THE EFFECTS OF OIL PRICES AND OTHER ECONOMIC INDICATORS ON HOUSING PRICES IN CALGARY, CANADA

by

Mercedes A. Padilla

Masters of Entrepreneurship
Asian Institute of Management, 2001

BS Management Engineering
Ateneo de Manila University, 1995

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Signature of Author:

Mercedes A Padilla, Department of Architecture, August 5, 2005

Certified by:

William C. Wheaton
Professor of Real Estate Economics
Thesis Supervisor

Accepted by:

David Geltner
Chairman, Interdepartmental Degree Program in Real Estate Development

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ABSTRACT:

This thesis aims to answer: (1) to what extent can oil prices and other economic indicators predict the changes in housing prices and rent in the Calgary single family housing market and (2) to determine what the lag time is between them. Implications of this study from a macro perspective are multiple. This study can be used as a simplified case study in isolating the effects of the boom and bust cycles of economic industries and quantify its impact to real estate performance.

Results found an astonishing correlation. Oil prices, exchange rate, interest rate and employment levels can determine up to 98% of the changes in house prices and rents. Oil prices, representing economic viability of the city, affect the real estate industry with a lag of 7 quarters of approximately two years, while interest rates representing the financial well-being of the city affect house prices and rents with a lag of 2½ years. Foreign exchange rate to the dollar, representing the relative global prosperity, affects real estate prices in one year.

House prices seem to be equally sensitive to a positive or negative shock in oil prices, exchange rate, and interest rates. At which, $25/barrel oil price seems to be the "breakeven" level at which house prices remain stable, all else equal. Above which, prices will continue to appreciate, below which, prices will fall. Not surprisingly, this is the same estimate of the 'breakeven" point at which the oilsands in Calgary become economically viable.

Rents are more sensitive to positive shocks in oil prices, not exchange rate. Inversely, they sensitive to negative shocks in exchange rate, not oil prices. Rents are not sensitive to interest rates.

Thesis Supervisor:

William Wheaton
Title: Professor of Real Estate Economics

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INTRODUCTION

Economic theory suggests that the boom and bust cycles of an economy precedes its housing industry, i.e. when the city is in a boom, the housing market will follow and vise versa [17,30,6]. In fact, many papers have been written in an attempt to use these economic indicators to accurately predict housing prices. An example is a recent paper by Artis, Banerjee and Marcellino [22] for the UK market but unfortunately, could only explain 50% of the variable changes based on economic indicators, using 80 variables. Some have gone so far as to say that home buyers do not behave with economic indicators but more with short-term price expectations [14,13]. In any case, there is an impression that housing prices, though in the long-term, would follow the trends of the economy, is actually simply inefficient [15] and complex to predict [16,31].

The objective of this paper is to prove, that economic indicators do precede the housing industry and in fact, devoid of extraneous variables such as speculation, predict housing prices with a high degree of accuracy. More so, this paper aims to quantify the degree of correlation, predict the direction of the change, define how sensitive the market it to these changes in the economy and know the timing of the change as well.

This paper aims to give an indication of this timeless economic question:

To what extent do economic indicators predict the housing market?

LITERATURE REVIEW

Many economic aggregate models have been developed since the 1960s. At first, such efforts forecasted the level of new residential investment [1, 20, 2]. Later on, models were developed for housing price movements in the owner-occupied housing sector based on changes in interest rates, financial institutions or credit markets. More complex models were then developed to accommodate the supply side of the equation, as well as the demand [7, 24, 5].

In these models, the demand side of the equation depended on exogenous variables such as demographic characteristics (X_1) such employment, population, etc. and real permanent income, the real price level of housing (P), the cost of financing at that price (U), and the

alternative cost of renting (R). The cost of financing (U) recently included tax implications and capital gains.

$$D = f(X_1, P, U, R) \quad (1)$$

The supply side of the equation assumes that markets clear quickly and at any time, prices adjust to equal the demand for housing. Thus, demand should equal supply.

$$D = S \quad (2)$$

We can thus substitute (2) in equation (1) and get (3)

$$S = f(X_1, P, U, R) \quad (3)$$

Inversely, one can determine house price, P, as a function of supply

$$P = f(S, X_1, U, R) \quad (4)$$

If in equation (4), the adjustment of the stock to price is efficient then the equation of supply is (5).

$$S = f(P) \quad (5)$$

Substituting (5) in (4), P becomes a function of $f(P)$.

$$P = f(X_1, f(P)\, U, R) \quad (6)$$

Isolating P, equation (6) can be reduced to the equation (7) below, known as the **reduced form model.**

$$\mathbf{P = f(X_1, U, R)} \quad \mathbf{(7)}$$

If, however, the supply side functions separately from P, i.e. S grows slowly because of building lags, then another model is to assume that supply stocks slowly depreciate over time (at a rate of δ) and expands gradually with new construction, C. Construction, on the other hand, depends of exogenous variables (X_2).

$$\Delta S = C(X_2, P) - \delta S \quad (8)$$

Most of the models for these equations are largely on number of housing units vs. the value of the housing stock, especially on the demand side of the equation.

In the early 1980s, the model was given a more precise definition, i.e. an after-tax inflation adjusted measure. The term U incorporated after tax cost of debt and property taxes

$(i+t_p)(1-t_y)$ where i is the nominal interest rate and t_p and t_y are marginal tax rates of property and income. The inflation adjustment added the expected rate of future nominal price appreciation for housing assets, $E(\Delta P/P)$.

$$U = (i+t_p)(1-t_y) - E(\Delta P/P) \qquad (9)$$

The authors that first incorporated equation (8) to equation (1) and (2) were Kearl [17] estimating housing prices, Poterba [23] estimating housing investments and most recently, Mankiw and Weil [21] estimating the demand equation without including the stock of housing.

A final extension of the house pricing model involves modeling the factors which affect demand, i.e. mortgage interest rates are a factor of housing demand and interest rates [24,11], construction costs are a function of level of home building activity and construction costs globally [24], decision models for risk and return [27] etc.

While this history of models spanned almost three decades, there are only a short list of consistencies hold within all the models:

1. Of all the variables, interest rates or mortgage rates are consistently an important variable to predict housing prices.
2. Short-term price expectations or real housing price levels has the most immediate effect to future house prices
3. The housing market was described as having a somewhat predictable cyclical behavior, with inefficiencies. And attempts to explain complicated price dynamics, i.e. construction costs, etc. has been highly elusive [32]

REVISIONS TO THE HOUSING MARKET STOCK FLOW THEORY

Given the lessons of the housing market research, there are opportunities in revising this model. Studies have shown that real estate cycles are caused by external shocks in the economy [26]. After which, you can predict cycles in real estate based on inflation cycles, equilibrium price cycles, inflation cycles, rent rate catch-up cycles, and property life cycles to real estate

price cycles [29]. There are also extensive studies to predict the timing of these cycles [18,25]. The missing link in the above analysis is that all the indicators, such as interest rates, inflation rates, etc. are symptoms and causes of the cyclical behavior, but not the *direct* cause.

Little study has actually been done in linking a city's *vital trade's cycles* as a critical variable to predict the housing market industry. This may actually be the missing link to finally explain the housing industry in a predictable and quantifiable pattern.

BACKGROUND

To isolate a city's vital trade cycle and link it to its effects on housing prices, a city was picked that was dependent on only one economic trade so as to strip the cause and effect relationship to its simplest form. Having only one economic trade is critical in isolating the effects of the boom and busts cycle, as cities are usually dependent on many trades whose boom and bust cycles occur at different times.

More specifically, this paper will focus on the CMA[1] (Census Metropolitan Area) of the city of Calgary, Canada. Calgary is relatively dependent on only one industry, oil and gas. Thus, its economic health can be arguably measured using one main economic indicator: oil and gas prices.

History of the Calgary, Canada[2]

The city of Calgary was born in 1894. It was primarily an agricultural town with a strategic railroad bridging the eastern and western part of Canada.

[1] A census metropolitan area (CMA) is a large urban area (known as urban core) together with adjacent urban and rural areas (known as urban and rural fringe) that have a high degree of social and economic integration with the urban cores. A CMA has an urban core population of at least 100,000.

[2] Source: http://calgary.foundlocally.com; http://www.calgaryalberta.net/history.html; and http://www.calgarypubliclibrary.com/library/local_history_resources.htm

Oil was first discovered in Calgary in 1914 with the Dingman well in nearby Turner Valley. This was to be one of the shortest booms ever, lasting from May to August 1914. It came to an abrupt halt with the outbreak of World War I. After World War I, in 1924, the roar of high pressure oil and gas erupting caused the Dingman well to run out. Royalite drilled below the Dingman well and struck it rich. This boom ended in 1927. The depression hit in the 1930s.

When the depression ended in 1939, with the start of World War II, strong demand for oil drained the Turner Valley. In 1947, oil was found at Leduc, Alberta.

In the 50's Calgary became the fastest growing city in Canada and it stayed that way for a long time. From 100,000 in 1947, it mushroomed to 200,000 by 1955 and 325,000 by 1965. The growth continued to center on oil, with reliable and constant help from the agricultural industries. The establishment as oil capital in the heyday of Turner Valley held, and as the oil patch spread across provincial boundaries and into the untapped North, Calgary remained the heart of the industry.

Although Calgary's oil reserves are estimated to be the biggest in the world – a whopping 1.7 to 2.5 trillion barrels of oil (bigger than the reserves of Saudi Arabia), most of the oil is found in oilsands, which need more technology and higher costs to excavate. High production costs and more readily accessible supplies from other regions of the world were major impediments to the development of the oilsands. Only 7% (or 175 billion barrels) are classified as "proven reserves", i.e. they are recoverable given the current long term price outlook. [4]

Thus, with the Arab Oil Boycott in 1974, which caused oil prices to climb steeply, it spurred a madcap exploration in Western Canada. A fresh boom in Calgary began which made past booms look tame. At the peak of the boom, 3000 people a month were arriving in Calgary. The city's population grew from 325,000 in 1974 to 650,000 by the early 1980s. The "oilpatch"

headquartered in Calgary grew rapidly. The city mushroomed and what little was left of old Calgary was being smashed down by the city block to make way for the new. The pressure to accommodate the boom was such that there really wasn't time for master planning. The buildings were approved with little thought given to the views to the relationship of one building to the rest. The city grew in both size and business stature, with all those shiny office towers creating a virtually instant downtown. Any surviving building that pre-dates the 1974-1980 oil boom is these days a candidate for being declared a heritage site.

The recession that had much of the rest of the world in its grip finally found Calgary in 1982 with a world oil glut and the enactment of the "National Energy Program" (NEP) legislation created by Finance Minister Jean Chretien unfairly sucking over $100 billion in oil industry profits from the West. Whatever caused the boom in Calgary had come to an end and was going the other way. Minute vacancy rates shot up to 20% for office space downtown. Full employment became 15% unemployment and the trains going east were fuller then the ones coming west.

In the 1990's, Calgary's population maintained a slow and steady growth. The 1996-1998 gas exploration boom, offsetting a relatively weak Eastern Canadian and B.C. economy, has led to a large influx of new residents into the city. The city has grown by an average of 20,000 people per year over the past three years. By the turn of the century, Calgary's population is reaching almost 900,000. [9]

Calgary and Oil Prices Today

The oilsands have carried enormous potential for a very long time, but they have only become economical at massive scale in the 1990s. What has changed since the first large-scale commercial operation, Great Canada Oil Sands (now Suncor Energy), started in 1967 that

allowed for relatively recent explosive growth of this industry is the huge improvements in technology, which brought costs down dramatically over the past 40 years or so, and a hike in the long-term oil price expectations. Given historic price differential, the high side of the break-even point requires a price of over $25 USD per barrel to be economic in Calgary [4]. Only a few years ago, consumption of most banks and oil companies was only $18 USD per barrel. With sweet crude oil averaging about $45 USD per barrel over the long term, excavations in Calgarian oil sands and the oil industry in Calgary has become very profitable. This should be able to attract sufficient capital to keep output surging. In fact, Canada's oil production from the oilsands is on track to explode over the next decade, starting 2008. By 2015, oil production is expected to be 3 million barrels per day (more than triple today's output), becoming the second largest exporter (next to Saudi Arabia) in the coming decade, supplying 13% of new global demand in this period.

HYPOTHESIS

Thus, more specifically, this thesis will aim to answer: "***To what extent can oil prices and other economic indicators predict the changes in housing prices and rent in the Calgary single family housing market?"*** And "***If oil prices and other economic indicator can predict housing prices and rent,what is lag time between them?"***

Implications of this study from a macro perspective are multiple. This study can be used as a simplified case study in isolating the effects of an economic indicator to real estate performance. You can deduct from this study:

- The extent of correlation between economic indicators and the patterns of reaction to the real estate industry
- The degree of the reaction, i.e. how sensitive is the market?

- Timing, i.e. how fast does the market react?

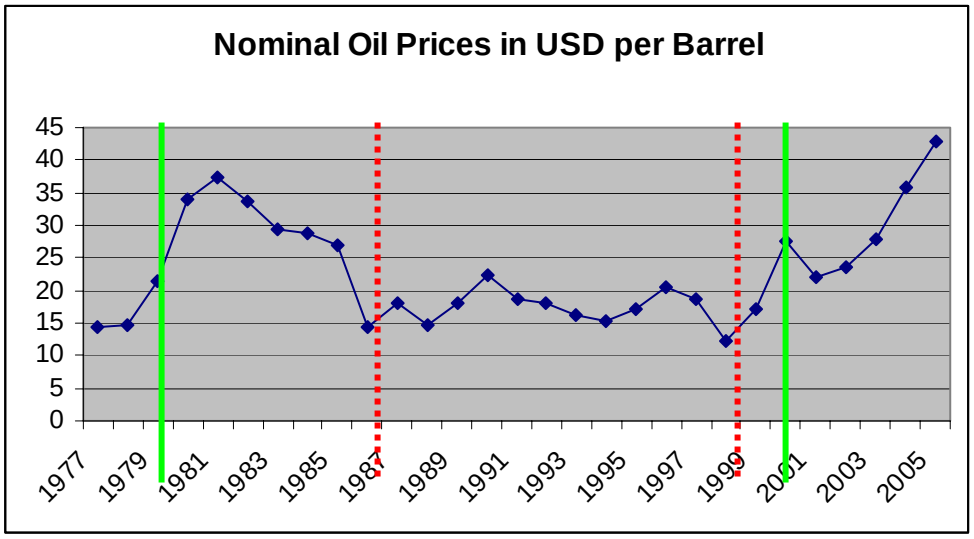
Implications of this study from a micro perspective are as practical. Forecasts of oil and gas prices in the future can be used to predict the behavior of the local real estate industry in Calgary in the future. This model can be applied to determine when the best time is to buy and sell real estate in the city.

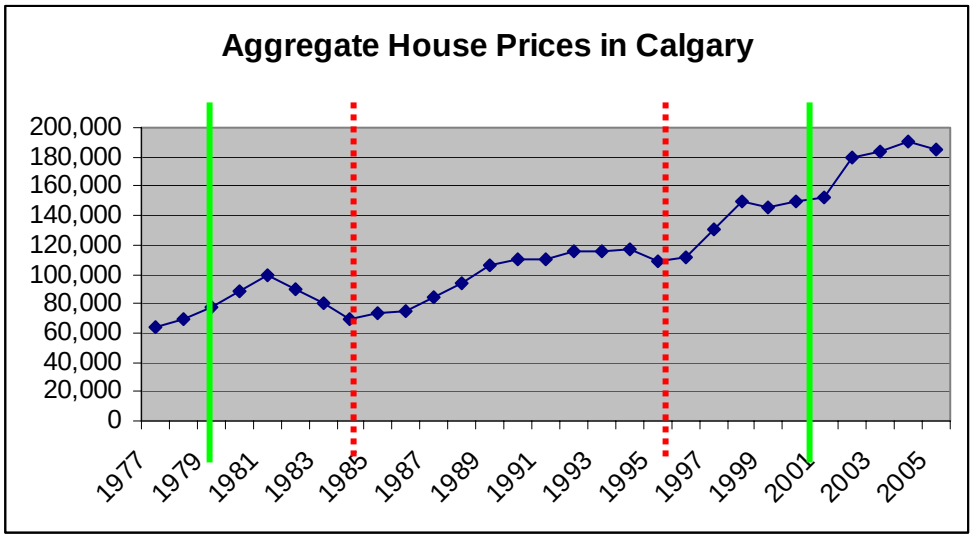
DATA SERIES AND TRENDS

(See Appendix A for Raw Data Annually and Appendix B for Raw Data Quarterly)

House Price

Calgary Canada is also well-documented in terms of aggregate indices for house prices in nominal Canadian dollars (CAD). Data from 1974 to the present was collected, both quarterly and annually. This is a span of 31 years, which has gone through two cycles of boom and bust for both oil and the real estate market in Calgary.





