain why builders continue to increase production. Because of the supply driven growth of the area, the wages for construction workers has plummeted (Figure 10). Because of these falling wages, and the increased efficiency of production the "profit" for new homes must lie with construction costs falling faster than sales prices. Because home construction is a combination of labor and materials, with the materials that go into home production mostly commodity items[3], the difference in construction costs that Las Vegas homebuilders are seeing is due to changes in labor costs and increased efficiency. Therefore, to account for these savings in the supply equation the first term will track labor costs (construction income per worker "C"). At this time there is no reliable method of tracking efficiency. The data that would have been useful is a timeline of the number of man-hours needed to build a home. However, it is hoped that the combination of the construction wage term and a price term will account for increased production when real prices are falling.

An example of the increased efficiency is evident in the building techniques employed in Las Vegas today. Currently, because production is so large, companies can afford to assemble specialty crews that are capable of greatly decreasing the production time. An example of these specialty crews is

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[3] The difference in price from one area to the next consisting mostly of transportation costs.

employed by a local plumbing company. This company has crews that specialize in only on a few styles of homes. However, because production is so large, they repeat the work over and over again. The foreman for one of these crews mentioned that he and his crew had done the same home so many times that they had the floor plans memorized. Because of this, they could make all there cuts and placements from memory. With the thinking already done, instead of finishing two to three homes a week, this crew was doing one and a half to two houses a day.

The next term in the equation is change in employment (Δemp). The Δemp term is used to track the general economy of the area. When the economy is strong and growing, the expectation is the number of new jobs created will be high, therefore Δemp will be high. On the other hand, if the economy is weakening the Δemp term will be small (slow growth) or negative (shrinking economy).

Finally the last term will be used to track the expectation of more people moving into the area. Because this term will track the rate of growth, the second difference of the population ($\Delta\Delta$pop)will be used. The best way to explain why the second difference was used is through an analogy. In physics, the position of an object with respect to time is defined as "position". The first difference of position is the change in position with respect to time, or velocity. And the second difference of position is the change in velocity with respect to time, or acceleration. If the population at any one time is considered analogous to position, then the second difference of population can be considered analogous

to the acceleration of the population. Therefore when the rate of population growth begins to slow, the second difference term will turn negative, and during steady growth, the ΔΔpop term will be zero.

Based on these factors, the equation for the supply of new product is as follows:

$$\text{Supply}=\alpha_0+\alpha_1(\text{construction wages}_{t-3})+\alpha_2(\Delta\text{emp}_{t-1})+\alpha_3(\text{home price}_t)+\alpha_4(\Delta\Delta\text{pop})$$

Because new supply is approximately equal to the number of permits issued in that year[4], permits was substituted for supply and a regression analysis performed. The regression analysis yielded the following results:

α_0=618.90 (.124)	α_1=-2176 (-4.84)
α_2=.135 (5.14)	α_3=.950 (3.86)
α_4=.144 (1.65)	R^2=.88

A graph comparing the collected data versus is shown in figure 20.

The coefficients in the above table give an indication of the elasticity's of starting new construction. Below is a table of the alpha coefficients and a brief discussion of their impact.

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[4] This model does not take into account the demolition of existing buildings. Because almost all development in the Las Vegas valley is done on bare land, the demolition term is assumed to be small. Had these equations been done in a land constrained like San Francisco demolition as a factor of supply would have been required.

α_0	618	The intercept, α_0 is the starting point from which the economic indicators either add or subtract permits
α_1	-2.175	As the coefficient to the construction income term, α_1 represents the number of permits subtracted from the intercept for every dollar increase in yearly construction income.
α_2	0.135	As the coefficient to Δ employment α_2 is an indicator of the general health of the area's economy. When Δemp is high many jobs are being added and the demand for housing is strong. The α_2 coefficient indicates that for every fifteen jobs added two permits are taken out.
α_3	.95	α_3 represents the price coefficient. For each dollar increase in home price, there is another permit issued.
α_4	.143	α_4 represents the acceleration of the population growth. When pop growth is slowing, the α_4 term will be negative, thus decreasing the number of permits issued.

4.3.2. Derivation of Stock Flow Table

With a set of equations that predict the amount of units that will be produced, and price that they will sell for, the next step is to create a table that calculates price, production, stock, etc. for the following year based on the values for the current and previous years. Below is the table based upon the derived equations. The forecast data needed is employment growth, personal income , construction income per worker, population, and mortgage interest rate. This data along with the observed data from current and previous years provides the values needed to progressively fill the bottom rows of the table. In the following section, the stock flow table will be used to make forecasts of the housing market.

