

DETERMINANTS OF HOUSE PRICES IN NEW ZEALAND

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ABSTRACT

Residential house prices in New Zealand (NZ) have experienced substantial increases even as the rate of house transactions began to slow down in 2007. This paper develops house price forecasting models using multiple regression analysis in order to analyse the main determinants of house prices in the New Zealand market. Quarterly time series data for the period from March 1980 to December 2007 were collected from the Department of Statistics and the Reserve Bank New Zealand for the model development. The estimated model suggests that house prices will fall after 2007 and will continue to fall in 2008 and 2009, and that migration plays an important role in determining house price fluctuation, so that a one-percent increase in migration arrivals is associated with approximately a 10 percent change in house prices with a one-year lag. Investment expectations, unemployment, mortgage rate and building permits are also the main determinants of price variations. The model shows that even before the sub-prime crisis hit NZ, the prices had been on the way down.

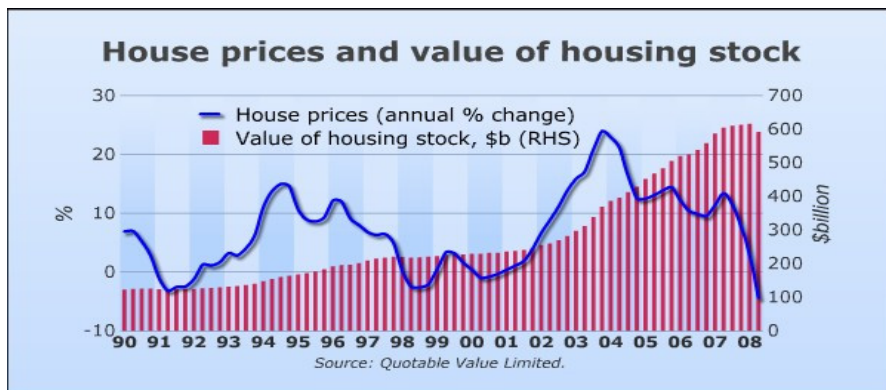
Keywords: House price model, multiple regression analysis, New Zealand

INTRODUCTION

Residential house prices in New Zealand have risen dramatically since 2000. The national median selling price has more than doubled from \$170,000 in December 2000 to \$345,000 at the end of 2007 (REINZ, 2008). The prosperous property market attracted much capital and investment and encouraged construction activities. Over the last two decades, New Zealand house prices have grown constantly in response to market changes, except the periods of 1991, 1998, 2000 and 2008, when they decreased briefly as shown in Figure 1. Prices increased dramatically - on average 6.9% and 4.5% per quarter respectively. These changes in prices reflect land values. The average real price of vacant residential land rose by 286% (CPI-adjusted) between 1981 and 2004 across New Zealand and by 700% in Auckland City (Grimes & Aitken, 2006). However, the rate of price increases has slowed down in 2007. The number of sales of properties fell from 8,245 in

December 2006 to 5,597 in December 2007 and the average number of days required selling a house increased to 36, compared with 29 in December 2006 (News Team, 2007). People were concerned whether the property market will be turning down and how far the price will decline.

Figure 1: House prices and value of housing stock from 1990 to 2008



The property market plays an important role to the macro economy. The residential property sector contributed around 17% of the total GDP in Auckland in 2005 (RBNZ, 2006). House price is one of the criteria for measuring property market performance. Fluctuation in house prices can generate great impacts on economic fundamentals and investment confidence in the local market. This makes it important to develop house price models in order to identify house price determinants and ascertain the reasons for the market variations. An understanding of future movements of house prices helps investors to make rational investment decisions; as well as provides information for government to formulate appropriate housing policies.

Accordingly, this research studies residential house price behaviours to determine the reasons for fluctuations and to predict future movements. In order to address these questions, examination of the causal relationships between house price movements and apparent drivers of these movements are necessary on both the supply and demand sides and from both a theoretical and empirical perspective. The paper is organized as follows: firstly, it reviews the literature relevant to house price formation and the background of economic and house price dynamics in New Zealand. Secondly, the correlation between house prices and the explanatory variables is studied. It then develops regression models for estimating future trends of house price movements. Thirdly, it studies the cause of decreasing house prices to determine the main explanatory variables that influence house price performance and concludes.

MARKET BACKGROUND AND LITERATURE REVIEW

House prices and property values are assumed to increase in the long term because of scarcity of land and durability of houses. The durability of houses produces the markets of housing stock and housing services, two distinct markets that are integrally related (Megbolugbe, Marks & Schwartz, 1991). One is for the demand and supply of a consumer good that is termed a housing service. The other is a derived demand and supply of an investment good that is termed housing stock (Maclennan, 1982). Owner/occupiers view houses not merely as accommodation, but also, simultaneously, as an investment and a hedge against inflation (Case & Shiller, 1988; Dusansky & Wilson, 1993; Levin & Wright, 1997a; Lin & Lin, 1999). However, landlords only act as investors and tenants purchase on housing services. Price decrease is of great concern to investors, but can benefit tenants.