Descriptive Statistics:

	Oil Prices	House Price
Mean	22.83146	114615.9
Standard Error	1.503615	7034.56
Median	20.59917	110000
Standard Deviation	8.097214	37882.27
Range	30.7175	125900
Minimum	12.0975	64000
Maximum	42.815	189900

Based on simple observation, house prices seem to exhibit a pattern already. Increases in house price are relatively steady with spikes roughly when the nominal $USD/barrel price of crude oil increases beyond the $25 price level. In the chart, the point with the solid vertical line show when the price of oil starts to surpass the $25 price level, and it is at that point in time that house prices start to appreciate at an increasing pace, signaling the start of a boom.

Similarly, there are patterns in the decrease of house prices. House prices decrease in the past 3 decades on only 2 occasions with a bottoming out in 1985 and 1996. It is not surprising, that both occasions at which house prices bottomed out were both 2-3 years from the bottoming out of prices of crude oil, 1987 and 1999 respectively. Thus, signaling the end of the bust. These are indicated in the chart with dotted vertical lines.

In determining house prices, the value of a detached, three-bedroom single storey home was used, which is the most popular dwelling unit type in Calgary.

2001 Census Data on Type of Dwelling Unit

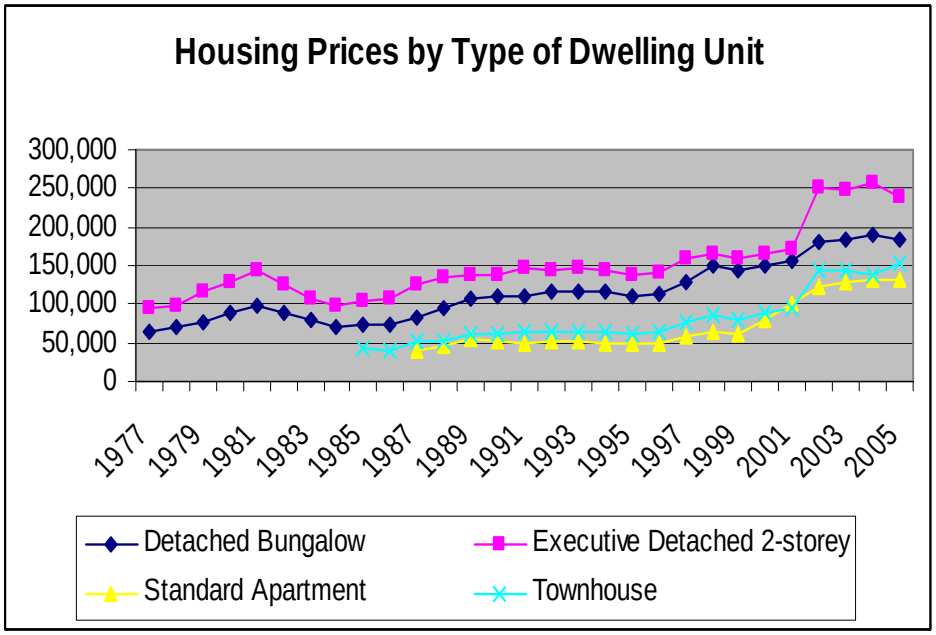
Total Dwelling	250,165	100%
Single Detached [Bungalow][3]	198,525	79%
Apartment	4930	2%
Movable	1545	1%
Other [Attached], etc.	45,145	18%

It is described to have 1 ½ bathrooms and a one-car garage, a full basement but no recreation room, fireplace or appliances. Using outside dimensions (excluding garage), the total area of the house is 111 sq. metres (1,200 sq. ft.) and it is situated on a full-serviced, 511 sq. metre (5,500 sq. ft.) lot. Depending on the area, the construction style may be brick, wood, siding or stucco. The appraisal is based on Royal LePage's market survey and adjusted based on Royal Le Page's opinion of fair market value built on local data and market knowledge provided by their residential real estate experts [10].

Mortgage financing has not been taken into account in arriving at published prices and all properties have been considered as being free and clear of debt. However, the type of mortgage debt financing on a property can affect its market value either up or down depending on the amount, term, rates of interest, method of repayment and other factors.

Between different dwelling unit types, the housing prices follow more or less the same trend, with correlation coefficients of at least 95% and above. With this characteristic, it is safe to assume that conclusions on a detached bungalow will most likely apply to other dwelling unit types as well, such as the 2-storey house, apartments, etc.

[3] A bungalow is a one floor house for the bedrooms, kitchen, living room and bathroom. Some bungalows have either finished or unfinished basements.



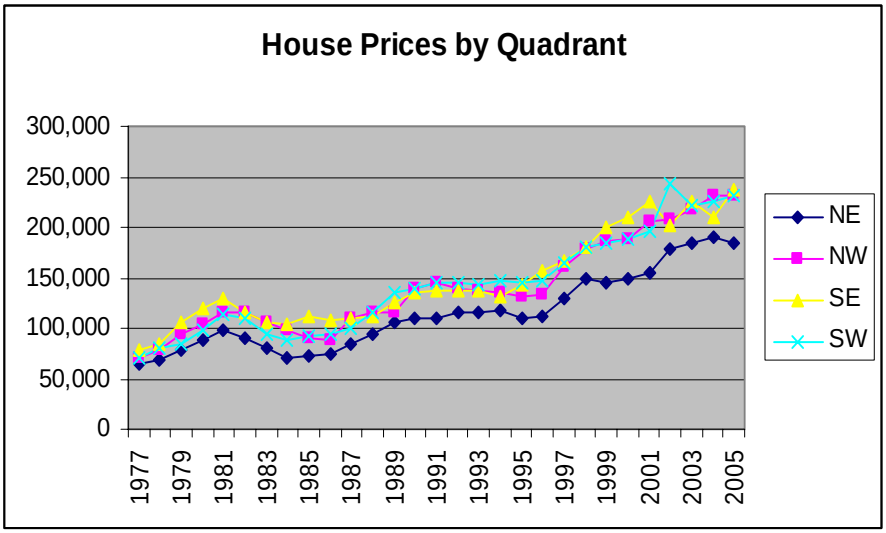
Correlation Coefficients of House Prices of Different Types of Dwelling Units

	Detached Bungalow	*Executive Detached 2-storey*	*Standard Apartment*	*Townhouse*
Detached Bungalow	1			
Executive Detached 2-storey	0.95728	1		
Standard Apartment	0.945417	0.966827	1	
Townhouse	0.956034	0.985266	0.979628	1

For the purpose of this study, we have also used the NE properties as a benchmark for all the other locations. According to a study done by Torto Wheaton Research and the Royal Bank of Canada [28], the NE properties was described to be the best series that followed the price of a weighted series of housing prices in the different towns vs. town population[4].

Furthermore, based on the chart below, all locations follow more or less the same trend, with correlations of 96% and above. With this observation again, we assume that conclusions on the NE properties can be generalized to the rest of Calgary.

[4] Used roughly to approximate households and units based on Census data of 1991 and 1996.

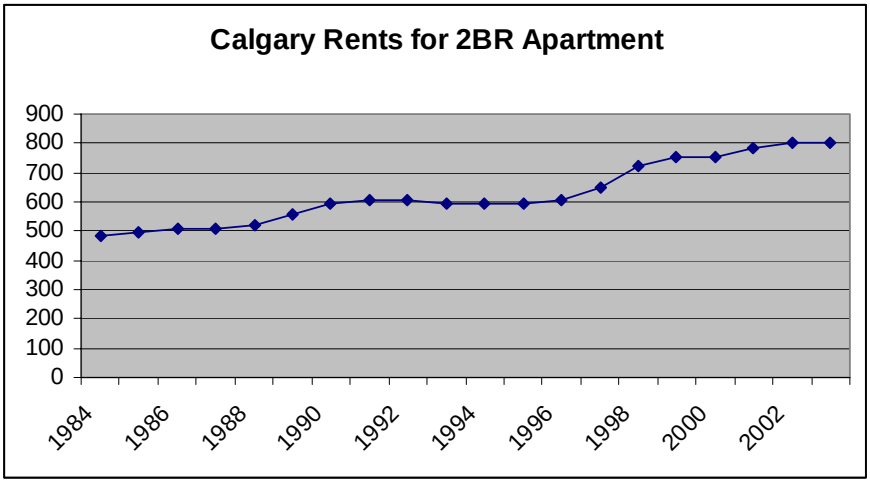


Correlation Coefficients of House Prices of Different Locations [Quadrants]

	NE	*NW*	*SE*	*SW*
NE	1			
NW	0.988129	1		
SE	0.961271	0.973806	1	
SW	0.989794	0.981152	0.957087	1

Rent

For rents, I used average rental rates from a rental market survey for privately initiated apartment structures with at least 3 units as published by the Canada Mortgage and Housing Corporation. Data for rents are available only annually and only from 1984, and is available in nominal Canadian dollars.

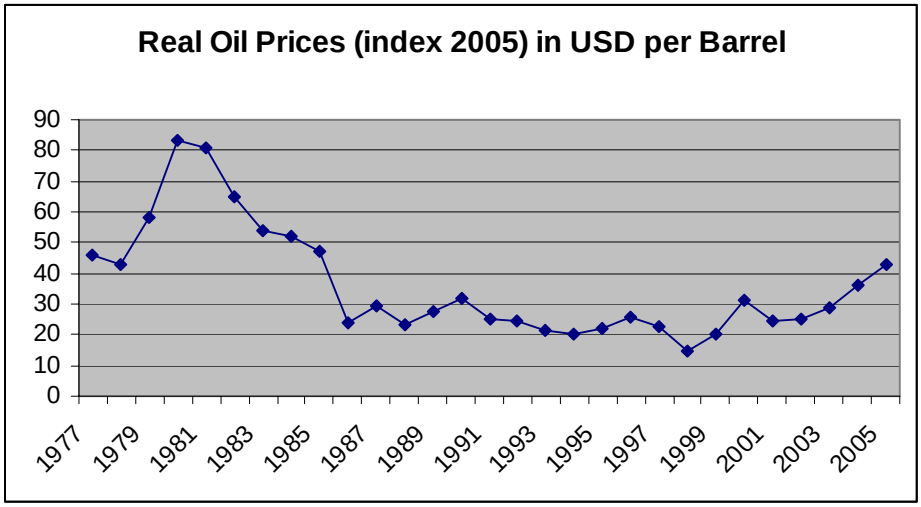


Rents	
Mean	626.95
Standard Error	23.77554
Median	600.5
Mode	753
Standard Deviation	106.3274
Range	319
Minimum	485
Maximum	804

Rents are expected to follow the trend for housing prices closely. Based on a study by Joshua Gallin in 2004 [12], rents go up at the same proportion as house price so that owners can compensate for increases in owning costs. In fact, based on this data series, rents and house prices have a high correlation of 0.976. Thus, we expect more or less the same variables to affect rents as they do house prices in the same way.

Real Oil Prices

Nominal Oil Prices of crude oil at $USD per barrel were adjusted to 2005 real numbers using the Calgary Consumer Price Index (CPI) as the deflator[5]. Real Oil prices represent the main economic indicator of increased or decreased economic viability in the city of Calgary.



[5] Formula is: where CPI_i is the Calgary CPI based where 1992=100 for the year i, and REAL OIL_i is the real oil price in USD per barrel for the year i and NOM_i is the nominal price of oil in USD per barrel for the year i.

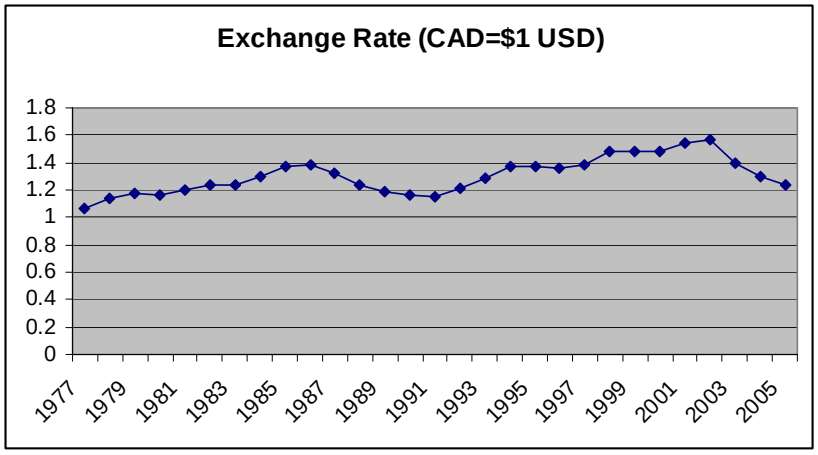
$$\text{REAL } OIL_i = NOM_i * CPI_{2005}/CPI_i$$

Real Oil Prices	
Mean	36.14621
Standard Error	3.350487
Median	28.57758
Standard Deviation	18.04293
Sample Variance	325.5472
Minimum	14.52008
Maximum	83.00738

Since house prices react positively to positive shocks in the economy and vice versa according to a study done by Grimson and DeLisle in 1999 [26], it is expected that an increase in real oil prices would result in an increase in house prices.

Exchange Rate[6]

Since oil is an export oriented industry and is sold is USD/barrel, Calgary is expected to be very sensitive to exchange rates changes between the Canadian dollar and the US dollar. It is expected that exporters are more profitable when the local currency weakens.



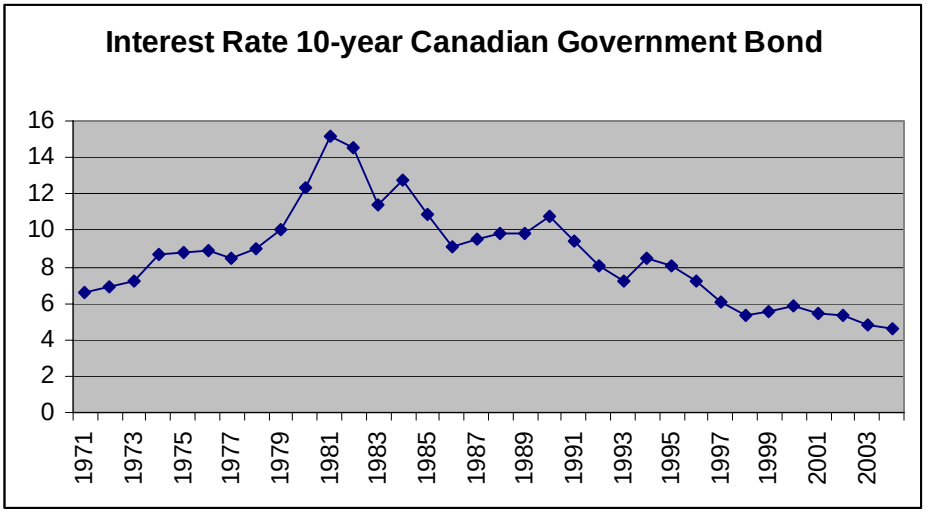
Exchange Rate $CAD=$1USD	
Mean	1.303811
Standard Error	0.024503
Median	1.295066
Standard Deviation	0.131953
Minimum	1.063442
Maximum	1.570343

[6] Foreign exchange of US dollar rates in Canadian dollars. Noon spot rate, average. Source: Bank of Canada

Exchange rates in Canada have been relatively stable, with a range of only 0.50 to the USD in a span of 3 decades. The boom and bust cycles of the exchange rate are not correlated in any way to oil prices (0.07 and 0.50 correlation quotient for nominal oil prices and real oil prices respectively) and vice versa.

Interest Rates[7]

Interest rates seem to be the most volatile among all the variables used, with a single peak during the depression in the early 1980's and interest rates becoming consistently better ever since. This can be attributed to the recovery of the economy after the recession, a relatively stable exchange rate and improvement of credit systems and laws.



Interest Rate	
Mean	8.593119
Standard Error	0.455485
Median	8.549672
Standard Deviation	2.655912
Range	10.59584
Minimum	4.601075
Maximum	15.19692

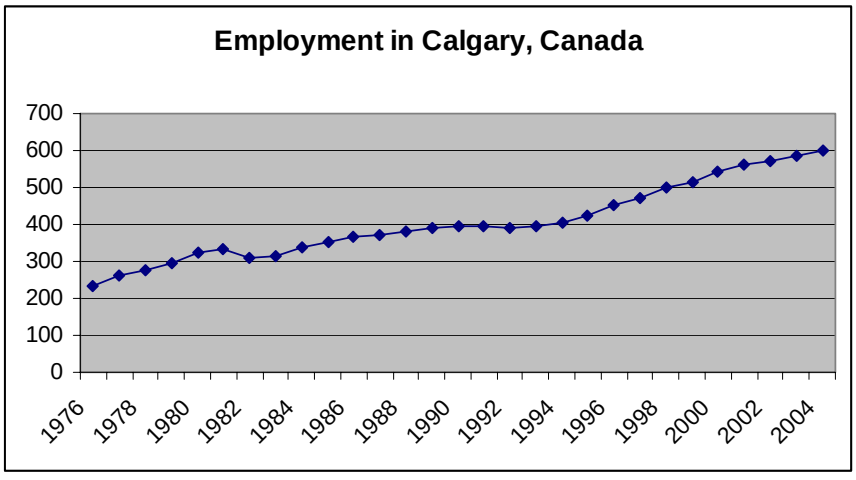
[7] 10 year government Canadian bond. Source: Bank of Canada

Interestingly enough, although mortgage rates are more directly related to the cost of financing, interest rates were used because it gave a higher correlation to house price (0.75 vs. 0.73). Although, not surprisingly, mortgage rates and interest rates are highly correlated themselves (0.99).