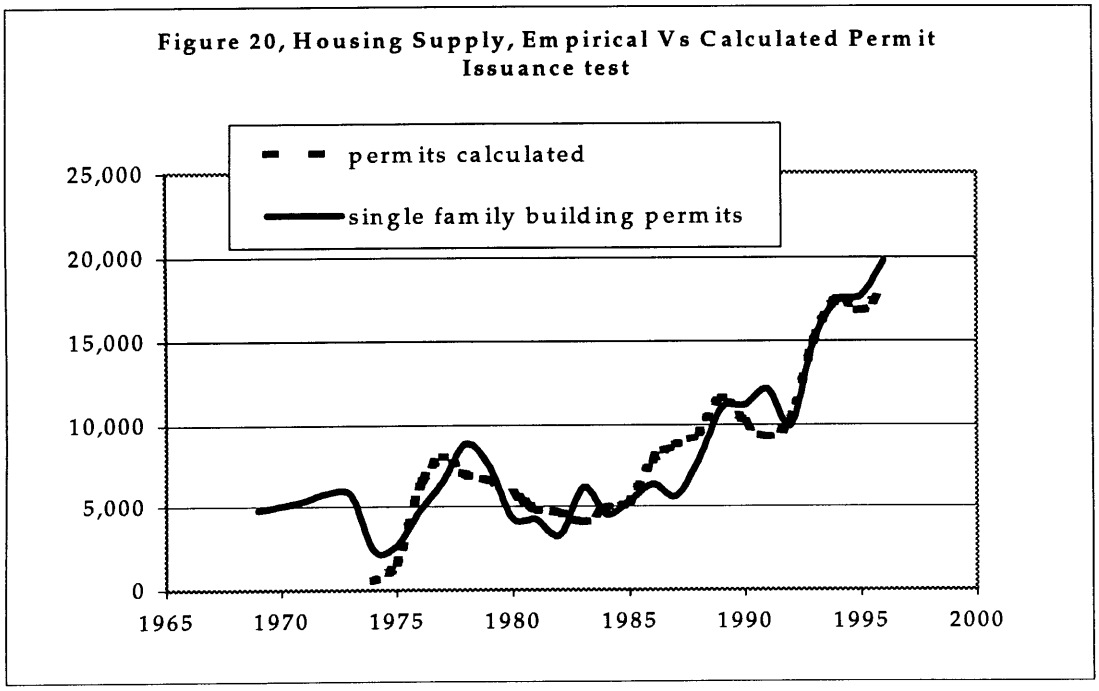
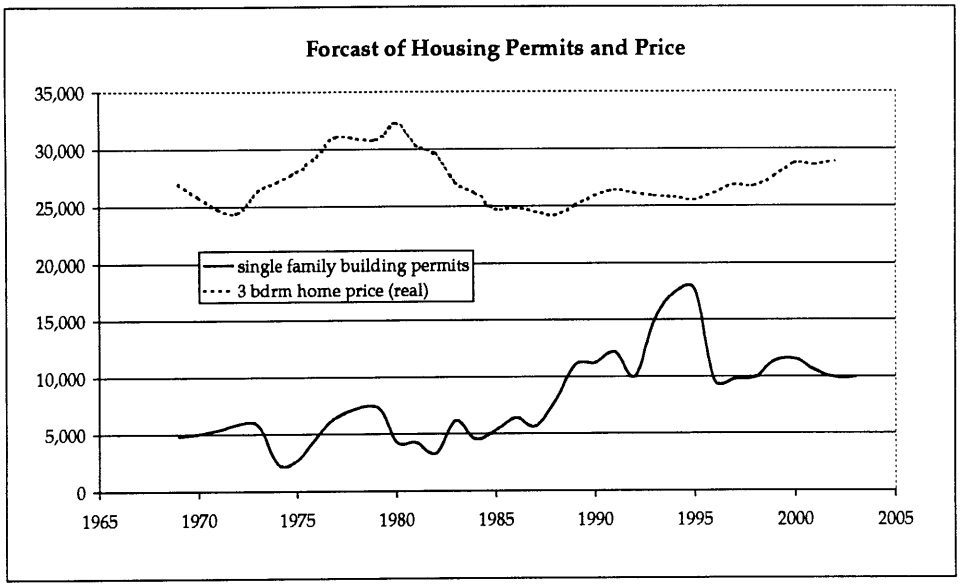


Figure 22a, Projection Using RFA's Economic Predictions

	projected growth						
	1997	1998	1999	2,000	2001	2002	2003
employment	3.8%	3.8%	3.8%	3.8%	3.8%	3.8%	3.8%
personal income (real)	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
construction income per worker (real)	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
population	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%
interest rate	7.8%	7.8%	7.8%	7.8%	7.8%	7.8%	7.8%