According to Reichert (1990), house prices are determined by demand and supply variables in the market. Household incomes and demographic characteristics are frequently cited determinants of the housing demand decision (Megbolugbe & Chao, 1993). National economic factors such as mortgage rates and local factors such as population shifts, employment and income trends also affect demand and therefore prices (Abelson, 1997; Nellis & Longbottom, 1981). Changes in cost of living (consumer price index) can change demand and thus is one of the explanatory variables to be considered. Demographic variables to be considered include population growth, household structure or formation rates, and household size distributions or age composition (Champion, 2001). Immigration is also an important catalyst for the demand of new housing. Bloch (1997) suggested that in the case of Australia, immigration was a major factor in the sharp house prices rise in the 1980s. Coleman and Landon-Lane (2007) used a structural vector autoregression model analysing the relationship between migration flow, housing construction and house prices in New Zealand. Their findings suggest that a net immigration flow equal to one-percent of population which is associated with an approximately 10 percent increase in house prices for the period of 1962 to 2006 in New Zealand. Stillman and Mare (2008), nevertheless, reported that a one-percent increase in an area's population is associated with a 0.2 to 0.5 percent increase in local housing prices by using census data from the 1986 to 2006. However, their findings have not supported the statistical relationship between the international migration flows and local house prices. Siek (1997) found that higher incomes, lower housing prices, lower interest rates and increased availability of housing finance encourage the demand for new houses. Supply side factors, including vacancies, housing starts and the interest rate have played a marginal and in some instances even a counterintuitive role in price movements (Ley & Tutcher, 2001). Potepan (1996) found that house prices rise with construction costs, but so do land prices.

These explanatory variables may be categorised into three groups (Ge, 2004):

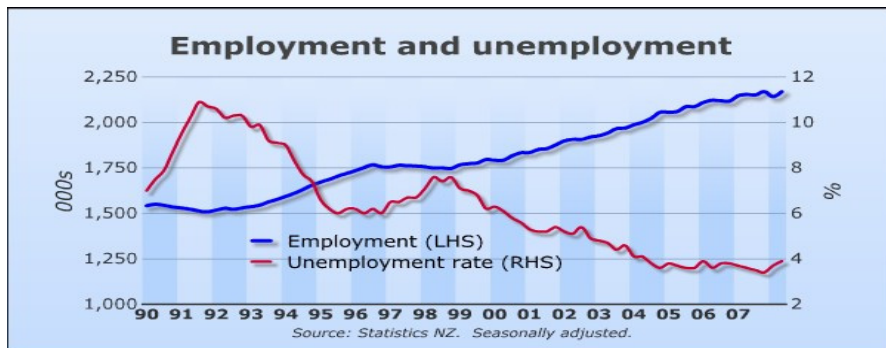
- 1) Macroeconomic variables and external factors, such as gross domestic product, consumer price index, interest rate and exchange rate;
- 2) Housing demand variables, such as unemployment rate, demographic elements, mortgage claim and percentage of household income;
- 3) Housing supply variables, such as building permit issued, land availability for residential property and production costs.

Macroeconomic variables and external factors

Inflation is the result of an excess of demand over supply in the economy (Hendry, 2001). The Consumer Price Index (CPI) has been indicated as an appropriate measure of home ownership cost (Dougherty & Van Order, 1982). A substantial literature suggested a positive correlation between excess returns to housing and inflation (Gatzlaff, 1994; Mile, 1996) and that housing drives inflation (Stevenson, 2000). Increases in CPI indicate excess demand for houses.

Gross domestic product (GDP) and GNP are the most widely used measures of economic performance. GDP is considered because it links macroeconomic activity to residential expenditure (Wheeler & Chowdhury, 1993). On the other hand, unemployment is a very useful measure of the overall health of the economy. Figure 2 illustrates trends of employment and unemployment rate in New Zealand from 1990s to 2007. The unemployment rate has fallen substantially after peaking in the early '90s, was highest (10.5%) in 1991. Though the unemployment rate reduced gradually to 6.0% at the third quarter in 1995, it returned again to 7% before the house price went down in 1998. The rate of unemployment is a key parameter of conditions in the aggregate labour market (Gwartney, Stroup & Sobel, 2000) and is a sign of performance in the economy. The unemployment variable in this study links the economic conditions to the housing price changes and so to households' purchase power.