This can be explained because interest rates affect not only the consumer buying habits of the home buyers, but the market as a whole as well in terms of making it more attractive to invest in expansion which ends up spurring the economy. Not mistakenly, when interest rates go down, the home buying demand should go up and the economy should enhance as well.

Employment

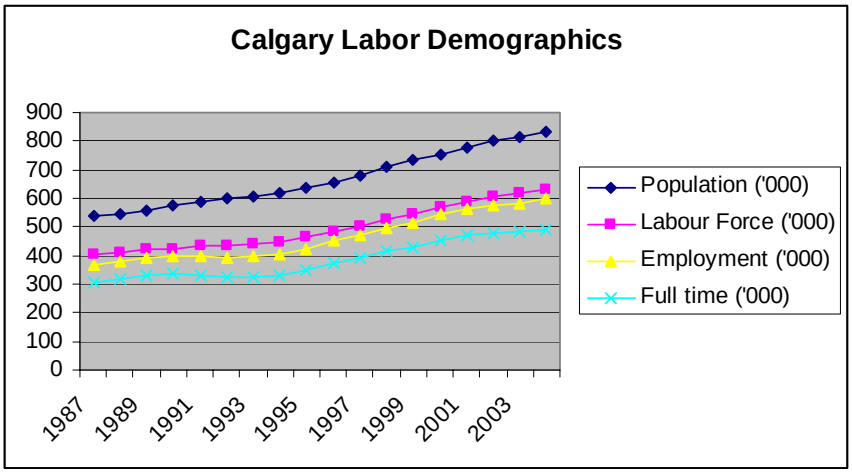
Employment is defined as number of persons in the CMA of Calgary, Canada, who, during the reference week, worked for pay or profit, or performed unpaid family work or had a job but were not at work due to own illness or disability, personal or family responsibilities, labour dispute, vacation, or other reason. Those persons on layoff and persons whose job attachment was to a job to start at a definite date in the future are not considered employed. Estimates in thousands, rounded to the nearest hundred.[8]



[8] Source: Labour Force Survey, Statistics Canada

Employment	
Mean	405.0824
Standard Error	18.82783
Median	392.7
Std Deviation	101.391
Range	364.2196
Minimum	234.0804
Maximum	598.3

In the past 3 decades, employment in Calgary has almost tripled, and is still consistently growing. This is proportionately consistent with Calgary's increase in population and labor force.



Based on the chart above, each labor demographic moves in unison with the rest. In fact, each demographic has almost 99% correlation with the other.

Correlation Coefficients of Different Demographics of Calgary, Canada

	Population ('000)	*Labour Force ('000)*	*Employment ('000)*	*Full time ('000)*
Population ('000)	1			
Labour Force ('000)	0.995485053	1		
Employment ('000)	0.989923428	0.997968	1	
Full time ('000)	0.980556586	0.992981	0.997991	1

Thus, one can deduct that the increase in population in the Calgary area is primarily because of migration for employment (inclusive of their families).

It is to no surprise therefore that an increase in employment will directly increase the demand for housing as new migrants will have new housing needs. It is also no surprise that among all the variables listed, employment has the highest correlation to house price (0.96) and

rent (0.97). And that, oil prices, interest rates and exchange rates will probably increase housing prices in as much as they increase employment.

METHODOLOGY

Regression Analysis

A regression analysis aims to find a relationship between the dependent variable (house price and rents) and the independent variables (oil prices, employment, interest rates, etc.) which are possible predictors of such. This commonly used statistical tool determines if there is a correlation between the variables and if so, the nature of their correlation.

The result is a regression equation, which is a numerical equation that defines how dependent variables are predicted by independent variables. The regression also gives indicators on how good or poor the model is in predicting the dependent variable. If the t-stats are above 2 and the p-stats are below 0.1 for each variable, then those independent variables are correlated to the dependent variable. The multiple regression correlation coefficient, R^2, is a measure of the proportion of variability explained by the regression relationship model or the regression equation. Roughly, this means the R^2 is the percentage at which the model explains the changes in the dependent variable based on the independent variables. Lastly, the standard deviation is the range at which there is +/- error with a 95% confidence level.

Given the independent and dependent variables mentioned above, several permutations were done between the different combinations of potential economic indicators (see Appendix C). When the combination of variables was identified as having the highest correlations, the variables were lagged to determine the highest r square. The model with the highest t-stats, p-stats, R^2 and lowest standard deviation was determined and used.

The Impact of Oil Prices

Oil prices affect housing prices and rent in two ways:

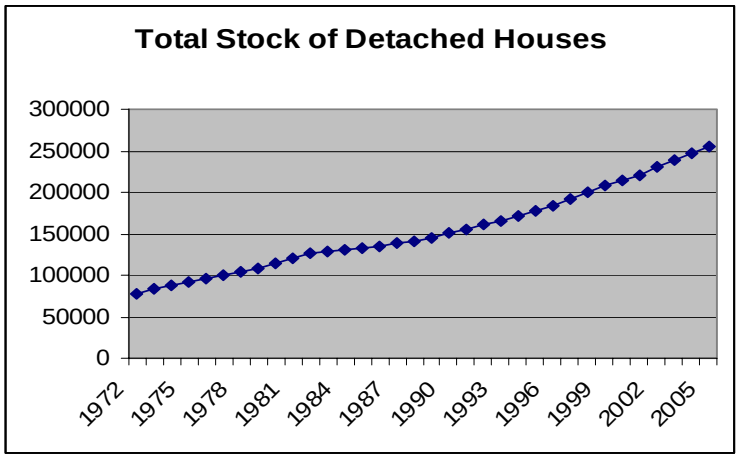
1. First, it generates employment which then pushes housing demand. Thus, the first step is to understand the effects of oil prices and other economic indicators on *employment*.
2. Second, it generates prosperity in terms of income and wealth. Here, a regression model will determine the oil prices and other economic indicators and its relation to house prices and rent *directly*.

Reduced Form Model

It is important to note that this study will not take into consideration the stock flow (supply side) of housing of the city, since there is already a high correlation (0.86) between housing prices and housing starts on the same year, i.e. S = *f* (P) as described in equation (5) in the literature review. Thus the market seems to react quickly and the supply of housing is efficient in its adjustment to demand.

This can be explained partially by a study by Chinloy, 1996 [3], where Canada seems to react more to economic indicators and less to speculation than the United States. More so, a

possible cause of the high correlation is the fact that Calgary is a city is known for its bad weather (6 months out of the year is winter). Thus, there is little reason to live in Calgary aside from employment and economic viability, i.e. it is not a city that is susceptible to speculation. I believe, given this nature, developers are wary of overdeveloping new stock, if it's not demand driven. In fact, if you observe the chart above, the pattern of housing starts follow very much the pattern of house prices, with very little overshooting. Developers only build *when* prices are have already gone up, and not in anticipation of it. This results in a steady increase of stock throughout the years.



DETERMINING EMPLOYMENT

Annual Regression Model for Employment (See Appendix D)

EMP = 15.46 - 4.16 INT + 42.59 EXCH + 0.35 REAL OIL + 0.912 EMP (last year)

Where: EMP – Total Employment of Calgary CMA estimated in thousands
INT – Interest of 10-year Canadian Government Bond
EXCH – Exchange Rate of US dollar rates in Canadian dollars.
REAL OIL –Prices of Crude Oil in $USD per barrel indexed to 2005 based on Calgary CPI

Statistical Results:

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	15.4573	32.0715	0.4820	0.635
Real Oil	0.3493	0.1508	2.3162	0.030
Exchange	42.5911	20.6132	2.0662	0.051
Interest Rate	-4.1153	1.4104	-2.9179	0.008
Employ-1 year	0.9124	0.0383	23.8330	0.000

R Square	0.992361267
Standard Error	9.028227078

Quarterly Regression Model for Employment (See Appendix E)

EMP = 11.32 - 1.25 INT + 8.67 EXCH +0.08 REAL OIL + 0.97 EMP (last year)

Where: EMP – Total Employment of Calgary CMA estimated in thousands
INT – Interest of 10-year Canadian Government Bond
EXCH – Exchange Rate of US dollar rates in Canadian dollars.
REAL OIL –Prices of Crude Oil in $USD per barrel indexed to 2005 based on Calgary CPI

Statistical Results:

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	11.3282	6.8246	1.6599	0.0998
Real Oil	0.0839	0.0403	2.0826	0.0396
Exchange Rate	8.6721	5.5030	1.5759	0.1179
Interest	-1.2494	0.3213	-3.8890	0.0002
Employ-1qtr	0.9719	0.0097	99.9017	0.0000

R Square	0.997320077
Standard Error	5.257589634

It is important to note that out of all the possible economic indicators that affect employment, the one that will explain 99% of the changes in real estate prices in Calgary comes from Real Oil Prices, Exchange Rate and Interest Rates. Real Oil Prices and Exchange Rates are positively correlated while Interest Rates are negatively correlated. We will explore each variable in more detail

1. Real Oil Prices

As Oil Prices go up, employment goes up. This is consistent vs. what was predicted since an increase in Real Oil prices result in more profits for oil companies, which attract more investments in the city *which increase jobs*.

More interestingly, for every $ increase in oil price, there is a 350 new employees come to Calgary per year (84 per quarter).

2. Exchange Rate

Exchange rate is an important variable to predict employment primarily because oil in Canada is an export industry. Thus, the changes in foreign exchange to US dollars (USD) are critical in determining the degree of profitability of the company. Exchange rate affects employment positively. Thus, when the Canadian dollar (CAD) is weaker, the company's relative cost is lower (same amount of cost in CAD but less cost in terms of USD), thus making more money per barrel (which is sold in USD), which gives the long term effect of making the company more profitable, more likely to expand, increasing employment.

For every weakening in foreign exchange of CAD to USD by 10 cents, 867 new employees are expected per quarter or 4,259 new employees are expected per year. The slight discrepancy (18%) between quarterly and annual estimates may be explained with the fact that the longer the change in foreign exchange takes place, the more chances of employees being hired since hiring is a long-term decision.

3. Interest Rate

As predicted, the lower the interest rate, the higher the employment. This is because lower interest rates make it cheaper to finance businesses and making it more attractive to do investments. Thus, companies can expand, and thus attract more labor.

A 1% decrease in interest rates would increase employment by 1,250 employees quarterly or 4,115 annually.

DETERMINING HOUSE PRICES

Annual Regression Model (See Appendix F)

The model that can best forecast housing prices, given *annual* data is the following:

PRICE = 48,543.82 + 271.31 EMP - 2588.17 INT (lag 2 years) - 60457.9 EXCH (lag 1 year) + 259.15 REAL OIL (lag 2 years) + 0.414 Price (last year)

Where: Price - House Prices of a Single Detached Bungalow
EMP – Total Employment of Calgary CMA estimated in thousands
INT – Interest of 10-year Canadian Government Bond
EXCH – Exchange Rate of US dollar rates in Canadian dollars.
REAL OIL –Prices of Crude Oil in $USD per barrel indexed to 2005 based on Calgary CPI

Statistical Results:

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	48543.8211	19247.0577	2.5221	0.0198
Employment	271.3119	73.8131	3.6757	0.0014
Real Oil -2yr	259.1513	133.5547	1.9404	0.0659
Exchange -1yr	-60457.8502	23183.5881	-2.6078	0.0164
Interest -2yr	-2588.1735	949.4154	-2.7261	0.0127
Price -1yr	0.4142	0.1358	3.0499	0.0061

R Square	0.974168641
Standard Error	6337.463458

Quarterly Regression Model (See Appendix G)

Similarly, this model was done as well using *quarterly* data. The quarterly model is as follows:

PRICE = 12353.03 + 80.51 EMP - 696.028 INT (lag 2 1/2yr) - 14992.8 EXCH (lag 1yr) + 53.66 REAL OIL (lag 1 3/4 yr) + 0.814337 Price last quarter

Where: Price - House Prices of a Single Detached Bungalow
EMP – Total Employment of Calgary CMA estimated in thousands
INT – Interest of 10-year Canadian Government Bond
EXCH – Exchange Rate of US dollar rates in Canadian dollars.
REAL OIL –Prices of Crude Oil in $USD per barrel indexed to 2005 based on Calgary CPI

Statistical Results:

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	12353.0348	6173.4845	2.0010	0.0480
Employment	80.5148	23.0601	3.4915	0.0007
Real Oil-7qtrs	53.6608	35.0869	1.5294	0.1292
Exchange-4qtrs	-14992.7996	6898.8015	-2.1732	0.0321
Interest-10qtrs	-696.0279	264.5475	-2.6310	0.0098
Price-1qtr	0.8143	0.0437	18.6368	0.0000

R Square	0.985445048
Standard Error	4443.919041

Analysis:

It is important to note that out of all the possible economic indicators that affect price, the one that will explain 97.4% - 98.5% of the changes in real estate prices in Calgary comes from Employment, Real Oil Prices, Exchange Rate and Interest Rates. Real Oil Prices and Employment are positively correlated while Interest Rates and Exchange Rates (CAD to USD) are negatively correlated. We will explore each variable in more detail

1. Employment

Housing prices are most correlated to the existing employment. This is not unusual as an increase in employment indicates an increase in people who would need a house who can afford to buy a house. The current employment level is in fact an indication of the total *consumer base* of the housing market. Also, considering that 95.0%[9] of the labour force is already employed in Calgary and as discussed, the fact that increase in population in Calgary is highly correlated to increase in employment (99%), an increase in employment is presumably caused by either migration or an increase in the labor force (i.e. graduating students). This new source of people who have new housing needs fuel the increase in demand for housing, and vice versa. This is consistent with our previous predictions.

[9] Calculated as Total Employment divided by the Total Labour Force in Calgary. Based on Labour Force Survey 2004 for Calgary, Alberta. Source: Statistics Canada

For every 1,000 new employees in Calgary, houses prices are expected to increase by $80 for the next quarter or by $271 in the next year (which is roughly the quarterly coefficient multiplied by 4). Given that the past 3 year average increase in employment is 12,500 per year, house prices should expect *an appreciation of $3387.5 or 2% per year just from the trend of increasing employment alone.*

2. Real Oil Prices

As Oil Prices go up, real estate prices go up. As explained by the employment regression, this is caused primarily because an increase in Real Oil prices result in more profits for oil companies, which attract more investments in the city, *which increase jobs*, which increase migration into the city and thus effectively increase the demand for housing and vice versa. In this model, for every $ increase in oil price, there is a 350 new employees come to Calgary per year (84 per quarter). Alternatively, 350 new employees per year results in a $95 increase in house price or an appreciation of .05% per year per $1 increase in real oil prices from its effects via employment.

Oil prices also affect housing prices directly. This can be explained because an increase in oil prices would generate prosperity and wealth. This increases the consumer's ability to buy housing or upgrade their current house. The effect of this is such that for every $1 increase in real oil prices, there is an increase in house price by $259/year or an appreciation of 0.14%.

Thus, the accumulative effect of an increase in oil price of $1/barrel would be $355/year or 0.2%.

More interestingly, Real Oil Prices affect housing prices directly with a lag of 2 years, but more specifically 1 ¾ years (7 quarters). This makes sense since first of all, it is reasonable to expect that the effects of such news is not instantaneous, and the process of expanding a

company, hiring new people, and uprooting people and moving them into a new city will take approximately two years before all is said and done. Secondly, since housing is a substantial investment for an average household, an increase in wealth would not increase the consumer habit of buying houses right away. A consistent stabilization of an increase in prosperity would be prudent first before it would significantly affect buying behavior.

Expanding the computations described above, the accumulative increase in price per increase in $1/barrel after the 2 year lag has passed is as follows:

	Current	Year 1	Year 2
via Employment	94.77	181.24	260.13
Direct Effect[10]	259.15	405.75	502.28
Total Effect	353.92	586.98	762.41
Accumulative Appreciation	0.2%	0.3%	0.4%

Thus, based on this model, the rule of thumb is: *house price is expected to appreciate by of 1% every $2/barrel increase in real oil prices (index year 2005) with a lag of two years.*

3. Exchange Rate

It is important to note that although exchange rate has a positive correlation to employment, the exchange rate affects consumers the other way. This means that as the Canadian dollar (CAD) strengthens, demand for housing increases. This can probably be explained because the exchange rate also affects how the Canadian consumer would spend his/her money. When the Canadian dollar is stronger, the consumer feels richer, and is thus more likely to spend on housing. A stronger CAD means that imports are cheaper, increasing the effective household income as consumers have more money to buy local items, including real estate. In addition to this, when the Canadian dollar is stronger, the real estate market in Canada also becomes a more attractive investment relative to other parts of the world. That is because

[10] This includes the effect of the change in last year's house prices (with a coefficient of 0.4142)

for every CAD earned, you get more USD out of it. Thus, it fuels an increase in demand as well. Since the effect of exchange rate on consumer's behavior is more direct, the lag time is only one year.