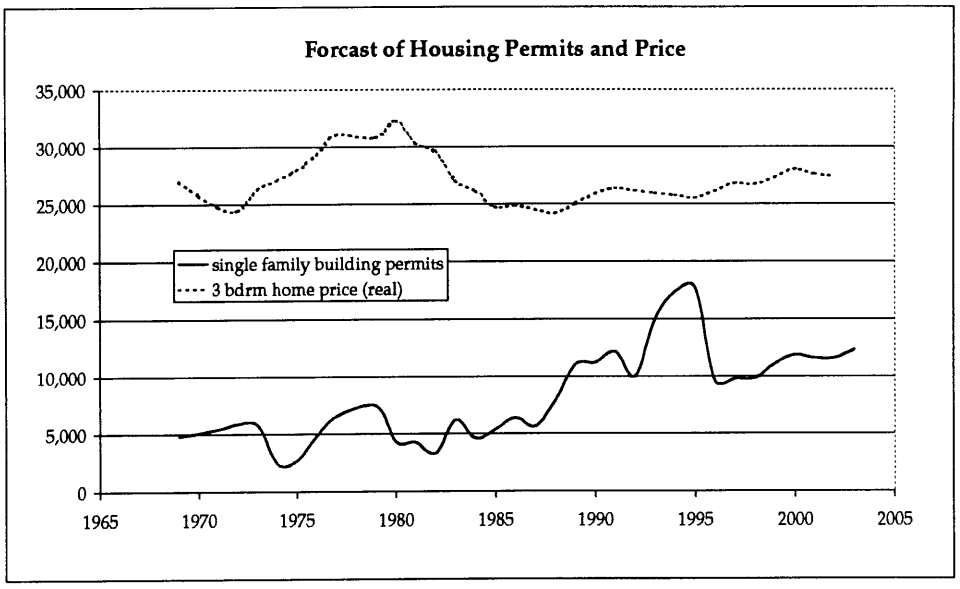


year	MRATE	employment	Δ employment	single family housing stock	single family building permits	single family housing stock over employment	user cost of capital	3 bdrm home price (real)	income per worker (real)	population	Δ population	ΔΔ population	average ΔΔ population	% change in population	POPEM	construction income income per worker (real)
1969	7.81	125,875	7,964	50,720	4,800			27,000	8,185							12,030
1970	8.45	133,839	4,732	55,272	5,049	0.448749	10.49	25,809	8,086	277,230				0.0%	2.07	12,099
1971	7.74	138,571	6,850	60,060	5,380	0.470244	9.75	24,745	8,404	293,000	15,770			5.4%	2.11	12,394
1972	7.60	145,421	14,551	65,162	5,849	0.486237	8.10	24,454	8,768	307,400	14,400	-1,370		4.7%	2.11	12,233
1973	7.96	159,972	8,473	70,709	5,740	0.476036	2.57	26,310	7,914	319,400	12,000	-2,400		3.8%	2.00	12,499
1974	8.92	168,445	5,326	76,152	2,372	0.465445	1.02	27,096	7,591	336,900	17,500	5,500	577	5.2%	2.00	11,516
1975	9.00	173,771	12,316	78,402	2,657	0.46568	3.40	27,931	7,984	351,300	14,400	-3,100	0	4.1%	2.02	11,653
1976	9.00	186,087	18,415	80,922	4,764	0.459137	2.34	29,341	8,179	369,500	18,200	3,800	2,067	4.9%	1.99	12,402
1977	9.02	204,502	23,666	85,440	6,504	0.447954	0.98	31,008	8,421	390,000	20,500	2,300	1,000	5.3%	1.91	11,757
1979	10.78	251,237	13,612	99,981	7,422	0.425972	8.13	30,778	7,190	441,400	28,500	5,600	3,433	6.5%	1.76	11,289
1980	12.66	264,849	9,293	107,020	4,272	0.419375	7.69	32,255	6,940	463,087	21,687	-6,813	396	4.7%	1.75	11,084
1981	14.70	274,142	-2,070	111,071	4,241	0.41983	11.38	30,290	6,541	491,620	28,533	6,846	1,878	5.8%	1.79	10,896
1982	15.14	272,072	5,087	115,093	3,269	0.434419	15.10	29,545	6,827	507,510	15,890	-12,643	-4,203	3.1%	1.87	10,089
1983	12.57	277,159	12,502	118,193	6,157	0.447512	14.41	27,045	7,011	525,050	17,540	1,650	-1,382	3.3%	1.89	9,903
1984	12.38	289,661	16,073	124,032	4,532	0.443035	14.71	26,118	7,120	539,030	13,980	-3,560	-4,851	2.6%	1.86	9,248
1985	11.55	305,734	17,940	128,330	5,333	0.436286	12.64	24,707	7,283	562,280	23,250	9,270	2,453	4.1%	1.84	9,200
1986	10.17	323,674	24,966	133,387	6,355	0.430724	9.80	24,825	7,461	587,760	25,480	2,230	2,647	4.3%	1.82	9,248
1987	9.31	348,640	30,845	139,414	5,630	0.415194	7.09	24,515	7,534	616,650	28,890	3,410	4,970	4.7%	1.77	8,799