Figure 2: Employment and unemployment rate in New Zealand



Nellis and Longbottom (1981), Abelson (1997) and Siek (1997) all identify the mortgage interest rates influence on house prices. House prices will increase when mortgage rates decline, whereas the property market will slow down when mortgage rates rise. In addition to the factors identified in the literature review, anecdotal advice suggested that the market is influenced by changes in the environment within which the market operates. These changes can be at a national, regional or global level.

House demand variables

Income is the most important economic variables for explaining variations in consumer expenditure. Muth (1960) concluded that housing demand is highly responsive to changes in income and price. His empirical results indicate that the most important factor in the determination of house prices is real income, because income links directly to the housing decisions made by households. The long-term permanent income is an appropriate measure, as a household's behaviour is consistent with the long-term nature of housing expenditure. An increase in the level of household income will change the demand conditions within the housing market (Rex, 2000). Research results from Ortalo-Magne and Rady (2001) showed that house prices commonly overreact to income shocks.

Green and Hendershott (1996) found that evolving demographic forces are likely to raise real house prices. Family size and age compositions are major determinants of household consumption patterns (Pollak & Wale, 1981). The implications of a rising trend in population and demographic elements are that the demand for housing may increase. Migration is the primary source of variation in population growth (Potepan, 1994). Residents' choices to migrate from one city to another depend on the employment, income (Frame, 2001) and political and social environments. Migration is expected to have a strong impact on house price performance.

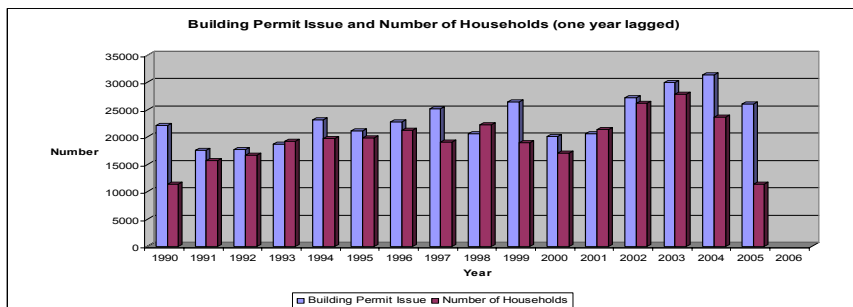
House supply variables

Scarcity of land raises house prices because of suppressed housing production and higher investment demand (Peng & Wheaton, 1994). A shrinking supply of land available for development in central regions of key New Zealand cities is expected to drive supply and thus property prices upwards (DTZ, 2006). The availability of land stock is thus considered an important variable for housing price estimation.

The supply of new houses is relatively inelastic in the short term. The reason is that there are time delays between a change in price and either an increase in the supply of new properties becoming available (new supply) or other homeowners deciding to put their properties onto the market (existing stock). The long-term effect on price depends on the supply response (DiPasquale, 1999). Increases in the supply of houses in excess of any increase in demand should result in price decreases. Outgoing migration or any other decrease in household numbers may free more existing stock onto the supply side of the market. In New Zealand, building permits is a major indicator of house supply. Figure 3 compares building permits in the previous year and the increased number of households

for the current year, assuming a construction period of nine months to one year. Figure 3 shows that the number of building permits were greater than the increase in the number of households for the period of 1990, 1997, 1999 and 2004/2005. The sharp increase in house supply may contribute to house price decreases.

Figure 3: Building permits and number of households in New Zealand



ANALYSING HOUSE PRICE MOVEMENTS OF NEW ZEALAND

Quarterly time series data of the house price index published by Quotable Value New Zealand were collected for analysing house price movements. House price movements appear to have a basic pattern of a boom and bust cyclical trend of seven to eight years on average. Figure 4 depicts the quarterly percent changes of residential house price index from 1963 to 2008 provided by the RBNZ (2003q4=1000). The performances have demonstrated that house price experienced a number of cycles in New Zealand. There were three downward movements of house prices in the early and late '90s, as well as in early 2000. The greatest decrease of house price was 2.9% in the second-quarter 1998. The duration of decreases were from three to five quarters. The observation of the change patterns suggests there was a cyclical behaviour of house prices in the property market, where the average cycle was 7.5 years.