The direct effect of the changes in exchange rate is that for every appreciation of the dollar by 10 cents, house prices are expected to increase by $6046 (3.2% appreciation) in the same year and $8071 (4.4%) by the next year.

However, the effects of exchange rate will be tapered down by its inverse effects on employment with a total impact as follows for every appreciation in exchange rate of ten cents:

	Current	Year 1
via Employment	(1155.55)	(2209.87)
Direct Effect	6045.79	8071.32
Total Effect	4890.24	5861.45
Accumulative Appreciation	2.6%	3.2%

Overall, it is still better for house prices that the currency appreciates, rather than depreciates. And as a rule of thumb, *for every 10 cents appreciation in exchange rate, one can expect appreciation in house prices by 3.2% in the next year and vice versa*.

4. Interest Rate

The way interest rates affect the housing market is obvious. Lower interest rates make buying a house financially cheaper and more affordable. Likewise, higher interest rates make it more difficult to buy a house whether or not there is a demand for it.

The lag time for interest rates to take effect is 2 years or more specifically 2 ½ years (10 quarters). I believe that there is a longer lag time for interest rates to take effect in the housing market because most financial borrowings have fixed terms of an average of 5 years. Thus, even when interests decrease, there are penalties to pre-terminate financial packages making interest effects a little stickier.

The direct effect of the interest rate is that for every decrease in exchange rate of 1%, there is an increase in house prices by $2588 or 1.4% in the current year and by $4123 or 2.2% in the next year.

Interest rates also affect house prices in another way, by encouraging business to invest and expand because of lower financing cost, thus increasing employment.

To summarize, the total impact of interest rates on housing prices are as follows:

	Current	Year 1
via Employment	1116.53	2135.25
Direct Effect	2588.17	4122.66
Total Effect	3704.70	6257.91
Accumulative Appreciation	2.0%	3.4%

Two-thirds of the actual impact of interest rates is direct, which is consistent with current literature. However, a substantial one-third of its effect comes from its impact on the economy as a whole. *As a rule of thumb, every decrease of interest rates by 1% increases house price appreciation by 2% in the current year and 3.4% in the next.*

Conclusion:

The abovementioned model makes sense and is a good model to predict housing prices for the Calgary market. In fact, based on the model, one can predict housing prices given today's oil prices, interest rates and exchange rates as far as two years from now with a margin of error of only $4,444 (using quarterly data) to $6,337 (using annual data) CAD with a 95% confidence level.

DETERMINING RENTS (See Appendix H)

RENT = 150.54 + 1.16 EMP - 205.28 EXCH (lag 1 year) + 0.513 REAL OIL (lag 2 years) + 0.371 RENT (last year)

Where: EMP – Total Employment of Calgary CMA estimated in thousands
EXCH – Exchange Rate of US dollar rates in Canadian dollars.
REAL OIL –Prices of Crude Oil in $USD per barrel indexed to 2005 based on Calgary CPI

Statistical Results:

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	150.537	42.894	3.510	0.003
Employment	1.161	0.206	5.650	0.000
Real Oil-2	0.513	0.400	1.284	0.220
Exchange-1	-205.283	55.238	-3.716	0.002
Rent-1	0.371	0.117	3.178	0.007

R Square	0.988018648
Standard Error	12.87168923

Analysis:

It is important to note that out of all the possible economic indicators that affect rents, the one that will explain 98.8% of the changes in rents in Calgary comes from Employment, Real Oil Prices and Exchange Rate. Real Oil Prices and Employment are positively correlated while Exchange Rates (CAD to USD) are negatively correlated.

It is interesting to note that there are noteworthy similarities between the behavior of house prices and rents. Particularly, they have the same variables that affect them in the same way: when there is an increase in employment, there is a new housing need that has to be filled, which increases demand for rents as well. Similarly, when oil prices increase, it fuels higher employment and more income, creating bigger demand and better affordability. Lastly, the higher the exchange rate, the more consumers feel richer, the more they can afford higher rents. With respect to lag times, it is no coincidence that the effect of real oil prices and exchange rate is exactly the same as house prices, i.e. 2 years and 1 year respectively. This means that changes in the economy affect the real estate industry, whether renting or selling, in the same way.

However, there are major differences. For one, interest rates are no longer a significant variable directly, though it still affects rental rates via employment. This is because the increase

and decrease of interest rates do not affect the operating costs of renters because renters do not use financing for their housing needs.

Secondly, rents seem to be less sensitive to the changes in the variables.

Effect of 1,000 employee increase on rental rates: $1.16 (0.14% appreciation)

Effect of a $1/barrel change in oil prices on rental rates

	Current	Year 1	Year 2
via Employment	0.41	0.78	1.11
Direct Effect	0.51	0.85	1.12
Total Effect	0.92	1.63	2.23
Accumulative Appreciation	0.1%	0.2%	0.3%

Effect of a 10 cents appreciation in exchange rate on rental rates

	Current	Year 1
via Employment	-4.94	-9.46
Direct Effect	20.53	26.31
Total Effect	15.58	16.85
Accumulative Appreciation	1.9%	2.1%

Effect of a 1% decrease in interest on rental rates

	Current	Year 1
Total Effect (via Employment)	0.48	1.09
Accumulative Appreciation	0.1%	0.1%

With respect to the regression equation, it is interesting to note that the intercept of $150 seems to determine the minimum level acceptable for board and lodging.

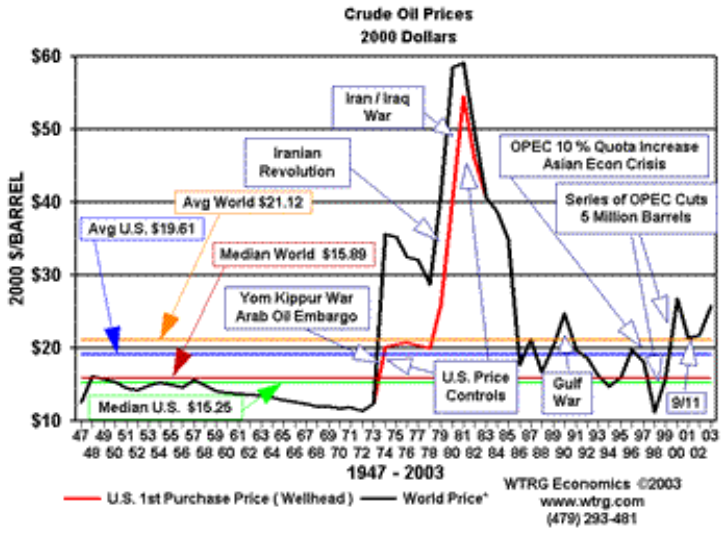
Conclusion:

Thus the abovementioned model makes sense and is a good model to predict rents for the Calgary market. In fact, based on the model, one can predict rents given today's oil prices and exchange rates as far as two years from now with a margin of error of only $13 CAD with a 95% confidence level.

FORECAST AND SENSATIVITY ANALYSIS BASED ON OIL PRICE CHANGES

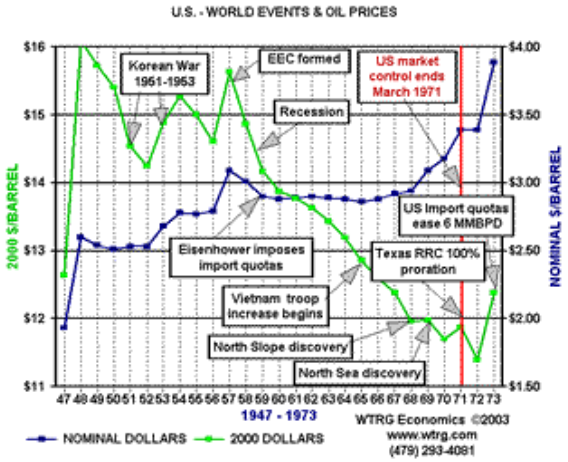
History of Oil Prices[11]

The complete history of oil prices is exhaustive and is beyond the scope of this paper. However, below are charts which will give a good picture on the key historical facts and events that affected oil prices in the past.

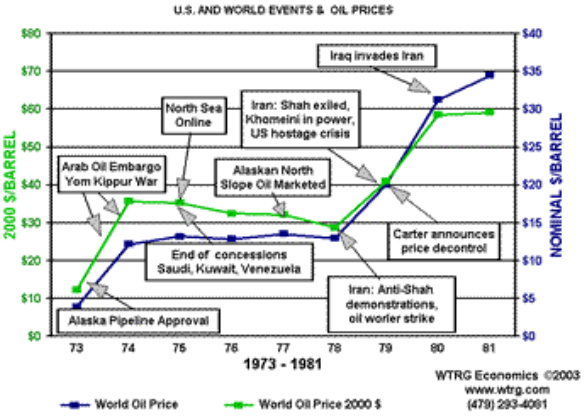


[11] Source: WTRG Economics (http://www.wtrg.com/prices.htm) and http://www.eia.doe.gov/price.html

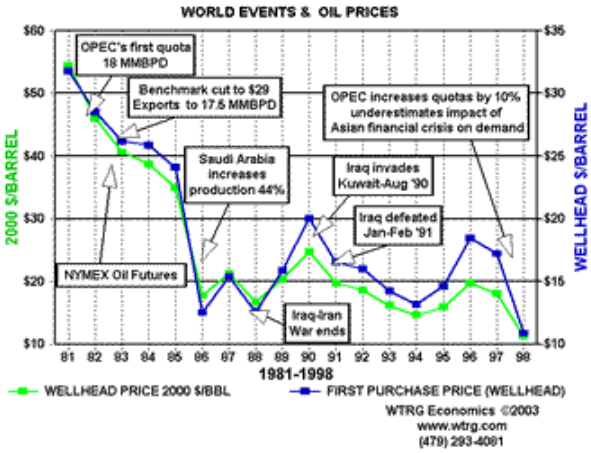
Pre-OPEC/Arab Boycott – 1947-1973



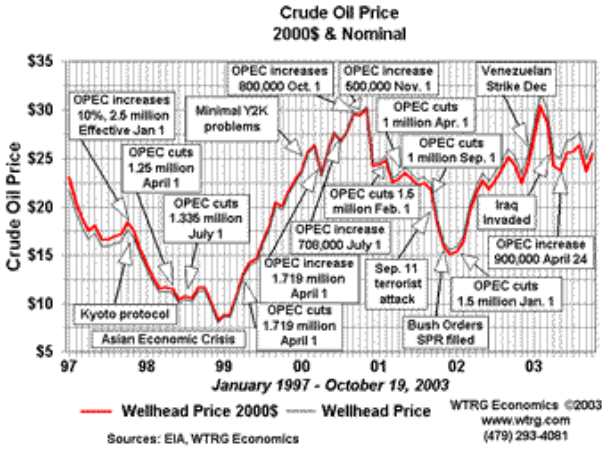
Post-OPEC oil price boom – 1974-1982



The Recession 1982-1997



Recent Events – 1998-2004



Oil Prices Today

Current oil production is just about equal to current global demand for oil. However, oil is running scarce. The average life cycle of an oil reserve is 50 years, with the largest producer and exporter of oil, Saudi Arabia, already in its 7th decade of production. Still, among all the oil supplier countries, only Saudi Arabia is operating with excess capacity. Furthermore, most of the supply of crude oil relies on the politically unstable regions such as the Middle East with all its violence, Nigeria with its ethnic tension and the increasingly unfriendly Venezuela with its strikes. [8]

On the other hand, the demand for oil is increasing with fervor. There is higher than expected demand in industrialized countries and the unexpected appetite for oil of an emerging economic power, China. The US is the largest consumer of oil, and demand has risen because of its strengthening economic recovery and greater consumption from the popular fuel-hungry Sport Utility Vehicles (SUVs). China's demand is up 20% over the past year, driven primarily by its expanding economy. Traders are betting this rapid growth will continue for several years although there is some chance that the economy will "overheat" and oil demand growth will slacken.

The producers' cartel Opec accounts for about half of the world's crude oil exports and attempts to keep prices roughly where it wants them by trimming or lifting supplies to the market. International oil companies traditionally used times of seasonally weaker demand, when prices were lower, to rebuild stocks. However, consumption forecasts by market experts turned out to be too low. The result was that producers were not able to accumulate stock. Opec argues that its members are now pumping flat-out - which is largely true - and that it is powerless in a situation where factors other than mere supply and demand are at work. This lack of stock makes the prices more volatile and sensitive to world oil events.

Both the scarcity of supply and the increase in demand has fueled the increase in oil prices today. If no new source of oil or alternative source of energy is found, economists predict the world will run out of oil by the year 2070.

Sensitivity Analysis for Oil Prices

Based on Dr. Sherry Cooper, chief economist of BMO Nesbitt Burns, "Light sweet crude [oil prices] will likely average about $45 USD/barrel over the long term, taking into account peaks at over $60 US per barrel during high growth periods, an troughs in the mid-$30's US during recessions" [4]. Based on this analysis, we will forecast oil prices based on 3 future scenarios: $30 USD/barrel (depression), $45 USD/barrel (expected average) and $60 USD/barrel (during peak seasons).

Assumptions

Interest and Exchange Rates estimates were based on the financial outlook from TD Economics, the economics department of one of the biggest banks in Calgary, TD Canada Trust. The forecast was based on their economists and experts.

The Interest Rate and Foreign Exchange outlook is as follows:

	2005			2006				2007/08
	Q2	Q3	Q4	Q1	Q2	Q3	Q4	
Interest Rate	3.74	4.15	4.45	4.70	4.85	4.60	4.45	5.00
Exchange Rate	1.235	1.227	1.220	1.216	1.212	1.208	1.205	1.20

Plugging in the forecasts for interest rate, oil prices and exchange rates, the regression models were used for future forecasts of employment.

It is important to note that forecast for housing price for the year 2006 and 2007 will be based on the actual oil prices, interest rates and exchange rates in the past year and today, thus will be more reliable data and less sensitive to changes in forecast assumptions.

Forecast Results for Housing Prices: Annual Model

	$30/barrel	$45/barrel	$60/barrel
Current	185,000.00	185,000.00	185,000.00
2006	215,118.08	216,539.66	217,961.24
2007	232,523.12	235,830.56	239,138.00
2008	236,555.00	245,714.27	254,873.53
2009	237,880.88	250,543.67	263,206.46
2010	238,942.65	254,041.78	269,140.90

Forecast Results for Housing Prices: Quarterly Model

	$30/barrel	$45/barrel	$60/barrel
Current	185,000.00	185,000.00	185,000.00
2005.2	190,021.30	190,443.17	190,865.03
2005.3	195,504.07	196,654.41	197,804.74
2005.4	201,853.55	203,948.31	206,043.06
2006.1	207,345.28	210,529.56	213,713.85
2006.2	211,984.21	216,348.12	220,712.03
2006.3	216,352.52	221,943.81	227,535.11
2006.4	220,372.06	227,206.28	234,040.49
2007.1	223,127.78	232,001.15	240,874.51
2007.2	225,470.54	236,207.11	246,943.68
2007.3	227,473.64	239,912.38	252,351.11
2007.4	229,182.05	243,175.62	257,169.19
2008.1	230,677.65	246,091.30	261,504.95
2008.2	231,922.40	248,632.92	265,343.44
2008.3	232,960.53	250,855.28	268,750.03
2008.4	233,828.26	252,804.29	271,780.32

To check the accuracy of the housing forecast models, I compared the annual model with the quarterly model. On average, there price differences were 4% or less.