1988	9.19	379,485	37,162	144,753	7,850	0.401064	7.93	24,173	7,582	661,690	45,040	16,150	7,263	6.8%	1.74	8,476
1989	10.13	416,647	39,753	152,198	11,024	0.390383	6.33	24,988	7,548	708,750	47,060	2,020	7,193	6.6%	1.70	8,472
1990	10.05	456,400	13,694	162,652	11,177	0.379605	3.79	25,840	7,066	770,280	61,530	14,470	10,880	8.0%	1.69	8,349
1991	9.32	470,094	13,151	173,252	12,120	0.392997	3.94	26,374	7,380	820,840	50,560	-10,970	1,840	6.2%	1.75	8,266
1992	8.24	483,245	27,030	184,745	9,986	0.401899	5.43	26,098	7,773	856,350	35,510	-15,050	-3,850	4.1%	1.77	8,342
1993	7.20	510,275	57,379	194,215	15,015	0.408515	6.11	25,883	8,110	898,020	41,670	6,160	-6,620	4.6%	1.76	8,669
1994	7.49	567,654	22,706	208,455	17,374	0.396247	6.12	25,719	8,125	971,680	73,660	31,990	7,700	7.6%	1.71	8,314
1995	7.87	590,360	23,614	224,931	17,674	0.381007	6.30	25,496	8,308	1,036,290	64,610	-9,050	9,700	6.2%	1.76	8,537
1996	7.95	613,975	23,331	241,692	9,548	0.393651	6.47	26,054	8,308	1,075,669	39,379	-25,231	-764	3.7%	1.75	8,878
1997	7.80	637,306	24,218	251,240	9,788	0.394222	4.96	26,796	8,723	1,118,696	43,027	3,648	-10,211	3.8%	1.76	9,322
1998	7.80	661,523	25,138	261,028	9,855	0.394587	3.07	26,704	9,160	1,163,444	44,748	1,721	-6,621	3.8%	1.76	9,789
1999	7.80	686,661	26,093	270,883	11,331	0.394493	4.37	27,543	9,618	1,209,981	46,538	1,790	2,386	3.8%	1.76	10,278
2000	7.80	712,754	27,085	282,214	11,512	0.395948	4.22	28,700	10,098	1,258,381	48,399	1,862	1,791	3.8%	1.77	10,792
2001	7.80	739,839	28,114	293,726	10,512	0.397013	1.88	28,557	10,603	1,308,716	50,335	1,936	1,862	3.8%	1.77	11,331
2002	7.80	767,953	29,182	304,238	9,858	0.396167	3.77	28,827	11,134	1,361,064	52,349	2,013	1,937	3.8%	1.77	11,898
2003	7.80	797,135	30,291	314,096	9,892	0.394031	5.39	29,871	11,690	1,415,507	54,443	2,094	2,014		1.78	12,493

Figure 22b, Projection Using RFA's Economic Predictions

But Holding Income Flat

	projected growth						
	1997	1998	1999	2,000	2001	2002	2003
employment	3.8%	3.8%	3.8%	3.8%	3.8%	3.8%	3.8%
personal income (real)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
construction income per worker (real)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
population	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%
interest rate	7.8%	7.8%	7.8%	7.8%	7.8%	7.8%	7.8%