Figure 4: Residential detached house price index in NZ (Source: RBNZ)

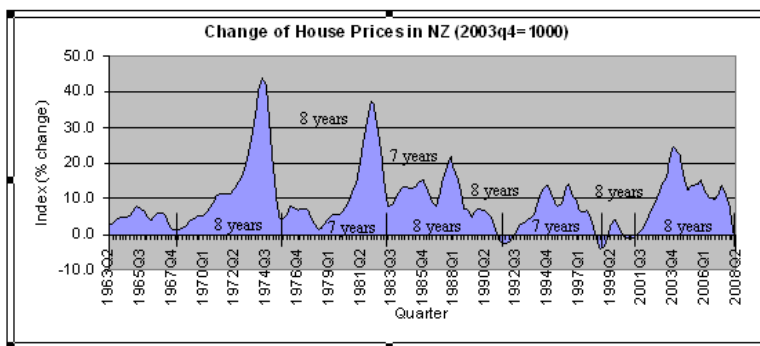


Table 1 statistics show significant booms and relatively minor busts since the '80s. The price index rose 297.6% from the Q1:1980 to the Q3:1990, 54.1% from the Q3:1992 to Q4:1997 and 115.8% from the Q3:2001 to the Q2:2007. The periods of price decreases were comparatively less volatile. The first decline, i.e., from the Q4:1990 to the Q4:1991, showed a fall of prices of 2.9%, with a 5.5% fall in the period of Q1:1998 to Q3:1998 and 1.2% fall in the period of Q1:2000 to Q3:2000. The mean and median of price changes for the year of booms were 2.74% and 2.56%; -0.32% and -0.39% for the year of busts respectively. These results indicate that house prices have greater volatility and dynamic change in the upturns than in normal periods. The volatility of the New Zealand housing market could be caused by the constraints on supply. If the number of new houses built is very small, any change in demand will magnify changes in prices. Similarly, the price can decrease by a small fall in demand.

Table 1: House price booms and busts

Type	Movement Period	Percent Change (nominal)	Average Change per quarter
Booms	Q1:1980 – Q3:1990	+ 297.6%	+ 6.9%
	Q3:1992 – Q4:1997	+ 54.1%	+ 2.5%
	Q4:1998 – Q4:1999	+ 2.4%	+ 0.5%
	Q3:2001 – Q2:2007	+ 115.8%	+ 4.8%
Busts	Q4:1990 – Q4:1991	- 2.9%	- 0.4%
	Q1:1998 – Q3:1998	- 5.5%	- 1.8%
	Q1:2000 – Q3:2000	- 1.2%	- 0.4%
	Q2:2008- ?		

HOUSE PRICE MODELS AND DETERMINANTS

The main determinants of house prices in New Zealand can be studied through developing house price models. A reduced-form equation (Case & Mayer, 1996; Reichert, 1990) for

the price function is applied, which is derived from using the supply and demand functions for owner-occupied housing and then inverted under an equilibrium assumption.

$$P_t = f(Q_d, Q_s, t) \quad (t = 1, 2, 3, \dots, n) \quad (1)$$

where P = the price of detached houses sold during period t as a dependent variable, Q_d = aggregate quantity demanded of new housing during period t and Q_s = aggregate quantity of new supply during period t .

Quarterly demand and supply time series variables for the period of Q1:1980 to Q2: 2007 with total 110 of sets of data were collected from various sources. The house price index by Quotable Value New Zealand provides an indicator of capital growth and price trend. Mortgage rates and CPI are provided by the Reserve Bank New Zealand. Other variables, such as population, number of households, long-term migration arrivals and departures, building permit issues and unemployment rates are collected from the Statistic New Zealand.

All collected data was subject to stationarity check, Granger causality test, and examination of correlation of dependent and explanatory variables in order to develop statistical significant models. House prices and mortgage rates are converted into real terms. The transformation of variables is listed at Appendix 1. Appendix 2 shows that real house prices are strongly correlated to the number of households, migration arrivals, real mortgage rate, building permits issued and unemployment rate.

The reduced form of short-term housing price forecasting models using MRA have been developed in Table 2. The house price models were constructed using SPSS, where the dependent variable is the change of logarithm of real house price ($CLRHPI_t$) and logarithm of real house price ($LRHPI_t$). The most suitable models were selected based on statistical criteria, such as mean squared error, variance, and adjusted R^2 and Durbin-Watson test. The models demonstrate that the main determinants of housing price in New Zealand are housing price lagged by one period (RHP_{t-1}), long-term migration arrival (MAN_t), building permits issued (BPI_t) and the unemployment rate ($UEPR_t$). Model 1 to Model 3 explain the increase/decrease of explanatory variable changes will lead to change in the logarithm of real house prices. Model 1 indicates statistical significance, where 37.3% of the change of logarithm of real house price has been explained by the logarithm of long-term migration arrivals. However, it takes approximately four quarters for migration to have its effect on housing prices. The DW test demonstrates there is not autocorrelations built in the model. Model 3 is statistically significant and it suggests that 43.3 percent of price changes have been explained by the price changes of the previous period, the previous year's long-term migration arrival and building permits issued and changes of real mortgage rates. The model indicates that a one percent positive change of previous house price will lead to approximately .645 current price changes. Similarly, a one percent increase of long-term migration arrivals (logarithm) will result in

approximately .0302 percent increase in price (logarithm) a year later.