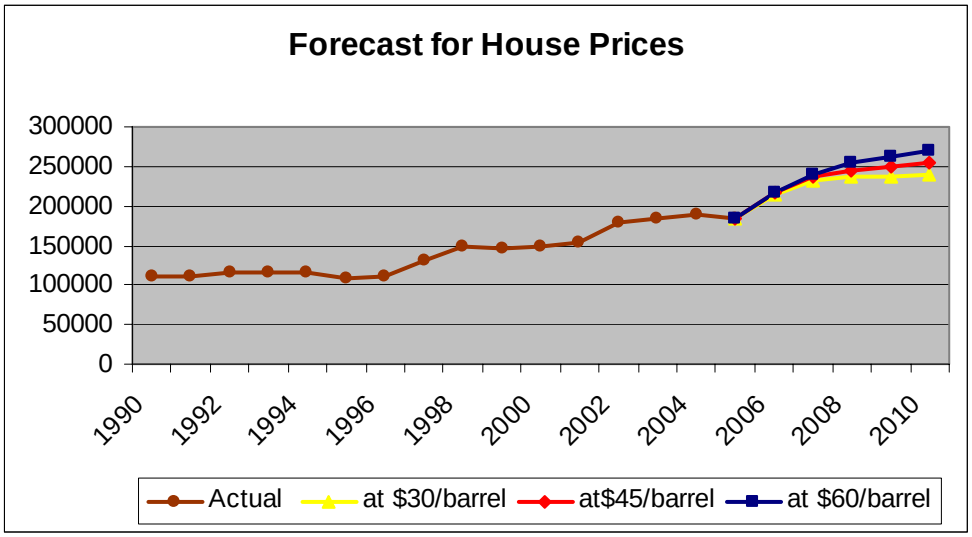
Price Differential	$30/barrel	$45/barrel	$60/barrel
2006	1,104.56	(2,467.28)	(6,039.13)
2007	6,209.62	(1,993.50)	(10,196.62)
2008	4,207.79	(3,881.68)	(11,971.15)
Difference	2%	-1%	-4%

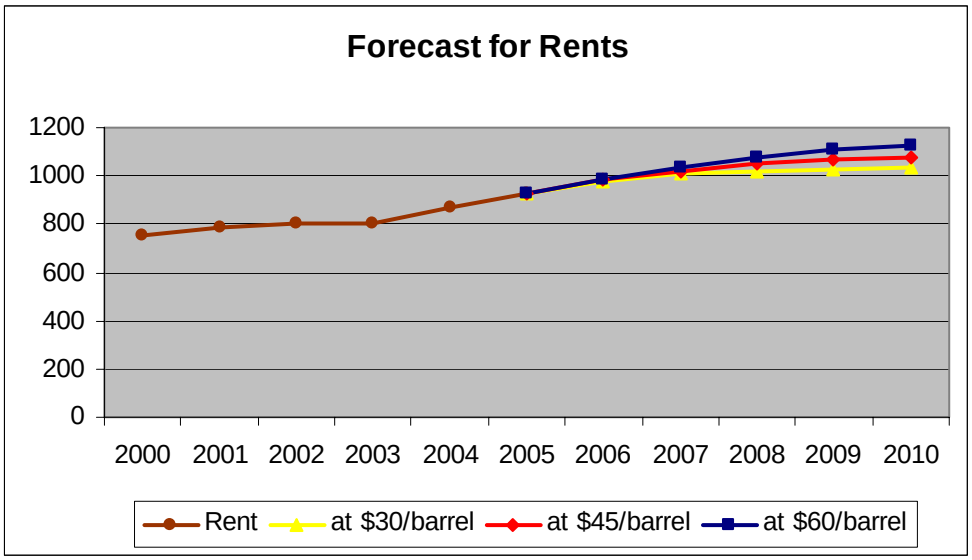
Forecast Results for Rents:

	$30/barrel	$45/barrel	$60/barrel
Current	931	931	931
2006	976	982	988
2007	1007	1020	1034
2008	1017	1047	1077
2009	1025	1065	1105
2010	1032	1080	1128

Analysis:

Based on the current outlook on interest rates, exchange rates, and oil prices, things are optimistic for the Calgary housing market in the next quarters and years. In fact, considering that the increase in oil prices happened early this year, housing prices are expected to reflect this jump next year with an appreciation of 16-17% and 8-10% in the next year after that. Rents on the other hand, will follow the same upward trend but in a much slower pace, increasing by 5-6% in the next year and only 8-11% in the year after. Both house prices and rents level off in 2010 onwards.





Given the strength of other economic indicators, i.e. a low interest rate, an exchange rate of about 1.20 CAD/USD and exploding employment, a sharp decrease in house prices and rents are expected only when prices fall to the low $20/barrel range, which is highly unlikely given the current supply and demand issues of the global oil economy. In fact, the "breakeven" level for housing prices to remain level is at the $25/barrel range. Below this level, it's time to sell. Above this level, prices will continue to appreciate. It is not a coincidence that this threshold is consistent with the "breakeven" level of oil and gas companies to remain economically viable.

However, it seems that at the point when changes in oil prices are reflected in the market, i.e. on the 3rd year onward, for every $15/barrel difference, there is a 5-6% difference in forecasted housing prices and 3-5% difference in rents which accumulate and widens every year.

FORECAST AND SENSATIVITY ANALYSIS BASED ON EXCHANGE RATES

Assuming the long-term forecast of $45/US barrel, the same interest rates as indicated in the TD Economics report and the corresponding employment levels using the regression equation, a similar sensitivity analysis can be done using three levels of exchange rates: 1.2 (current), 1.4 and 1.0 CAD to the USD.

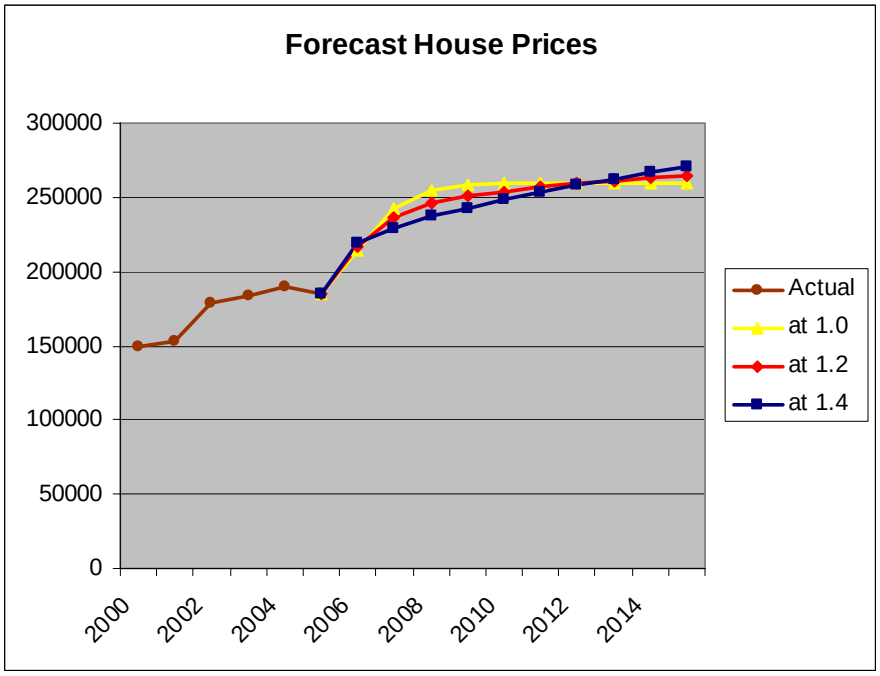
Forecast Results for Housing Prices:

	At 1.0	At 1.2	At 1.4
Current	185000.0	185000.0	185000.0
2006	214110.1	216421.2	218732.3
2007	243007.7	236293.1	229578.5
2008	254336.1	245807.2	237278.4
2009	258017	250492.2	242967.4
2010	259445.6	253938.4	248431.2
2011	259949.6	256739.6	253529.5
2012	260078.5	259153.3	258228.1
2013	260059	261296.8	262534.6
2014	259984.3	263228.1	266471.9
2015	259892.7	264980.2	270067.7

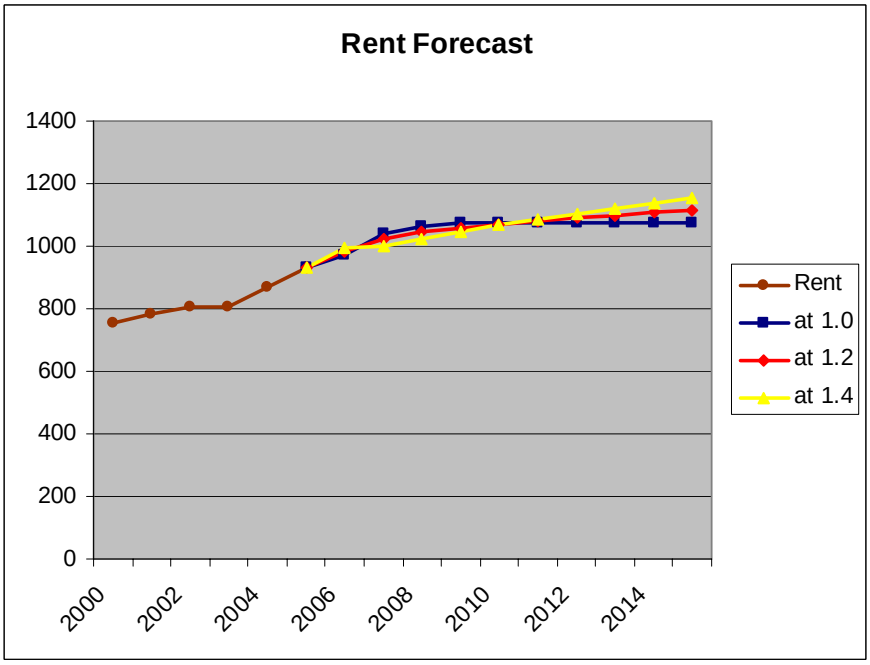
Forecast Results for Rent :

	At 1.0	At 1.2	At 1.4
Current	931	931	931
2006	972	982	992
2007	1,039	1,020	1,002
2008	1,064	1,043	1,023
2009	1,073	1,059	1,045
2010	1,076	1,071	1,066
2011	1,077	1,082	1,087
2012	1,077	1,091	1,105
2013	1,076	1,099	1,122
2014	1,076	1,107	1,138
2015	1,075	1,114	1,152

Based on the forecasts of housing prices, there is a *short-term* but very slight advantage on the strengthening of the Canadian dollar. This is probably caused by the direct and immediate effect of the Canadian dollar having more purchasing power, making Canadians afford new housing or upgrade their current dwelling unit. However, in the *medium-term* (as soon as the second year to the seventh year), the housing market would already reflect the indirect effect of the strengthened dollar via weakening imports, weakening of export companies including oil and gas companies and the slowing down employment because of this. But in the *long-term* (8^{th} year onwards), the housing market would benefit from the strengthening of the Canadian dollar because the country as a whole would have a stronger economy.



Rent follows the same trend, with a short term advantage for a strong dollar, a medium term advantage for the weaker dollar (except that it lasts only until the 5th year), and finally a long term advantage with a strong dollar, for the same reasons.



For all forecasts, housing prices are expected to increase by 15-18% in the first year, and 5-13% in the next. Rents are expected to increase from 5-7% in the first year and 8-11% in the second.

FORECAST AND SENSATIVITY ANALYSIS BASED ON INTEREST RATES

Assuming the long-term forecast of $45/US barrel, the same exchange rates as indicated in the TD Economics report and the corresponding employment levels using the regression equation, a similar sensitivity analysis can be done using three levels of exchange rates: 5% (long term expected average), 4% and 6%.

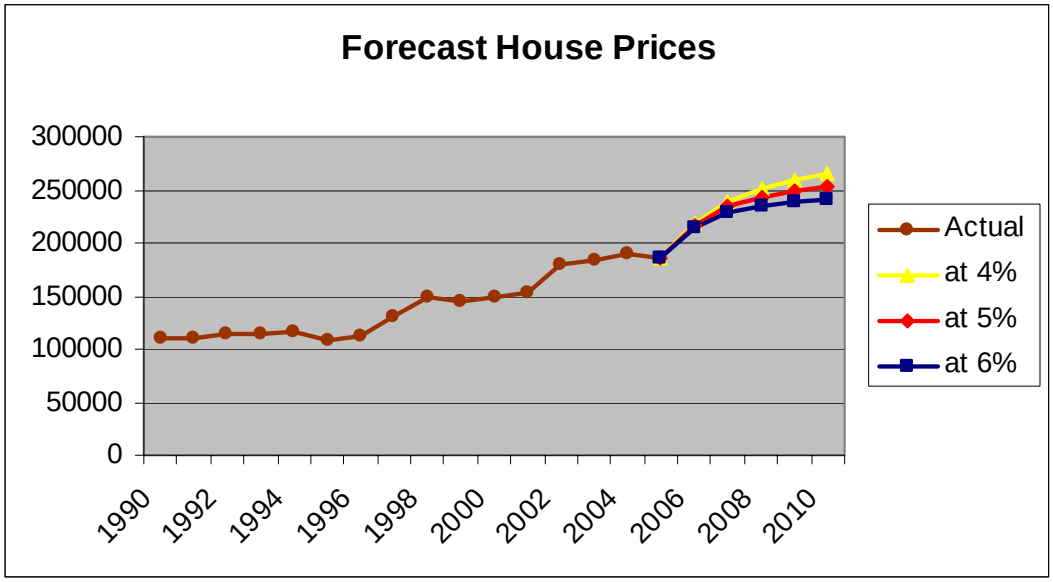
Forecast Results for Housing Prices:

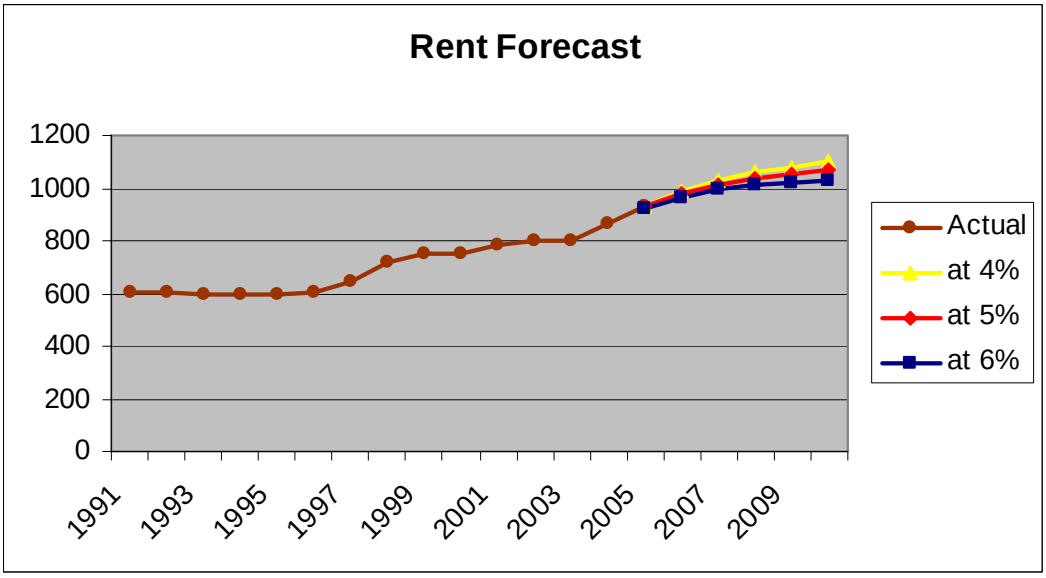
	At 4%	At 5%	At 6%
Current	185,000	185,000	185,000
2006	217,418	215,792	214,166
2007	238,501	233,933	229,366
2008	251,369	243,400	235,432
2009	259,206	249,018	238,829
2010	264,740	252,892	241,044

Forecast Results for Rents:

	At 4%	At 5%	At 6%
Current	931	931	931
2006	987	976	965
2007	1029	1012	995
2008	1059	1036	1013
2009	1082	1053	1024
2010	1099	1066	1032

For all forecasts, housing prices are expected to increase by 15-18% in the first year, and 7-10% in the next. Rents are affected only indirectly, in as much as it affects employment. Forecasts for rent are expected to increase from 4-7% in the first year, and 8-12% in the second.



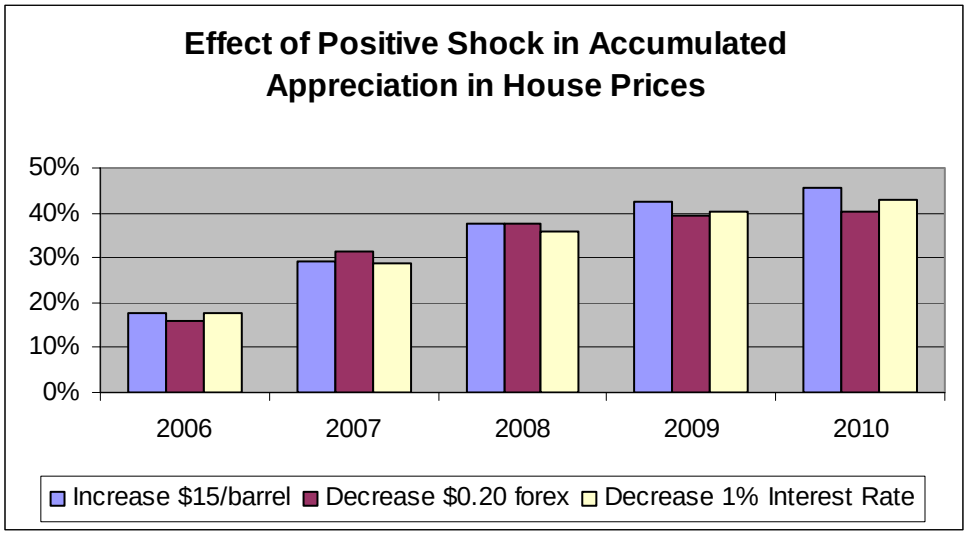


The "breakeven" point at which prices will start to decline is at 10.5% for housing prices and 10% for rent. The only time interest rates reached this high was during the recession in 1980-1986 and once in 1990. It seems unlikely that interest rates would reach these alarming levels in the next five years.