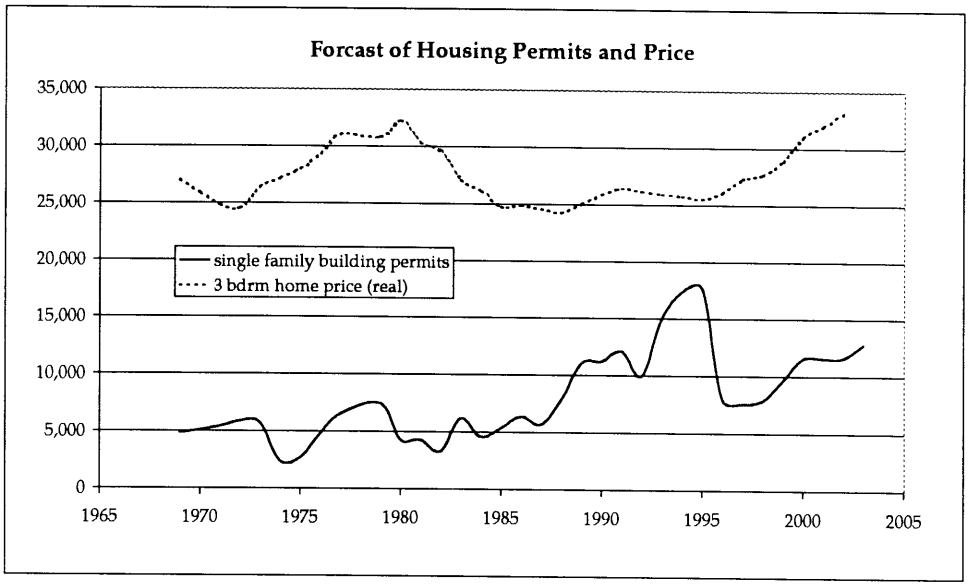


year	MRATE	employment	Δ employment	single family housing stock	single family building permits	single family housing stock over employment	user cost of capital	3 bdrm home price (real)	income per worker (real)	population	Δ population	ΔΔ population	average ΔΔ population	% change in population	POPEM	construction income income per worker (real)
1969	7.81	125,875	7,964	50,720	4,800			27,000	8,185							12,030
1970	8.45	133,839	4,732	55,272	5,049	0.448749	10.49	25,809	8,086	277,230				0.0%	2.07	12,099
1971	7.74	138,571	6,850	60,060	5,380	0.470244	9.75	24,745	8,404	293,000	15,770			5.4%	2.11	12,394
1972	7.60	145,421	14,551	65,162	5,849	0.486237	8.10	24,454	8,768	307,400	14,400	-1,370		4.7%	2.11	12,233
1973	7.96	159,972	8,473	70,709	5,740	0.476036	2.57	26,310	7,914	319,400	12,000	-2,400		3.8%	2.00	12,499
1974	8.92	168,445	5,326	76,152	2,372	0.465445	1.02	27,096	7,591	336,900	17,500	5,500	577	5.2%	2.00	11,516
1975	9.00	173,771	12,316	78,402	2,657	0.46568	3.40	27,931	7,984	351,300	14,400	-3,100	0	4.1%	2.02	11,653
1976	9.00	186,087	18,415	80,922	4,764	0.459137	2.34	29,341	8,179	369,500	18,200	3,800	2,067	4.9%	1.99	12,402
1977	9.02	204,502	23,666	85,440	6,504	0.447954	0.98	31,008	8,421	390,000	20,500	2,300	1,000	5.3%	1.91	11,757
1979	10.78	251,237	13,612	99,981	7,422	0.425972	8.13	30,778	7,190	441,400	28,500	5,600	3,433	6.5%	1.76	11,289
1980	12.66	264,849	9,293	107,020	4,272	0.419375	7.69	32,255	6,940	463,087	21,687	-6,813	396	4.7%	1.75	11,084
1981	14.70	274,142	-2,070	111,071	4,241	0.41983	11.38	30,290	6,541	491,620	28,533	6,846	1,878	5.8%	1.79	10,896
1982	15.14	272,072	5,087	115,093	3,269	0.434419	15.10	29,545	6,827	507,510	15,890	-12,643	-4,203	3.1%	1.87	10,089
1983	12.57	277,159	12,502	118,193	6,157	0.447512	14.41	27,045	7,011	525,050	17,540	1,650	-1,382	3.3%	1.89	9,903
1984	12.38	289,661	16,073	124,032	4,532	0.443035	14.71	26,118	7,120	539,030	13,980	-3,560	-4,851	2.6%	1.86	9,248
1985	11.55	305,734	17,940	128,330	5,333	0.436286	12.64	24,707	7,283	562,280	23,250	9,270	2,453	4.1%	1.84	9,200