On the other hand, the logarithm of real house price index is used as a dependent variable to derive Model 4 to Model 6. All variables have the expected sign. The models suggest that 99.5 percent of the real price has been explained by the explanatory variables. For example, Model 5 indicates that a one percent increase of previous year migration arrivals will effect a .036 percent (logarithm) or approximately 10.86 percent (after converting to the real terms) increase of house price a year later. Similarly, a one percent increase of unemployment rate will result in approximately a .001 percent decrease in house prices. The regression also has shown that the previous period of housing price contributes a great impact to the current house price, where a one percent decrease of previous house price leads to approximately a .98 percent decrease of price for the current period.

Table 2: House price models for New Zealand

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Dependent	<i>CLRHPI_t</i>	<i>CLRHPI_t</i>	<i>CLRHPI_t</i>	<i>LRHPI_t</i>	<i>LRHPI_t</i>	<i>LRHPI_t</i>
Constant	-.069 (-3.406)			-.190 (-5.058)	-.109 (-4.899)	-.107 (-4.900)
<i>LRHPI_{t-1}</i>	.009 (6.423)			.972 (92.97)	.983 (102.38)	.988 (113.51)
<i>CLRHPI_{t-1}</i>		.641 (8.348)	.645 (8.426)			
<i>LMAN_{t-4}</i>	.017 (3.511)			.029 (4.135)	.036 (5.044)	.034 (4.778)
<i>CLMAN_{t-4}</i>		.0301 (2.104)	.0302 (2.109)			
<i>UEPR_t</i>				-.001 (-3.118)	-.001 (-3.231)	-.001 (-3.172)
<i>CBPN_t</i>						3.09E ⁻⁰⁰⁶ (3.172)
<i>LBPI_t</i>		.023 (2.141)		.036 (3.105)		
<i>LBPI_{t-4}</i>			.022 (2.100)			
<i>CRMR_t</i>		.0125 (4.703)	.0125 (4.714)			
Adjusted R ²	.373	.434	.433	.996	.995	.996
Significance	.001	.000	.000	.000	.002	.002
<i>DW</i>	1.948	1.678	1.701	1.122	1.107	1.099
Data sets	105	106	106	104	104	104

(1) indicates lagged by the one quarter. (4) indicates lagged by the fourth quarter.

The determinants were somewhat surprising compared with some of the surveyed literature. The present findings of house price determinants demonstrate some crucial replications of findings and consistency with other research findings in the literature. These replications provide a foundation to build the theory of the housing market and its relationship with housing price. For example, a significant and positive effect on previous period of housing price changes is considered one of the explanatory variables for house price models in the literature. This result suggests that the models are short-term forecasting models. The models indicated that for a one percent change in the previous period of house price, there are approximately a 0.98 percent variation in the current house price. This finding is consistent with the previous models suggested by Tse et al (1999), in which a one percent increase in the previous period of housing price was associated with a 0.837 percent increase or a 0.76 percent increase in house prices, suggested by Peng and Wheaton (1994) in Hong Kong. The lagged house price supports the models developed in the literature in which the quantities supplied and demanded adjust slowly towards the equilibrium, concomitant with a significant positive impact of lagged price changes (Hendershott, 2000).

The finding shows systematic patterns and a serial correlation of house prices that may form the expectations of households (Case & Shiller, 1988; Cutler, Poterba & Summers, 1991; Poterba, 1991). Expectations are based on past values of appreciation as opposed to market fundamentals (Clayton, 1997; Hendershott, 2000; Riddel, 1999). Also, irrational house price expectations cause housing prices to change. The lagged change in real house prices can explain a substantial part of the variation in house price appreciation (Poterba, 1991). When house prices are expected to rise, there is an incentive for the purchase of houses for appreciation (Levin & Wright, 1997a). Price declines are also exaggerated, since feedback traders sell as house prices fall. The expectation forms people's psychological elements that influence the behaviour of buying or selling, which will affect house prices.

The findings provide information on the extent to which a change of investment expectations affects housing prices and how we measure expectations. Expectations determine current market prices (Ganesan, 1984). The housing demand curve depends on price expectations (Dusansky & Wilson, 1993). Housing price is driven primarily by irrational housing price expectations and investor psychology, rather than by wide swings in housing market fundamentals (Clayton, 1997).

The presence of the one-period lagged house price also implies that house prices are predictable (Hwang & Quigley, 2002) because housing markets are inefficient (Muellbauer & Murphy, 1997). Thus, the lagged price included in the house price model is significant. Therefore, the developed models can be used for short-term housing price forecasting in New Zealand, as quarterly time-series data were used.