CONCLUSION ON HOUSE PRICES

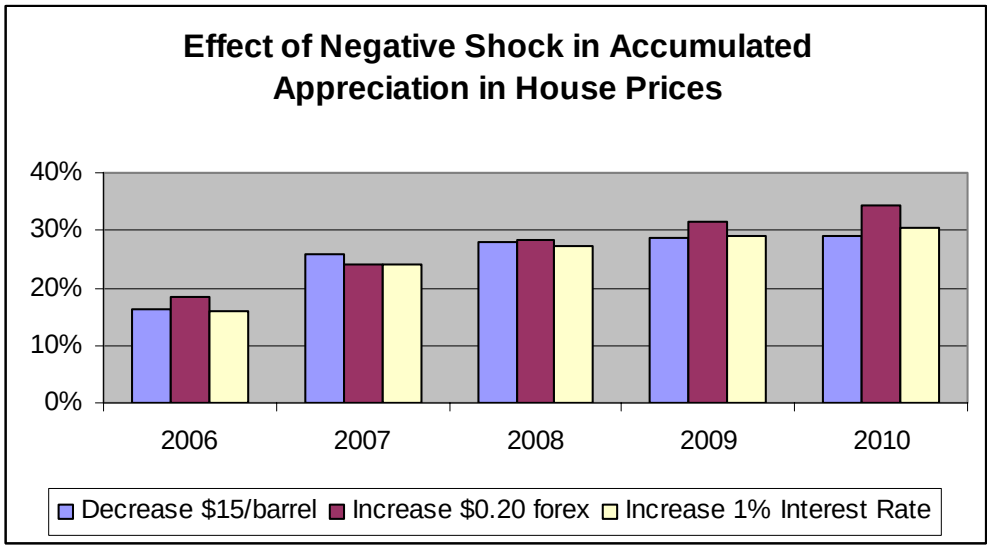
Based on the forecasts, a positive shock in the economy defined as either an increase in oil prices of $15/barrel, a decrease of foreign exchange by $0.20 or a decrease in interest rates would produce more or less the same accumulated appreciation per year. See chart below.

	Increase $15/barrel	***Decrease $0.20 Forex***	***Decrease 1% Interest Rate***
2006	18%	16%	18%
2007	29%	31%	29%
2008	38%	37%	36%
2009	42%	39%	40%
2010	45%	40%	43%



On the other hand, negative shocks in the economy, *in isolation*, defined as the reverse will only slow down or arrest the appreciation of house prices by the third year, without decreasing the real estate value.

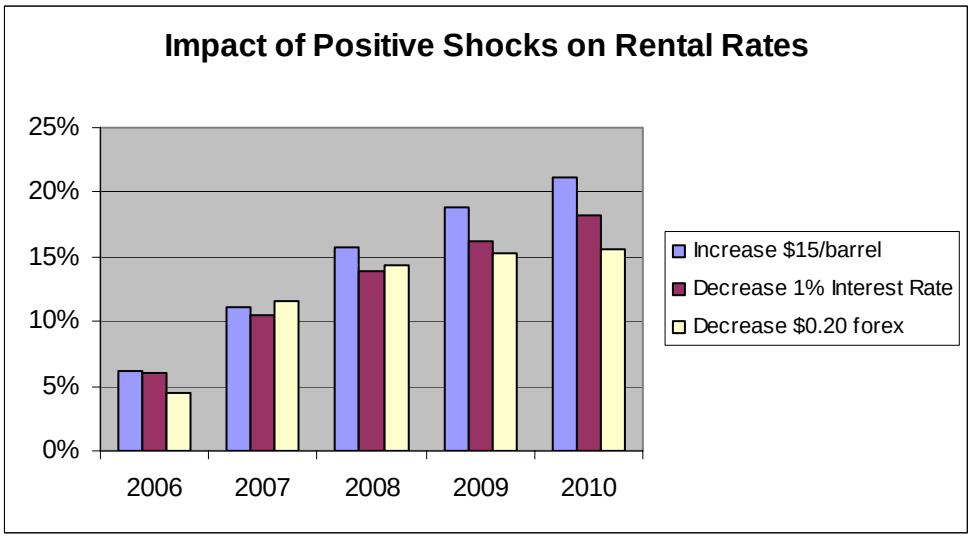
	Decrease $15/barrel	**Increase $0.20 forex**	**Increase 1% Interest Rate**
2006	16%	18%	16%
2007	26%	24%	24%
2008	28%	28%	27%
2009	29%	31%	29%
2010	29%	34%	30%

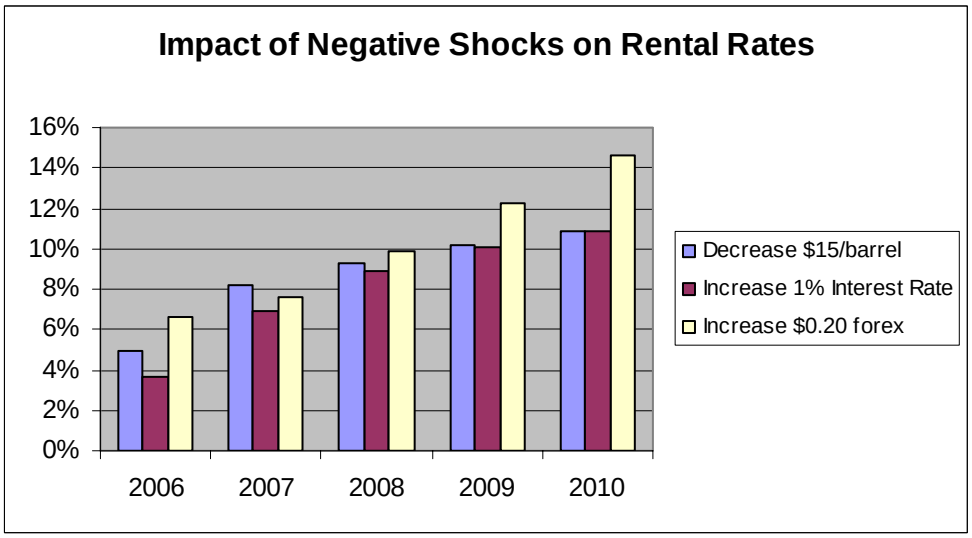


It thus seems like a high return investment to buy housing now in the Calgary market. It is generally low risk, based on this thesis since the most recent increase in real oil prices of +$14 in the past two years (from an annual average of $28 to $42) is fuelling the increase in prices now. If prices continue at the current average of $45/barrel, we should be expecting an appreciation of 17%. If prices continue at the level that is this month (July 2005) at $55-60/barrel, we can expect an 18% appreciation next year and an accumulated appreciation of 33% by the 2nd and 3rd year when the oil prices reflect in the market.

CONCLUSION ON RENTAL RATES

Rents, on the other hand, are more sensitive to positive shocks in oil prices and negative shocks in foreign exchange, while stickier in the reverse. The spending pattern seems to be that good news is more welcomed in oil prices and bad news seems to be more alarming, when it comes to exchange rates. Rents seem least sensitive to changes in interest rate.





The prospects in rents seem equally optimistic. Rents seem to spiral upward, reflecting the past positive shocks in the economy and following the pattern of housing prices. Even with isolated negative shocks, we are expecting at least a 4-7% increase in rents next year and a 7-8% accumulated increase in rents the year after.

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Appendix C

	Definition of Variables Used
Oil Prices	
Nominal Oil	Refiner Acquisition Cost of Imported Crude Oil in $USD per barrel
Real Oil Calgary 2005	Inflation adjusted to 2005 index based on Calgary CPI in $USD per barrel
Real Oil Canada 2005	Inflation adjusted to 2005 index based on Total Canada CPI index in $USD per barrel
GDP Deflated Oil 2004	Constant 2004 GDP deflated prices based on Total Canada
Financial Indicators	
Exchange Rate	Foreign exchange of US dollar rates in Canadian dollars. Noon spot rate, average. Source: Bank of Canada.
Interest Rate	10 year government Canadian bond. Source: Bank of Canada
Mortgage Rate	Conventional mortgage lending rate, 5-year term in percent. Source: Canada Mortgage and Housing Corporation
Vacancy Rate	Vacancy rates in percent of apartment structures of six units and over, privately initiated in CMA of Calgary, Alberta. Source: Canada Mortgage and Housing Corporation
Inflation Calgary	Consumer Price Index of Calgary
Inflation Canada	Consumer Price Index of Canada
Employment in Calgary	
Total Population	Number of persons of working age. Estimates in thousands, rounded to the nearest hundred
Total Labour Force	Number of civilian, non-institutionalized persons 15 years of age and over who, during the reference week, were employed or unemployed. Estimates in thousands, rounded to the nearest hundred
Total Employment	Number of persons who, during the reference week, worked for pay or profit, or performed unpaid family work or had a job but were not at work due to own illness or disability, personal or family responsibilities, labour dispute, vacation, or other reason. Those persons on layoff and persons whose job attachment was to a job to start at a definite date in the future are not considered employed. Estimates in thousands, rounded to the nearest hundred.
Unemployment Rate	The unemployment rate is the number of unemployed persons expressed as a percentage of the labour force. The unemployment rate for a particular group (age, sex, marital status) is the number unemployed in that group expressed as a percentage of the labour force for that group. Estimates are percentages, rounded to the nearest tenth.
Housing Stock	
Housing Starts Total Completions Single detached housing Semi-detached housing Apartments Row Units	Housing starts, under construction and completions in Calgary CMA for the following dwelling types: single detached, semi-detached, apartment units and row housing units and total completions. Source: Canada Mortgage and Housing Corporation
Housing Stock[12]	Stock data for the following dwelling types: single detached, apartment, movable dwelling and other type of dwelling and total housing stock. Source: Census Data

[12] Housing Stock computed as housing stock per 5 years in Census data plus housing starts per year

Appendix A
Annual Raw Data Used for Regression Analysis

	PRICE	RENT	EMP	CPI	INT	EXCH	OIL	REAL OIL
1970							1.800	
1971				26.21	6.6082		2.133	10.871
1972				27.34	6.9269		2.463	12.037
1973				29.22	7.2653		3.145	14.380
1974				32.16	8.6662		12.443	51.698
1975				35.83	8.7883		13.884	51.769
1976			234.1	38.83	8.9164		13.472	46.350
1977	64000		262.9	42.12	8.4331	1.0634	14.526	46.081
1978	69500		274.3	45.61	9.0349	1.1407	14.562	42.658
1979	78000		296.4	49.56	10.0183	1.1714	21.543	58.078
1980	89000		322.5	54.68	12.3670	1.1692	33.973	83.007
1981	99000		331.4	61.97	15.1969	1.1989	37.476	80.802
1982	90000		311.1	69.43	14.5401	1.2337	33.593	64.643
1983	80000		313.5	72.51	11.4342	1.2324	29.347	54.076
1984	70000	485	336.7	74.37	12.7300	1.2951	28.866	51.861
1985	73000	496	353.5	76.51	10.8300	1.3655	26.998	47.148
1986	74500	509	365.6	79.20	9.1217	1.3895	14.323	24.162
1987	84000	510	371.6	82.17	9.4958	1.3260	18.047	29.345
1988	93400	523	379.9	84.37	9.8333	1.2307	14.621	23.154
1989	106000	555	390.7	87.68	9.7950	1.1840	18.069	27.533
1990	110000	595	395.5	93.11	10.7625	1.1668	22.202	31.859
1991	110000	608	395.6	98.68	9.4183	1.1457	18.739	25.371
1992	115000	607	392.7	99.99	8.0533	1.2087	18.115	24.205
1993	115000	593	395.1	101.33	7.2150	1.2901	16.170	21.320
1994	117000	594	403.2	102.76	8.4250	1.3657	15.411	20.037
1995	109000	592	425.2	105.14	8.0825	1.3724	17.147	21.789
1996	112000	606	450.7	107.36	7.2033	1.3635	20.599	25.636
1997	130000	647	471.7	109.72	6.1092	1.3846	18.554	22.594
1998	150000	722	498.8	111.32	5.2967	1.4835	12.098	14.520
1999	145000	753	515.5	114.23	5.5517	1.4857	17.271	20.202
2000	150000	753	541.9	118.43	5.8900	1.4854	27.683	31.229
2001	152961	783	562.8	121.29	5.4675	1.5488	21.988	24.220
2002	179100	804	572.6	125.80	5.2942	1.5703	23.633	25.100
2003	183500	804	583.5	130.18	4.7942	1.4010	27.845	28.578
2004	189900		598.3	132.45	4.6011	1.3013	35.902	36.216
2005	185000			133.61		1.2364	42.815	42.815

PRICE - House Prices of NE Detached Bungalow
RENT - Rent index for 2 Bedroom Apartment
CPI - Consumer Price Index for CMA of Calgary, Canada (1992 = 100)
INT - Interest Rate, 10-year Canadian government bond
EXCH - Exchange Rate, CAD=$1USD, noon spot rate average
OIL - Nominal Oil Prices in $USD per barrel
REAL OIL - Nominal Oil Prices in $USD per barrel adjusted based on Calgary CPI (index 2005)