1986	10.17	323,674	24,966	133,387	6,355	0.430724	9.80	24,825	7,461	587,760	25,480	2,230	2,647	4.3%	1.82	9,248
1987	9.31	348,640	30,845	139,414	5,630	0.415194	7.09	24,515	7,534	616,650	28,890	3,410	4,970	4.7%	1.77	8,799
1988	9.19	379,485	37,162	144,753	7,850	0.401064	7.93	24,173	7,582	661,690	45,040	16,150	7,263	6.8%	1.74	8,476
1989	10.13	416,647	39,753	152,198	11,024	0.390383	6.33	24,988	7,548	708,750	47,060	2,020	7,193	6.6%	1.70	8,472
1990	10.05	456,400	13,694	162,652	11,177	0.379605	3.79	25,840	7,066	770,280	61,530	14,470	10,880	8.0%	1.69	8,349
1991	9.32	470,094	13,151	173,252	12,120	0.392997	3.94	26,374	7,380	820,840	50,560	-10,970	1,840	6.2%	1.75	8,266
1992	8.24	483,245	27,030	184,745	9,986	0.401899	5.43	26,098	7,773	856,350	35,510	-15,050	-3,850	4.1%	1.77	8,342
1993	7.20	510,275	57,379	194,215	15,015	0.408515	6.11	25,883	8,110	898,020	41,670	6,160	-6,620	4.6%	1.76	8,669
1994	7.49	567,654	22,706	208,455	17,374	0.396247	6.12	25,719	8,125	971,680	73,660	31,990	7,700	7.6%	1.71	8,314
1995	7.87	590,360	23,614	224,931	17,674	0.381007	6.30	25,496	8,308	1,036,290	64,610	-9,050	9,700	6.2%	1.76	8,537
1996	7.95	613,975	23,331	241,692	9,548	0.393651	6.47	26,054	8,308	1,075,669	39,379	-25,231	-764	3.7%	1.75	8,878
1997	7.80	637,306	24,218	251,240	9,788	0.394222	4.96	26,796	8,308	1,118,696	43,027	3,648	-10,211	3.8%	1.76	8,878
1998	7.80	661,523	25,138	261,028	9,855	0.394587	3.07	26,704	8,308	1,163,444	44,748	1,721	-6,621	3.8%	1.76	8,878
1999	7.80	686,661	26,093	270,883	11,042	0.394493	4.37	27,239	8,308	1,209,981	46,538	1,790	2,386	3.8%	1.76	8,878
2000	7.80	712,754	27,085	281,926	11,851	0.395544	4.79	28,040	8,308	1,258,381	48,399	1,862	1,791	3.8%	1.77	8,878
2001	7.80	739,839	28,114	293,777	11,589	0.397082	3.12	27,608	8,308	1,308,716	50,335	1,936	1,862	3.8%	1.77	8,878
2002	7.80	767,953	29,182	305,366	11,579	0.397636	4.94	27,434	8,308	1,361,064	52,349	2,013	1,937	3.8%	1.77	8,878
2003	7.80	797,135	30,291	316,945	12,316	0.397605	6.70	28,041	8,308	1,415,507	54,443	2,094	2,014		1.78	8,878