Model 4 to Model 6 suggest that unemployment rates replicate the findings from the

literature (Abelson, 1997; Brown, Song & McGillivray, 1997; Dieleman, Clark & Deurloo, 2000; Reichert, 1990; Voith, 1999). This implies that unemployment rate represents households' capacity to purchase, which has always been a main determinant of housing demand (Megbolugbe et al., 1991; Pain & Westaway, 1997). Since housing is an expensive product, it requires long-term commitment for repayment. The higher the unemployment rate indicates the greater the constraints for the householders. Accordingly, households' capacity for payment of mortgage should be an important determinant impacting house price variations.

Demographic factors have been demonstrated as an important variable for housing price determination in the long term (Coleman & Landon-Lane, 2007; Ho & Ganesan, 1998; Meen & Andrew, 1998; Rosen, 1979). The long-term variable such as population may not be embodied in the short-term model because it is usually assumed that population should remain unchanged in the short term. In the long run, however, population becomes important and predictable.

The developed housing price models for New Zealand in this study are the short-term forecasting models. In the short term, the sources of demographic change in New Zealand are as follows:

- a) Local birth increase: There is a minimal increase quarterly.
- b) Overseas temporary resident population: As temporary residents, people in this group tend to rent rather than own houses.
- c) Migrants from overseas (both new and returners), however, new immigrants need time to accumulate savings and do market research for home ownership.

The derived models suggest that migration is one of the most important variables in explaining the size of house price changes, which is consistent with the finding of Coleman and Landon-Lane (2007). However, this study suggests that a one percent increase in migration arrival will associate with a ten percent increase in house prices. The main different findings in this paper compared to Coleman and Landon-Lane (2007) and Stillman and Mare (2008) are indicated in Table 3.

The replications of determinants as found in this research demonstrate consistency with other research findings in the literature in New Zealand (Coleman & Landon-Lane, 2007; Stillman & Mare, 2008), i.e., changes of migration, unemployment rates, mortgage rates are the main contributors to house price variations. However, some variables that had been found statistically significant in the literature were found statistically insignificant in this study. Building permits issued is positively correlated with house price in this study. House price increases are driven by the demand for housing, which attracts construction activities and results in high building permits issued. The lagged time for construction will help house prices surge up in the boom market. However, in contrast to the bust market, construction activities will be prevented because of less demand for housing. Expectation represented by the lagged house price is another example which is different from in the

literature. The differences suggest that housing price determinants may depend on methods of analysis, data set used (Stillman and Mare (2008) study only census years), and study location (Stillman and Mare (2008) study various local areas).

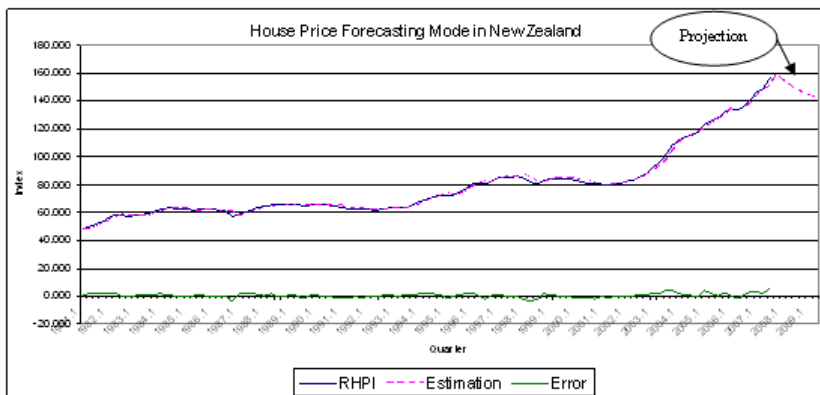
Table 3: Comparison of findings related to the migration in New Zealand

	This Paper	Coleman & Landon-Lane (2007)	Stillman and Mare (2008)
Data Sets	Quarterly data 1:1980 to 4:2007	Yearly data 1962 to 2006	Census data 1986, 1991, 1996, 2001 & 2006
Dependent variable	Real house price index (QVNZ) - time series data	Real house prices (QVNZ) – time series data	Average sales prices in each geographic area in each of the census years
Focus Method variable	National Multiple regression Migration arrival	National Vector autoregression Net migration	Local Probit regression Returning New Zealanders
Findings	A 1% increase in migration arrival is associated with approximated 10% increase in house prices.	A 1% increase in net migration is associated with 11-13% increase in house prices.	A 1% increase in population resulting from higher inflows of returning Kiwis associated with a 6-9% increase in house prices.
Effects	After a year	After a year	No indication
Forecasting	Short-term	Long-term	No indication

Forecasting was carried out using developed models and Figure 5 shows the predicted result in which house price trends coincide well with the original price trends. The model predicts that the house price index in New Zealand will move into a downturn after the fourth quarter of 2007 and continue in 2008-09. There is increasing evidence that

aggregate housing prices are predictable (Hwang & Quigley, 2002). The accuracy and forecasting ability can be measured by the R^2 and mean square error. All MRA models show that R^2 are statistical significant and the average forecasting mean square error is minimal. The MRA models in this study may be claimed to be comparatively more efficient and effective as the developed models merely used three or four explanatory variables, compared to eight explanatory variables in the models of Ho and Ganesan (1998) and five in Peng and Wheaton (1994).