Appendix B
Quarterly Raw Data Used for Regression Analysis

	PRICE	EMP	OIL	REAL OIL	CPI	INT	EXCH
1970.1			1.800			7.839	
1970.2			1.800			7.834	
1970.3			1.800			7.626	
1970.4			1.800			7.140	
1971.1			1.990	10.196	25.933	6.380	
1971.2			2.180	11.140	26.000	6.935	
1971.3			2.180	10.999	26.333	6.886	
1971.4			2.180	10.903	26.567	6.232	
1972.1			2.413	11.920	26.900	6.659	
1972.2			2.480	12.129	27.167	7.071	
1972.3			2.480	11.997	27.467	7.163	
1972.4			2.480	11.839	27.833	6.814	
1973.1			2.590	12.131	28.367	6.913	
1973.2			2.590	11.907	28.900	7.342	
1973.3			2.590	11.626	29.600	7.468	
1973.4			4.808	21.296	30.000	7.338	
1974.1			11.590	50.106	30.733	7.617	
1974.2			12.933	54.266	31.667	8.882	
1974.3			12.653	51.624	32.567	9.518	
1974.4			12.597	49.713	33.667	8.648	0.986
1975.1			13.033	50.389	34.367	7.998	0.999
1975.2			13.560	51.281	35.133	8.651	1.022
1975.3			14.107	51.445	36.433	9.279	1.031
1975.4			14.837	52.709	37.400	9.225	1.018
1976.1			13.347	46.749	37.933	9.063	0.995
1976.2		224.0	13.427	46.296	38.533	9.093	0.979
1976.3		234.1	13.520	46.021	39.033	9.005	0.977
1976.4		244.1	13.593	45.341	39.833	8.505	0.992
1977.1		254.1	14.383	46.955	40.700	8.381	1.030
1977.2		264.2	14.537	46.170	41.833	8.524	1.052
1977.3		265.8	14.540	45.456	42.500	8.349	1.070
1977.4	64,000	267.4	14.643	44.795	43.433	8.478	1.102
1978.1	65,500	269.0	14.500	43.653	44.133	8.898	1.113
1978.2	66,750	270.6	14.483	42.480	45.300	8.984	1.127
1978.3	68,000	276.0	14.493	41.742	46.133	8.906	1.144
1978.4	69,500	281.5	14.770	41.873	46.867	9.352	1.178
1979.1	71,500	286.9	15.930	44.218	47.867	9.692	1.186
1979.2	72,500	292.3	19.203	51.930	49.133	9.446	1.158
1979.3	73,500	299.5	24.043	63.764	50.100	9.928	1.166
1979.4	78,000	306.8	26.993	70.140	51.133	11.007	1.175
1980.1	80,000	314.0	32.190	81.882	52.233	12.780	1.164
1980.2	83,000	321.2	34.117	84.465	53.667	11.353	1.170
1980.3	86,000	325.3	34.470	82.720	55.367	12.474	1.159
1980.4	89,000	329.5	35.117	81.192	57.467	12.860	1.184
1981.1	74,000	333.6	38.720	86.902	59.200	13.173	1.194
1981.2	86,500	337.7	37.760	82.292	60.967	15.033	1.199
1981.3	99,000	330.7	35.947	75.771	63.033	17.258	1.212
1981.4	99,000	323.6	35.863	73.686	64.667	15.324	1.192
1982.1	99,000	316.6	35.030	69.606	66.867	15.291	1.209
1982.2	99,000	309.6	33.130	63.764	69.033	16.390	1.245
1982.3	94,000	309.3	33.140	62.398	70.567	14.557	1.250
1982.4	90,000	309.0	33.073	61.661	71.267	11.923	1.231
1983.1	89,000	308.7	30.197	56.140	71.467	11.320	1.227
1983.2	88,000	308.4	28.570	52.239	72.667	11.017	1.231
1983.3	86,000	315.1	29.267	53.488	72.700	11.773	1.233
1983.4	80,000	321.8	29.353	53.280	73.200	11.627	1.238
1984.1	73,000	328.6	28.887	52.053	73.733	12.333	1.255
1984.2	75,500	335.3	29.187	52.357	74.067	13.690	1.293
1984.3	75,500	339.4	28.873	51.287	74.800	13.043	1.314
1984.4	70,000	343.5	28.517	50.609	74.867	11.853	1.318
1985.1	68,000	347.6	27.227	47.978	75.400	11.747	1.353
1985.2	70,000	351.7	27.480	47.811	76.367	10.910	1.369
1985.3	70,000	355.5	26.580	45.905	76.933	10.670	1.360
1985.4	73,000	359.2	26.707	45.885	77.333	9.993	1.379
1986.1	75,000	362.9	19.087	32.457	78.133	9.690	1.404
1986.2	77,000	366.6	12.857	21.678	78.800	8.953	1.384
1986.3	74,500	366.5	11.877	19.791	79.733	8.960	1.385
1986.4	74,500	366.4	13.470	22.334	80.133	8.883	1.385
1987.1	72,000	366.3	16.897	27.900	80.467	8.297	1.338
1987.2	78,000	366.2	18.283	29.613	82.033	9.410	1.333
1987.3	80,000	372.6	19.050	30.495	83.000	10.303	1.322
1987.4	84,000	381.1	17.957	28.687	83.167	9.973	1.311
1988.1	84,000	377.4	15.203	24.124	83.733	9.350	1.267
1988.2	84,000	376.2	15.683	24.680	84.433	9.800	1.230
1988.3	92,500	381.0	14.323	22.460	84.733	10.187	1.219
1988.4	93,400	384.8	13.273	20.854	84.567	9.997	1.206
1989.1	89,000	393.4	16.807	26.189	85.267	10.337	1.192
1989.2	95,000	396.7	18.970	28.960	87.033	9.767	1.193
1989.3	106,000	383.9	17.613	26.324	88.900	9.520	1.182
1989.4	106,000	388.5	18.887	28.028	89.533	9.557	1.168
1990.1	118,000	391.4	19.743	28.806	91.067	10.483	1.183
1990.2	125,000	396.3	15.960	22.933	92.467	11.003	1.170
1990.3	120,000	395.9	23.560	33.396	93.733	10.930	1.153
1990.4	110,000	398.0	29.543	41.247	95.167	10.633	1.161
1991.1	110,000	398.5	19.393	26.356	97.767	9.730	1.156
1991.2	115,000	397.8	18.153	24.554	98.233	9.757	1.149
1991.3	113,000	396.0	18.617	24.851	99.533	9.610	1.144
1991.4	110,000	389.5	18.793	25.171	99.200	8.577	1.135
1992.1	110,000	386.8	16.153	21.577	99.467	8.430	1.177
1992.2	117,000	393.8	18.663	24.847	99.800	8.500	1.194
1992.3	117,000	398.4	19.417	25.747	100.200	7.533	1.202
1992.4	115,000	391.3	18.227	24.097	100.500	7.750	1.262
1993.1	114,000	390.1	17.343	22.898	100.633	7.650	1.261
1993.2	115,000	391.0	17.680	23.289	100.867	7.457	1.270
1993.3	115,000	394.9	15.590	20.341	101.833	6.993	1.304
1993.4	115,000	404.4	14.067	18.323	102.000	6.760	1.325
1994.1	117,000	402.1	13.003	16.944	101.967	7.093	1.341
1994.2	117,000	396.5	15.773	20.526	102.100	8.490	1.382
1994.3	117,000	399.6	16.697	21.496	103.200	8.993	1.371
1994.4	117,000	415.1	16.170	20.705	103.767	9.123	1.368
1995.1	115,000	415.5	16.993	21.627	104.400	8.890	1.407
1995.2	112,500	421.8	18.230	23.068	105.000	8.000	1.371
1995.3	110,000	430.9	16.583	20.885	105.500	8.053	1.356
1995.4	109,000	433.0	16.780	21.099	105.667	7.387	1.356
1996.1	110,000	438.1	18.383	23.007	106.167	7.393	1.369
1996.2	111,000	454.5	20.257	25.122	107.133	7.750	1.365
1996.3	112,000	456.4	20.723	25.503	107.967	7.373	1.370
1996.4	116,000	454.3	23.033	28.293	108.167	6.297	1.350
1997.1	120,000	460.6	21.020	25.591	109.133	6.540	1.359
1997.2	124,000	461.0	17.910	21.719	109.567	6.490	1.386
1997.3	127,000	471.1	17.767	21.453	110.033	5.853	1.385
1997.4	130,000	495.2	17.520	21.136	110.133	5.553	1.409
1998.1	154,000	495.1	13.330	16.106	109.967	5.407	1.430
1998.2	154,000	496.3	12.343	14.726	111.367	5.393	1.447
1998.3	154,000	502.3	11.887	14.084	112.133	5.363	1.515
1998.4	150,000	501.7	10.830	12.871	111.800	5.023	1.542
1999.1	150,000	508.0	10.863	12.834	112.467	5.067	1.511
1999.2	150,000	515.5	15.433	18.061	113.533	5.340	1.473
1999.3	150,000	515.8	19.750	22.812	115.033	5.647	1.486
1999.4	145,000	522.8	23.037	26.417	115.867	6.153	1.473
2000.1	147,000	534.5	26.793	30.707	115.933	6.220	1.454
2000.2	147,000	538.3	26.517	29.968	117.567	6.010	1.480
2000.3	152,000	540.4	29.120	32.323	119.700	5.793	1.482
2000.4	150,000	554.3	28.300	31.196	120.533	5.537	1.526
2001.1	152,000	545.2	24.157	26.881	119.400	5.387	1.528
2001.2	152,000	561.3	23.857	25.708	123.300	5.783	1.541
2001.3	155,000	569.6	23.013	24.873	122.933	5.480	1.546
2001.4	155,000	574.6	16.923	18.811	119.533	5.220	1.580
2002.1	166,900	573.5	19.190	20.888	122.067	5.507	1.594
2002.2	175,100	567.7	23.957	25.289	125.867	5.500	1.554
2002.3	179,100	574.3	25.937	27.249	126.467	5.097	1.563
2002.4	179,100	574.7	25.450	26.254	128.800	5.073	1.570
2003.1	181,100	575.8	30.587	31.350	129.633	5.027	1.510
2003.2	184,300	581.7	25.617	26.068	130.567	4.590	1.398
2003.3	187,400	585.4	27.370	27.974	130.000	4.793	1.380
2003.4	183,500	590.8	27.807	28.304	130.533	4.767	1.316
2004.1	181,600	595.9	31.087	31.506	131.100	4.510	1.318
2004.2	189,100	600.2	33.940	33.974	132.733	4.607	1.359
2004.3	189,500	599.7	38.687	38.677	132.900	4.686	1.307
2004.4	189,900	597.2	39.893	39.833	133.067	4.450	1.221
2005.1	185,000	604.4	41.553	41.553	132.867	4.293	1.227
2005.2			46.600			4.020	1.246

PRICE - House Prices of NE Detached Bungalow
CPI - Consumer Price Index for CMA of Calgary, Canada (1992 = 100)
INT - Interest Rate, 10-year Canadian government bond
EXCH - Exchange Rate, CAD=$1USD, noon spot rate average
OIL - Nominal Oil Prices in $USD per barrel
REAL OIL - Nominal Oil Prices in $USD per barrel adjusted based on Calgary CPI (index 2005)

Appendix D

Regression Annual Analysis Employment vs Interest Rate, Exchange Rate, Employment-1 and Real Oil Price

	EMP	INT	EXCH	REAL OIL	EMP-1
1978	274.3	9.0349	1.1407	42.658	262.9
1979	296.4	10.0183	1.1714	58.078	274.3
1980	322.5	12.3670	1.1692	83.007	296.4
1981	331.4	15.1969	1.1989	80.802	322.5
1982	311.1	14.5401	1.2337	64.643	331.4
1983	313.5	11.4342	1.2324	54.076	311.1
1984	336.7	12.7300	1.2951	51.861	313.5
1985	353.5	10.8300	1.3655	47.148	336.7
1986	365.6	9.1217	1.3895	24.162	353.5
1987	371.6	9.4958	1.3260	29.345	365.6
1988	379.9	9.8333	1.2307	23.154	371.6
1989	390.7	9.7950	1.1840	27.533	379.9
1990	395.5	10.7625	1.1668	31.859	390.7
1991	395.6	9.4183	1.1457	25.371	395.5
1992	392.7	8.0533	1.2087	24.205	395.6
1993	395.1	7.2150	1.2901	21.320	392.7
1994	403.2	8.4250	1.3657	20.037	395.1
1995	425.2	8.0825	1.3724	21.789	403.2
1996	450.7	7.2033	1.3635	25.636	425.2
1997	471.7	6.1092	1.3846	22.594	450.7
1998	498.8	5.2967	1.4835	14.520	471.7
1999	515.5	5.5517	1.4857	20.202	498.8
2000	541.9	5.8900	1.4854	31.229	515.5
2001	562.8	5.4675	1.5488	24.220	541.9
2002	572.6	5.2942	1.5703	25.100	562.8
2003	583.5	4.7942	1.4010	28.578	572.6
2004	598.3	4.6011	1.3013	36.216	583.5

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.996173312
R Square	0.992361267
Adjusted R Squa	0.990972407
Standard Error	9.028227078
Observations	27

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	4.0000	232957.1830	58239.2957	714.5147	0.0000
Residual	22.0000	1793.1955	81.5089		
Total	26.0000	234750.3784			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	15.4573	32.0715	0.4820	0.6346	-51.0548	81.9694	-51.0548	81.9694
Interest Rate	-4.1153	1.4104	-2.9179	0.0080	-7.0402	-1.1904	-7.0402	-1.1904
Exchange Rate	42.5911	20.6132	2.0662	0.0508	-0.1580	85.3402	-0.1580	85.3402
Real Oil	0.3493	0.1508	2.3162	0.0303	0.0365	0.6621	0.0365	0.6621
Employ-1	0.9124	0.0383	23.8330	0.0000	0.8330	0.9918	0.8330	0.9918

Appendix E

Regression Quarterly Employment vs. Real Oil, Interest, Exchange Rate, Employment-1

	EMP	REAL OIL	INT	EXCH	EMP-1
1976.3	234.1	46.021	9.0048	0.9775	224.0
1976.4	244.1	45.341	8.5047	0.9924	234.1
1977.1	254.1	46.955	8.3811	1.0299	244.1
1977.2	264.2	46.170	8.5239	1.0524	254.1
1977.3	265.8	45.456	8.3492	1.0697	264.2
1977.4	267.4	44.795	8.4783	1.1017	265.8
1978.1	269.0	43.653	8.8977	1.1133	267.4
1978.2	270.6	42.480	8.9838	1.1273	269.0
1978.3	276.0	41.742	8.9056	1.1437	270.6
1978.4	281.5	41.873	9.3524	1.1783	276.0
1979.1	286.9	44.218	9.6920	1.1864	281.5
1979.2	292.3	51.930	9.4462	1.1581	286.9
1979.3	299.5	63.764	9.9279	1.1664	292.3
1979.4	306.8	70.140	11.0072	1.1748	299.5
1980.1	314.0	81.882	12.7802	1.1643	306.8
1980.2	321.2	84.465	11.3535	1.1701	314.0
1980.3	325.3	82.720	12.4742	1.1586	321.2
1980.4	329.5	81.192	12.8600	1.1840	325.3
1981.1	333.6	86.902	13.1728	1.1936	329.5
1981.2	337.7	82.292	15.0333	1.1986	333.6
1981.3	330.7	75.771	17.2578	1.2117	337.7
1981.4	323.6	73.686	15.3237	1.1918	330.7
1982.1	316.6	69.606	15.2906	1.2089	323.6
1982.2	309.6	63.764	16.3900	1.2446	316.6
1982.3	309.3	62.398	14.5567	1.2499	309.6
1982.4	309.0	61.661	11.9233	1.2314	309.3
1983.1	308.7	56.140	11.3200	1.2273	309.0
1983.2	308.4	52.239	11.0167	1.2310	308.7
1983.3	315.1	53.488	11.7733	1.2328	308.4
1983.4	321.8	53.280	11.6267	1.2385	315.1
1984.1	328.6	52.053	12.3333	1.2554	321.8
1984.2	335.3	52.357	13.6900	1.2925	328.6
1984.3	339.4	51.287	13.0433	1.3139	335.3
1984.4	343.5	50.609	11.8533	1.3184	339.4
1985.1	347.6	47.978	11.7467	1.3534	343.5
1985.2	351.7	47.811	10.9100	1.3693	347.6
1985.3	355.5	45.905	10.6700	1.3600	351.7
1985.4	359.2	45.885	9.9933	1.3793	355.5
1986.1	362.9	32.457	9.6900	1.4037	359.2
1986.2	366.6	21.678	8.9533	1.3842	362.9
1986.3	366.5	19.791	8.9600	1.3853	366.6
1986.4	366.4	22.334	8.8833	1.3847	366.5
1987.1	366.3	27.900	8.2967	1.3378	366.4
1987.2	366.2	29.613	9.4100	1.3329	366.3
1987.3	372.6	30.495	10.3033	1.3222	366.2
1987.4	381.1	28.687	9.9733	1.3110	372.6
1988.1	377.4	24.124	9.3500	1.2674	381.1
1988.2	376.2	24.680	9.8000	1.2298	377.4
1988.3	381.0	22.460	10.1867	1.2194	376.2
1988.4	384.8	20.854	9.9967	1.2062	381.0
1989.1	393.4	26.189	10.3367	1.1919	384.8
1989.2	396.7	28.960	9.7667	1.1932	393.4
1989.3	383.9	26.324	9.5200	1.1823	396.7
1989.4	388.5	28.028	9.5567	1.1685	383.9
1990.1	391.4	28.806	10.4833	1.1826	388.5
1990.2	396.3	22.933	11.0033	1.1704	391.4
1990.3	395.9	33.396	10.9300	1.1531	396.3
1990.4	398.0	41.247	10.6333	1.1610	395.9
1991.1	398.5	26.356	9.7300	1.1558	398.0
1991.2	397.8	24.554	9.7567	1.1489	398.5
1991.3	396.0	24.851	9.6100	1.1436	397.8
1991.4	389.5	25.171	8.5767	1.1347	396.0
1992.1	386.8	21.577	8.4300	1.1772	389.5
1992.2	393.8	24.847	8.5000	1.1942	386.8
1992.3	398.4	25.747	7.5333	1.2016	393.8
1992.4	391.3	24.097	7.7500	1.2619	398.4
1993.1	390.1	22.898	7.6500	1.2614	391.3
1993.2	391.0	23.289	7.4567	1.2702	390.1
1993.3	394.9	20.341	6.9933	1.3039	391.0
1993.4	404.4	18.323	6.7600	1.3249	394.9
1994.1	402.1	16.944	7.0933	1.3413	404.4
1994.2	396.5	20.526	8.4900	1.3824	402.1
1994.3	399.6	21.496	8.9933	1.3713	396.5
1994.4	415.1	20.705	9.1233	1.3678	399.6

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.99865914
R Square	0.99732008
Adjusted R Square	0.99722263
Standard Error	5.24826587
Observations	115

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	4	1,127,552	281,888	10,234	2E-140
Residual	110	3,030	28		
Total	114	1,130,582			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	11.3282	6.8246	1.6599	0.0998	-2.1966	24.8531	-2.1966	24.8531
Real Oil	0.0839	0.0403	2.0826	0.0396	0.0041	0.1637	0.0041	0.1637
Interest	-1.2494	0.3213	-3.8890	0.0002	-1.8860	-0.6127	-1.8860	-0.6127
Exchange Rate	8.6721	5.5030	1.5759	0.1179	-2.2335	19.5777	-2.2335	19.5777
Employment-1	0.9719	0.0097	99.9017	0.0000	0.9526	0.9912	0.9526	0.9912