Figure 22c, Projection Using RFA's Economic Predictions

Except Halving Pop. and Employment Growth

	projected growth						
	1997	1998	1999	2,000	2001	2002	2003
employment	1.9%	1.9%	1.9%	1.9%	1.9%	1.9%	1.9%
personal income (real)	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
construction income per worker (real)	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
population	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
interest rate	7.8%	7.8%	7.8%	7.8%	7.8%	7.8%	7.8%



year	MIRATE	employment	Δ employment	single family housing stock	single family building permits	single family housing stock over employm ent	user cost of capital	3 bdrm home price (real)	income per worker (real)	population	Δ population	ΔΔ population	average ΔΔ population	% change in population	POPEM	construction income income per worker (real)
1969	7.81	125,875	7,964	50,720	4,800			27,000	8,185							12,030
1970	8.45	133,839	4,732	55,272	5,049	0.448749	10.49	25,809	8,086	277,230				0.0%	2.07	12,099
1971	7.74	138,571	6,850	60,060	5,380	0.470244	9.75	24,745	8,404	293,000	15,770			5.4%	2.11	12,394
1972	7.60	145,421	14,551	65,162	5,849	0.486237	8.10	24,454	8,768	307,400	14,400	-1,370		4.7%	2.11	12,233
1973	7.96	159,972	8,473	70,709	5,740	0.476036	2.57	26,310	7,914	319,400	12,000	-2,400		3.8%	2.00	12,499
1974	8.92	168,445	5,326	76,152	2,372	0.465445	1.02	27,096	7,591	336,900	17,500	5,500	577	5.2%	2.00	11,516
1975	9.00	173,771	12,316	78,402	2,657	0.46568	3.40	27,931	7,984	351,300	14,400	-3,100	0	4.1%	2.02	11,653
1976	9.00	186,087	18,415	80,922	4,764	0.459137	2.34	29,341	8,179	369,500	18,200	3,800	2,067	4.9%	1.99	12,402
1977	9.02	204,502	23,666	85,440	6,504	0.447954	0.98	31,008	8,421	390,000	20,500	2,300	1,000	5.3%	1.91	11,757
1979	10.78	251,237	13,612	99,981	7,422	0.425972	8.13	30,778	7,190	441,400	28,500	5,600	3,433	6.5%	1.76	11,289
1980	12.66	264,849	9,293	107,020	4,272	0.419375	7.69	32,255	6,940	463,087	21,687	-6,813	396	4.7%	1.75	11,084
1981	14.70	274,142	-2,070	111,071	4,241	0.41983	11.38	30,290	6,541	491,620	28,533	6,846	1,878	5.8%	1.79	10,896
1982	15.14	272,072	5,087	115,093	3,269	0.434419	15.10	29,545	6,827	507,510	15,890	-12,643	-4,203	3.1%	1.87	10,089
1983	12.57	277,159	12,502	118,193	6,157	0.447512	14.41	27,045	7,011	525,050	17,540	1,650	-1,382	3.3%	1.89	9,903
1984	12.38	289,661	16,073	124,032	4,532	0.443035	14.71	26,118	7,120	539,030	13,980	-3,560	-4,851	2.6%	1.86	9,248
1985	11.55	305,734	17,940	128,330	5,333	0.436286	12.64	24,707	7,283	562,280	23,250	9,270	2,453	4.1%	1.84	9,200
1986	10.17	323,674	24,966	133,387	6,355	0.430724	9.80	24,825	7,461	587,760	25,480	2,230	2,647	4.3%	1.82	9,248
1987	9.31	348,640	30,845	139,414	5,630	0.415194	7.09	24,515	7,534	616,650	28,890	3,410	4,970	4.7%	1.77	8,799
1988	9.19	379,485	37,162	144,753	7,850	0.401064	7.93	24,173	7,582	661,690	45,040	16,150	7,263	6.8%	1.74	8,476
1989	10.13	416,647	39,753	152,198	11,024	0.390383	6.33	24,988	7,548	708,750	47,060	2,020	7,193	6.6%	1.70	8,472
1990	10.05	456,400	13,694	162,652	11,177	0.379605	3.79	25,840	7,066	770,280	61,530	14,470	10,880	8.0%	1.69	8,349
1991	9.32	470,094	13,151	173,252	12,120	0.392997	3.94	26,374	7,380	820,840	50,560	-10,970	1,840	6.2%	1.75	8,266
1992	8.24	483,245	27,030	184,745	9,986	0.401899	5.43	26,098	7,773	856,350	35,510	-15,050	-3,850	4.1%	1.77	8,342
1993	7.20	510,275	57,379	194,215	15,015	0.408515	6.11	25,883	8,110	898,020	41,670	6,160	-6,620	4.6%	1.76	8,669
1994	7.49	567,654	22,706	208,455	17,374	0.396247	6.12	25,719	8,125	971,680	73,660	31,990	7,700	7.6%	1.71	8,314
1995	7.87	590,360	23,614	224,931	17,674	0.381007	6.30	25,496	8,308	1,036,290	64,610	-9,050	9,700	6.2%	1.76	8,537
1996	7.95	613,975	11,666	241,692	7,977	0.393651	6.47	26,054	8,308	1,075,669	39,379	-25,231	-764	3.7%	1.75	8,878
1997	7.80	625,640	11,887	249,669	7,562	0.399061	4.96	27,284	8,723	1,097,182	21,513	-17,866	-17,382	2.0%	1.75	9,322
1998	7.80	637,527	12,113	257,231	7,866	0.403482	2.11	27,606	9,160	1,119,126	21,944	430	-14,222	2.0%	1.76	9,789
1999	7.80	649,640	12,343	265,097	9,629	0.408067	2.64	28,917	9,618	1,141,509	22,383	439	-5,665	2.0%	1.76	10,278
2000	7.80	661,983	12,578	274,726	11,555	0.415004	2.62	31,005	10,098	1,164,339	22,830	448	439	2.0%	1.76	10,792
2001	7.80	674,561	12,817	286,280	11,511	0.424395	-0.54	31,991	10,603	1,187,626	23,287	457	448	2.0%	1.76	11,331
2002	7.80	687,378	13,060	297,791	11,588	0.433228	0.30	33,156	11,134	1,211,378	23,753	466	457	2.0%	1.76	11,898
2003	7.80	700,438	13,308	309,379	12,792	0.441693	2.15	35,564	11,690	1,235,606	24,228	475	466		1.76	12,493

4.3.3. Forecasts for the Las Vegas Housing Market

To look at the possible outcomes of the Las Vegas housing market, three separate scenarios were run, The first, or the base scenario is forecast using the predictions of RFA (Figure 22a). These forecasts are; employment will grow at 3.8 percent, population will grow at 4.0 percent, and real personal income will grow at 5.0 percent. Based upon these numbers, home prices rise steadily through the term, and permits flatten at just under 10,000 per year. The reason that home prices rise while permits flatten is due to the personal income assumption. Because RFA did not segment the increase in personal income a 5% real increase was assumed for all, including construction workers. The construction wages term of the supply equation is negative, and a 5% real growth for the construction sector is a very large increase, especially when considering that since the early eighties the housing industry has based its profits and production on falling labor costs. If the same RFA model is run except construction wages are held constant, home price remain very close to the outcome of the original forecast. However, permits increase by more than 3,000 per year.