Figure 5: House price forecasting for New Zealand



ANALYSING THE CAUSES OF PRICE DECREASES

The main house price determinants were found in the last section to be long-term migration arrivals, investment expectations, building permits issued, mortgage rates and unemployment rates. The forecasting suggests that house prices in New Zealand will experience a downturn movement in 2008. What are the causes of house price decreases? This section examines reasons of falling house prices by comparing the recorded determinants.

As depicted in the Figure 4, house prices decreased for the periods 1990:4 to 1992:2, 1998:1 to 1998:3 and 2000:1 to 2001:2. To gain a sense of the basic interplay between the explanatory variables and the incidence of decreasing house prices, quarterly percent

change of mean and median values of the explanatory variables in the years of prices increasing and in the years of prices decreasing are compared in the Appendix 3. The statistics indicate that the mean of consumer price index, building permits issued, external migration arrival and total house value perform positively and actively in the years of house prices increasing; whereas the mean of mortgage rate, building permits issued, net migration, unemployment rate and total house value show strong negative effects during the price decreasing period. These results demonstrate that house price determinants derived from the regression model are correct, and the explanatory variables react strongly when house prices fall compared to the phase of price increase. In addition, quarterly percent change of mean and median values of the explanatory variables in the year of preceding decreasing and in the year preceding increasing prices are compared. The statistics suggest that there was great volatility in the year prior to price decreases (Appendix 4). For example, quarterly percent changes of migration departure had decreased by -4.02 in 1990 prior to the house price decrease in 1991. In contrast, before house price increased, only -1.47 had decreased. The finding implies that the falling of house prices somehow is predictable by analysing the changes of major determinants.

Significant year-to-year fluctuations in the demand for residential housing are largely generated by the movements of migration (Stillman and Mare, 2008). According to the NZ government statistics, net permanent and long-term migration into New Zealand consist of 0.1 percent annually to the New Zealand resident population on average, compared with a natural increase of 0.8 percent (Stillman and Mare, 2008). This strong time-series relationship in New Zealand between migration movements and the real house price changes have been demonstrated by Coleman and Landon-Lane (2007). Does migration contribute to house prices going down in New Zealand? House prices had decreased since the third quarter of 1990 and stopped to fall on the second quarter of 1992. The number of total permanent and long-term net migration had decreased dramatically prior to the house price falling and the net migration increases one year before the house price started to increase. Similar scenario appeared in price decreases in 2000 after the great amount of people left to Australia in 1999. Figure 6 shows the yearly long-term net migration in NZ from 1986 to 2007. It can be noted that the net gain peaked at 30,200 in April 1996 and again at 42,500 in May 2003. There was an excess of departures over arrivals in 1986, 1989, 1999, and 2005/2006. Net outflows were generally experienced during 1998-2001, the highest being a net loss of 13,200 people in 2001. Demographic effects are major determinants of household consumption patterns (Pollak & Wales, 1981). The more people leaving New Zealand, the less is the demand for houses and potentially more houses are available in the market for sell; thus house prices decrease.

Figure 6: Long-term migration in New Zealand

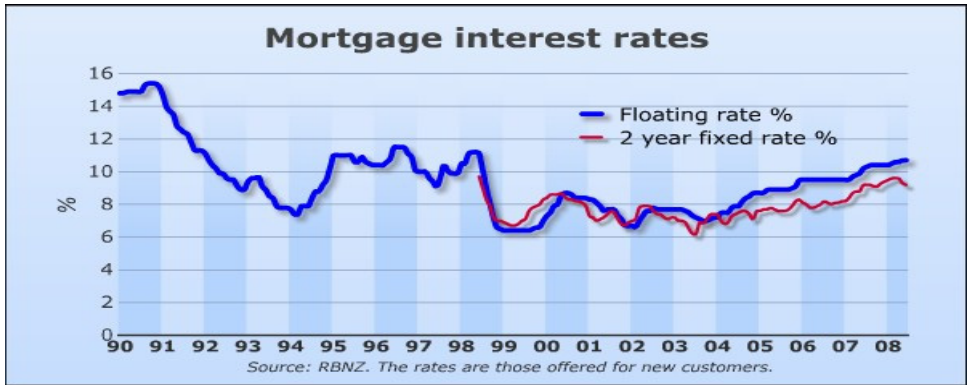
PLT total arrivals, departures, and net migration, 1986-2007



There is a significant negative relationship between mortgage interest rates and house prices in New Zealand. Interest rates are influenced by the monetary policy which is formulated based on the demand and supply of funds and implemented by the Reserve Bank New Zealand. Theoretically, a decrease in interest rates will increase consumer affordability, making home ownership possible. Affordability increases the number of purchasers in the market, which will result in an increase in property prices. In contrast, an increase in interest rates decreases affordability, which will prevent consumers from purchasing, slowing down demand and in turn lowering housing prices. Thus, interest rates determine the purchaser's ability to make loan repayments and their capacity to bid for properties on the market. According to Richardson (2007), "mortgage interest rates go up, housing affordability goes down". Less people are able to access homeownership.