	EMP	REAL OIL	INT	EXCH	EMP-1
1995.1	415.5	21.627	8.8900	1.4069	415.1
1995.2	421.8	23.068	8.0000	1.3713	415.5
1995.3	430.9	20.885	8.0533	1.3555	421.8
1995.4	433.0	21.099	7.3867	1.3560	430.9
1996.1	438.1	23.007	7.3933	1.3691	433.0
1996.2	454.5	25.122	7.7500	1.3645	438.1
1996.3	456.4	25.503	7.3733	1.3701	454.5
1996.4	454.3	28.293	6.2967	1.3503	456.4
1997.1	460.6	25.591	6.5400	1.3585	454.3
1997.2	461.0	21.719	6.4900	1.3861	460.6
1997.3	471.1	21.453	5.8533	1.3848	461.0
1997.4	495.2	21.136	5.5533	1.4089	471.1
1998.1	495.1	16.106	5.4067	1.4304	495.2
1998.2	496.3	14.726	5.3933	1.4467	495.1
1998.3	502.3	14.084	5.3633	1.5148	496.3
1998.4	501.7	12.871	5.0233	1.5422	502.3
1999.1	508.0	12.834	5.0667	1.5113	501.7
1999.2	515.5	18.061	5.3400	1.4728	508.0
1999.3	515.8	22.812	5.6467	1.4860	515.5
1999.4	522.8	26.417	6.1533	1.4727	515.8
2000.1	534.5	30.707	6.2200	1.4535	522.8
2000.2	538.3	29.968	6.0100	1.4802	534.5
2000.3	540.4	32.323	5.7933	1.4822	538.3
2000.4	554.3	31.196	5.5367	1.5257	540.4
2001.1	545.2	26.881	5.3867	1.5278	554.3
2001.2	561.3	25.708	5.7833	1.5411	545.2
2001.3	569.6	24.873	5.4800	1.5461	561.3
2001.4	574.6	18.811	5.2200	1.5804	569.6
2002.1	573.5	20.888	5.5067	1.5944	574.6
2002.2	567.7	25.289	5.5000	1.5542	573.5
2002.3	574.3	27.249	5.0967	1.5632	567.7
2002.4	574.7	26.254	5.0733	1.5695	574.3
2003.1	575.8	31.350	5.0267	1.5098	574.7
2003.2	581.7	26.068	4.5900	1.3984	575.8
2003.3	585.4	27.974	4.7933	1.3801	581.7
2003.4	590.8	28.304	4.7667	1.3158	585.4
2004.1	595.9	31.506	4.5100	1.3178	590.8
2004.2	600.2	33.974	4.6074	1.3595	595.9
2004.3	599.7	38.677	4.6858	1.3072	600.2
2004.4	597.2	39.833	4.4500	1.2207	599.7
2005.1	604.4	41.553	4.2933	1.2270	597.2
2005.2			4.0200	1.2458	604.4

Appendix F

Regression Analysis of Price against variables of Employment, Interest Rate (lag 2 yrs), Real Oil Prices (lag 2 yrs), Exchange Rate (lag 1 yr) and House Price (last year)

	PRICE	EMP	INT-2	EXCH-1	REAL OIL-2	PRICE-1
1978	69500	274.2911	8.916428	1.063442	46.35005	64000
1979	78000	296.3924	8.433119	1.140659	46.08086	69500
1980	89000	322.5189	9.03489	1.171424	42.65799	78000
1981	99000	331.4195	10.01833	1.169227	58.07817	89000
1982	90000	311.1433	12.36697	1.198903	83.00738	99000
1983	80000	313.5184	15.19692	1.233735	80.80226	90000
1984	70000	336.7198	14.54014	1.232412	64.64257	80000
1985	73000	353.5208	11.43417	1.295066	54.07598	70000
1986	74500	365.6215	12.73	1.365507	51.86081	73000
1987	84000	371.5718	10.83	1.389471	47.14784	74500
1988	93400	379.9	9.121667	1.325983	24.16168	84000
1989	106000	390.7	9.495833	1.230701	29.34505	93400
1990	110000	395.5	9.833333	1.183972	23.15447	106000
1991	110000	395.6	9.795	1.166774	27.53307	110000
1992	115000	392.7	10.7625	1.145726	31.85888	110000
1993	115000	395.1	9.418333	1.208723	25.37114	115000
1994	117000	403.2	8.053333	1.290088	24.20517	115000
1995	109000	425.2	7.215	1.365673	21.3202	117000
1996	112000	450.7	8.425	1.372445	20.03746	109000
1997	130000	471.7	8.0825	1.363522	21.78905	112000
1998	150000	498.8	7.203333	1.384598	25.63583	130000
1999	145000	515.5	6.109167	1.483505	22.59448	150000
2000	150000	541.9	5.296667	1.485705	14.52008	145000
2001	152960.5	562.8	5.551667	1.485394	20.2016	150000
2002	179100	572.6	5.89	1.54884	31.22949	152960.5
2003	183500	583.5	5.4675	1.570343	24.22024	179100
2004	189900	598.3	5.294167	1.401015	25.10024	183500

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.986999818
R Square	0.974168641
Adjusted R Square	0.968018317
Standard Error	6337.463458
Observations	27

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	5	31808055258	6361611052	158.3931	6.21117E-16
Residual	21	843432304.8	40163443.08		
Total	26	32651487563			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	48543.8211	19247.05766	2.52214	0.01981	8517.37366	88570.26851	8517.37366	88570.26851
Employment	271.3119	73.81306	3.67566	0.00141	117.80928	424.81458	117.80928	424.81458
Interest -2	-2588.1735	949.41536	-2.72607	0.01266	-4562.59080	-613.75616	-4562.59080	-613.75616
Exchange -1	-60457.8502	23183.58807	-2.60779	0.01643	-108670.76070	-12244.93963	-108670.76070	-12244.93963
Real Oil -2	259.1513	133.55474	1.94041	0.06587	-18.59104	536.89354	-18.59104	536.89354
Price -1	0.4142	0.13580	3.04988	0.00609	0.13176	0.69659	0.13176	0.69659

Appendix G

Regression Quarterly House Prices vs. Employment, Real Oil-7, Interest Rate-10, Exchange Rate-4 and Price last Quarter

	PRICE	EMP	REAL OIL-7	INT-10	EXCH-4	PRICE-1
1978.1	65,500	269.0	46.296	9.2785	1.0299	64000
1978.2	66,750	270.6	46.021	9.2254	1.0524	65500
1978.3	68,000	276.0	45.341	9.0631	1.0697	66750
1978.4	69,500	281.5	46.955	9.0930	1.1017	68000
1979.1	71,500	286.9	46.170	9.0048	1.1133	69500
1979.2	72,500	292.3	45.456	8.5047	1.1273	71500
1979.3	73,500	299.5	44.795	8.3811	1.1437	72500
1979.4	78,000	306.8	43.653	8.5239	1.1783	73500
1980.1	80,000	314.0	42.480	8.3492	1.1864	78000
1980.2	83,000	321.2	41.742	8.4783	1.1581	80000
1980.3	86,000	325.3	41.873	8.8977	1.1664	83000
1980.4	89,000	329.5	44.218	8.9838	1.1748	86000
1981.1	74,000	333.6	51.930	8.9056	1.1643	89000
1981.2	86,500	337.7	63.764	9.3524	1.1701	74000
1981.3	99,000	330.7	70.140	9.6920	1.1586	86500
1981.4	99,000	323.6	81.882	9.4462	1.1840	99000
1982.1	99,000	316.6	84.465	9.9279	1.1936	99000
1982.2	99,000	309.6	82.720	11.0072	1.1986	99000
1982.3	94,000	309.3	81.192	12.7802	1.2117	99000
1982.4	90,000	309.0	86.902	11.3535	1.1918	94000
1983.1	89,000	308.7	82.292	12.4742	1.2089	90000
1983.2	88,000	308.4	75.771	12.8600	1.2446	89000
1983.3	86,000	315.1	73.686	13.1728	1.2499	88000
1983.4	80,000	321.8	69.606	15.0333	1.2314	86000
1984.1	73,000	328.6	63.764	17.2578	1.2273	80000
1984.2	75,500	335.3	62.398	15.3237	1.2310	73000
1984.3	75,500	339.4	61.661	15.2906	1.2328	75500
1984.4	70,000	343.5	56.140	16.3900	1.2385	75500
1985.1	68,000	347.6	52.239	14.5567	1.2554	70000
1985.2	70,000	351.7	53.488	11.9233	1.2925	68000
1985.3	70,000	355.5	53.280	11.3200	1.3139	70000
1985.4	73,000	359.2	52.053	11.0167	1.3184	70000
1986.1	75,000	362.9	52.357	11.7733	1.3534	73000
1986.2	77,000	366.6	51.287	11.6267	1.3693	75000
1986.3	74,500	366.5	50.609	12.3333	1.3600	77000
1986.4	74,500	366.4	47.978	13.6900	1.3793	74500
1987.1	72,000	366.3	47.811	13.0433	1.4037	74500
1987.2	78,000	366.2	45.905	11.8533	1.3842	72000
1987.3	80,000	372.6	45.885	11.7467	1.3853	78000
1987.4	84,000	381.1	32.457	10.9100	1.3847	80000
1988.1	84,000	377.4	21.678	10.6700	1.3378	84000
1988.2	84,000	376.2	19.791	9.9933	1.3329	84000
1988.3	92,500	381.0	22.334	9.6900	1.3222	84000
1988.4	93,400	384.8	27.900	8.9533	1.3110	92500
1989.1	89,000	393.4	29.613	8.9600	1.2674	93400
1989.2	95,000	396.7	30.495	8.8833	1.2298	89000
1989.3	106,000	383.9	28.687	8.2967	1.2194	95000
1989.4	106,000	388.5	24.124	9.4100	1.2062	106000
1990.1	118,000	391.4	24.680	10.3033	1.1919	106000
1990.2	125,000	396.3	22.460	9.9733	1.1932	118000
1990.3	120,000	395.9	20.854	9.3500	1.1823	125000
1990.4	110,000	398.0	26.189	9.8000	1.1685	120000
1991.1	110,000	398.5	28.960	10.1867	1.1826	110000
1991.2	115,000	397.8	26.324	9.9967	1.1704	110000
1991.3	113,000	396.0	28.028	10.3367	1.1531	115000
1991.4	110,000	389.5	28.806	9.7667	1.1610	113000
1992.1	110,000	386.8	22.933	9.5200	1.1558	110000
1992.2	117,000	393.8	33.396	9.5567	1.1489	110000
1992.3	117,000	398.4	41.247	10.4833	1.1436	117000
1992.4	115,000	391.3	26.356	11.0033	1.1347	117000
1993.1	114,000	390.1	24.554	10.9300	1.1772	115000
1993.2	115,000	391.0	24.851	10.6333	1.1942	114000
1993.3	115,000	394.9	25.171	9.7300	1.2016	115000
1993.4	115,000	404.4	21.577	9.7567	1.2619	115000
1994.1	117,000	402.1	24.847	9.6100	1.2614	115000
1994.2	117,000	396.5	25.747	8.5767	1.2702	117000
1994.3	117,000	399.6	24.097	8.4300	1.3039	117000
1994.4	117,000	415.1	22.898	8.5000	1.3249	117000

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.992695849
R Square	0.985445048
Adjusted R Squ	0.984738497
Standard Error	4443.919041
Observations	109

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	5	1.37718E+11	27543626676	1394.726	7.00443E-93
Residual	103	2034086894	19748416.44		
Total	108	1.39752E+11			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	12353.03	6173.48	2.0010	0.0480	109.3848	24596.6849	109.3848	24596.6849
Employment	80.51	23.06	3.4915	0.0007	34.7804	126.2491	34.7804	126.2491
Real Oil-7	53.66	35.09	1.5294	0.1292	-15.9258	123.2473	-15.9258	123.2473
Interest-10	-696.03	264.55	-2.6310	0.0098	-1220.6955	-171.3603	-1220.6955	-171.3603
Exchange-4	-14992.80	6898.80	-2.1732	0.0321	-28674.9448	-1310.6544	-28674.9448	-1310.6544
Price-1qtr	0.81	0.04	18.6368	0.0000	0.7277	0.9010	0.7277	0.9010

	PRICE	EMP	REAL OIL-7	INT-10	EXCH-4	PRICE-1
1995.1	115,000	415.5	23.289	7.5333	1.3413	117000
1995.2	112,500	421.8	20.341	7.7500	1.3824	115000
1995.3	110,000	430.9	18.323	7.6500	1.3713	112500
1995.4	109,000	433.0	16.944	7.4567	1.3678	110000
1996.1	110,000	438.1	20.526	6.9933	1.4069	109000
1996.2	111,000	454.5	21.496	6.7600	1.3713	110000
1996.3	112,000	456.4	20.705	7.0933	1.3555	111000
1996.4	116,000	454.3	21.627	8.4900	1.3560	112000
1997.1	120,000	460.6	23.068	8.9933	1.3691	116000
1997.2	124,000	461.0	20.885	9.1233	1.3645	120000
1997.3	127,000	471.1	21.099	8.8900	1.3701	124000
1997.4	130,000	495.2	23.007	8.0000	1.3503	127000
1998.1	154,000	495.1	25.122	8.0533	1.3585	130000
1998.2	154,000	496.3	25.503	7.3867	1.3861	154000
1998.3	154,000	502.3	28.293	7.3933	1.3848	154000
1998.4	150,000	501.7	25.591	7.7500	1.4089	154000
1999.1	150,000	508.0	21.719	7.3733	1.4304	150000
1999.2	150,000	515.5	21.453	6.2967	1.4467	150000
1999.3	150,000	515.8	21.136	6.5400	1.5148	150000
1999.4	145,000	522.8	16.106	6.4900	1.5422	150000
2000.1	147,000	534.5	14.726	5.8533	1.5113	145000
2000.2	147,000	538.3	14.084	5.5533	1.4728	147000
2000.3	152,000	540.4	12.871	5.4067	1.4860	147000
2000.4	150,000	554.3	12.834	5.3933	1.4727	152000
2001.1	152,000	545.2	18.061	5.3633	1.4535	150000
2001.2	152,000	561.3	22.812	5.0233	1.4802	152000
2001.3	155,000	569.6	26.417	5.0667	1.4822	152000
2001.4	155,000	574.6	30.707	5.3400	1.5257	155000
2002.1	166,900	573.5	29.968	5.6467	1.5278	155000
2002.2	175,100	567.7	32.323	6.1533	1.5411	166900
2002.3	179,100	574.3	31.196	6.2200	1.5461	175100
2002.4	179,100	574.7	26.881	6.0100	1.5804	179100
2003.1	181,100	575.8	25.708	5.7933	1.5944	179100
2003.2	184,300	581.7	24.873	5.5367	1.5542	181100
2003.3	187,400	585.4	18.811	5.3867	1.5632	184300
2003.4	183,500	590.8	20.888	5.7833	1.5695	187400
2004.1	181,600	595.9	25.289	5.4800	1.5098	183500
2004.2	189,100	600.2	27.249	5.2200	1.3984	181600
2004.3	189,500	599.7	26.254	5.5067	1.3801	189100
2004.4	189,900	597.2	31.350	5.5000	1.3158	189500
2005.1	185,000	604.4	26.068	5.0967	1.3178	189900

Appendix H

Regression Rent vs. Employment, Exchange Rate-1, Real Oil-2, Rent last year

	RENT	EMP	EXCH-1	REAL OIL-2	RENT-1
1985	496	353.52	1.2951	54.0760	485
1986	509	365.62	1.3655	51.8608	496
1987	510	371.57	1.3895	47.1478	509
1988	523	379.90	1.3260	24.1617	510
1989	555	390.70	1.2307	29.3451	523
1990	595	395.50	1.1840	23.1545	555
1991	608	395.60	1.1668	27.5331	595
1992	607	392.70	1.1457	31.8589	608
1993	593	395.10	1.2087	25.3711	607
1994	594	403.20	1.2901	24.2052	593
1995	592	425.20	1.3657	21.3202	594
1996	606	450.70	1.3724	20.0375	592
1997	647	471.70	1.3635	21.7891	606
1998	722	498.80	1.3846	25.6358	647
1999	753	515.50	1.4835	22.5945	722
2000	753	541.90	1.4857	14.5201	753
2001	783	562.80	1.4854	20.2016	753
2002	804	572.60	1.5488	31.2295	783
2003	804	583.50	1.5703	24.2202	804
2004		598.30	1.4010	25.1002	804
2005			1.3013	28.5776	
			1.2364	36.2156	
				42.8150	

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.993991272
R Square	0.988018648
Adjusted R Square	0.984595405
Standard Error	12.87168923
Observations	19

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	4	191275.1062	47818.777	288.62063	2.80578E-13
Residual	14	2319.525371	165.68038		
Total	18	193594.6316			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	150.5367	42.8937	3.5095	0.0035	58.5389	242.5345	58.5389	242.5345
Employment	1.1614	0.2056	5.6499	0.0001	0.7205	1.6023	0.7205	1.6023
Exchange-1	-205.2827	55.2380	-3.7163	0.0023	-323.7565	-86.8089	-323.7565	-86.8089
Real Oil-2	0.5130	0.3996	1.2838	0.2200	-0.3440	1.3699	-0.3440	1.3699
Rent-1	0.3709	0.1167	3.1775	0.0067	0.1205	0.6212	0.1205	0.6212