The second scenario Figure 22b is based upon steady growth in jobs and population, but holding real income for all sectors flat. This scenario is closer to the observed historical data. In this scenario, new permits follows the historical

trend that started around 1980. Under this scenario, home prices rise steadily until 99 and then begin to flatten. This increase in prices is due the user cost of capital term. Because of a blip in new construction and home prices from 1993 through 1995 the U_{cc} term has decreased due to the escalation in home prices which in turn lowered the cost of money. This lowered U_{cc} term has propped home prices for the remainder of the decade. By 1999 the U_{cc} has returned back the 1995 values, and home prices begin to flatten.

The final scenario assumes that the income growth projections of RFA are accurate. However, the population growth and employment growth are halved. Under this scenario, permits follow an almost identical track with the smaller growth shifting the numbers down slightly. The reason the permits are shifted only slightly is because the home prices under the reduced growth scenario are raised considerably. With the home price coefficient (α_3) for the permit equation valued at 0.95 the $7,000 home price difference between the two scenarios makes up almost all of the difference. The next logical question is; Why is the price of homes going up when the influx of people and the creation of new jobs has slowed. To answer this question we have to look at the price fit equation. The first coefficient U_{cc} is unaffected by influx, and is riding at an all-time low during the end of the decade (the U_{cc} term is negatively correlated). The second term personal income is assumed to be growing a 5% real rate (an all-time high). The third term pop/emp is a ratio, because both terms have decreased by the same factor their ratio is unaffected. Finally the forth term stock/emp will be affected

by the slowdown of the employment growth. However, this ratio term is a cumulative indicator that will require a number of years for the stock to accumulate, while the employment does not. Eventually, this term will become the adjusting factor that will reduce price and bring down permit applications. However, in Las Vegas this will not occur until the housing market is vastly over-built, an this does not occur in the time span of this thesis's forecast.

5. CONCLUSION

Like many successful ventures, the continued growth and prosperity of Las Vegas has been founded upon hard work, vision, timing, and luck. The hard work has occurred continuously, but it is at no time more evident than in the humble beginnings of the first Townsite. Back when air conditioning was unheard of, but 115° summer days were common, the first settlers built a small community that planted the first seeds of today's metropolitan area. The luck portion is most evident in the late twenties when the city of Las Vegas sat at a cross road. Had the dam project not happened, Las Vegas would have been destined for an alternative course that would in no way resembled city we all know today. The vision aspect of the area's success is best exemplified in the early eighties. Again Las Vegas sat at a cross road. With gambling being approved throughout the nation, and the "numbers" falling for most of the area's resorts, the area set upon a capital investment that has dwarfed anything in both nominal and real terms that the valley has ever seen. This vision to reinvest has helped create a resurgence that has defined the modern metropolitan area

Based on a three sector model, the growth of Las Vegas is due to a supply driven economy. This supply driven growth has reduced construction labor costs to the point were the real prices of homes have fallen over the last decade, and yet production levels have increased continuously. In addition, with

explosive growth of tourism in the area, the influx of workers have seen an almost perfectly elastic labor demand curve. Because of the elastic labor demand curve, the real wages of most workers has been flat, or reduced very slightly.

One exemption to the flat real wage curve has been construction labor. Because the mid eighties to the early nineties has seen an influx of construction labor that has outpaced demand, real construction wages have plummeted. Because of this, home prices in the area have been in essence subsidized by the workers building them. It will be interesting to note what happens now that production has accelerated, and the rest of the nation has recovered from the recession. Undoubtedly construction wages will rise. But will they rise to the point that they choke off building starts? The stock flow model of chapter four was built to try and tackle this type of question.

Based on the results of a stock flow analysis, when personal income is kept flat, but construction wages are allowed to rise the number of permits does indeed taper off. In addition, home prices adjusts to the same level in real terms as the early seventies, a time when construction wages were relatively high, before the influx of new workers.

Two other scenarios were run. The first case was based on the Regional Financial Analyst's economic indicators and the second was a slower growth model. The outcome of the former model is a continuation of the trend from previous years. It should be noted that RFA's indicators predict personal income growth of around 5% in real terms. With a 5% growth of both real income and

construction wages the increased demand from personal income growth offsets the constriction of construction wage growth, and housing permits continue to rise. The later model assumes that wages continue to grow at 5%. However, the growth in population and employment have been halved. The results of this model show that until stock reaches a saturation point with stock/employment numbers lagging well behind acceptable household size ratios, the price and construction of new homes will continue to rise.

Under the scenarios explored, based on widely varied economic outlooks, new housing permits varied between 10,000 and 12,000 units per year, and the price of a home varying from $28,000 to $35,000 in 1970 dollars. Based on these expectations, it would seem that for the coming five years, home production and prices will remain relatively stable.

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