Most homeowners use mortgages to finance their purchase of properties. Higher mortgage rates increase monthly mortgage payments. Especially, high mortgage rates have increased the burden and risks to many homeowners. When mortgage rates are high, first-home buyers are not able to enter the housing market. The price to income ratio has been soaring to a level at which many families can not afford. According to Cabinet (2008) report, affordability in New Zealand has declined in the past four to five years. Figure 7 shows the mortgage trend since 1990. The mortgage rate had been decreasing since 1987:2 from 20.5 percent, down to average 15.1 percent in 1990 and 12.35 percent in 1991; the average weekly expenditure on mortgage payment per household in New Zealand increased from 32.02 dollars in 1987 to 50.69 dollars in 1991. The average weekly expenditure on rent per household was much cheaper than owning a house; only 48.8 percent of the mortgage payment per week. The mortgage rate again increased from 7.4 percent in 1994:1 to 11.09 percent in 1998:1. The high mortgage payment reduced the quantity of house demand.

Figure 7: Mortgage interest rates in New Zealand



The program of economic liberalisation introduced by the Lange-led Labour government from 1984 included the floating of the NZ dollar and the removal of lending controls on the finance sector (banks, building societies and insurance companies), which contributed directly to the supply of mortgage finance for house purchases. The availability of funds with the property boom, easy access to money and low interest rates encourage home buyers to borrow more money. For many households, more than 50 percent of the weekly income will be needed to pay for the mortgage. In such cases, increasing mortgage interest rate creates hardship for the heavy borrowers and they may be forced to sell their home or stop investing in properties in the market. More houses available in the market reduce house prices. The depreciated house prices further reduce investors' confidence in their investments. New investors hesitate entering into the market as they will reconsider their investment if interest increases. The sub-prime crisis increased New Zealand interest rates, which have been passed onto New Zealand borrowers and savers alike. In turn, high mortgage rates have slowed the housing market and house prices thus will fall further.

However, increases in mortgage rates do not have a direct impact on the capital growth of property. Liebke (2000) argued that interest rates and house price inflation (i.e. movement in house prices) are not directly correlated. He suggested that if interest rates and house prices were correlated, then an increase of interest rates in one year would cause a drop in the sale price of property the next year. This is, however, not accurate as historical evidence shows that interest rates have risen since 2003 for many times and each time these were followed by accelerated or steady house price growth. The reason why an interest rate rise does not correspond with a housing price fall is because not only has the demand dropped, the supply for property has dropped as well. For most homeowners, particularly owner-occupiers, there is a strong resistance to selling a property for less than what was paid for. Households will generally do whatever it takes to meet their mortgage payments. However, high interest rates reduce the number of property purchasers because

of affordability and that implies an increase in the number of renters which leads to a higher demand for rental properties and the potential for the investor to increase their rent. In many cases, this increase will compensate for the increase in interest rates, therefore the investor would hesitate to sell if they are making a viable return (Liebke, 2007). Eslake (2007) explains that prices do not fall across the board because of a rise in interest rates unless employment starts rising by amounts sufficient to force some existing owners to become sellers. Thus, interest rates do not have a direct impact on property prices; but they do have an impact on affordability which is what ultimately affects the purchasers' buying power. As a result, there is a clear and indirect relationship between interest rates and property prices and it is interest rates in combination with other economic factors such as wages, employment, affordability, the global economy and the state of the stock market and their relationships that cause the movement in property prices.

According to the statistics, the main variables explaining house price decreases in New Zealand can be summarized in the Table 4. They are people's expectation, migration, unemployment rate, building permits issued and mortgage rate.

Table 4: Summary of main variables contributing to house price decreases in NZ

Explanatory Variables	Q4:90 - Q2:92	Q1:98 – Q3:98	Q1:00 – Q2:01	Q4:07 - ?
Migration	XX	XX	XX	XX
Unemployment Rate	X	XX	X	X
Building Permit Issue	XX	XX	XX	X
Mortgage Rate	XX	X	X	XX

(X): strong impact; (XX): Very strong impact.

Will house prices further decrease in the property market in NZ? According to Statistics New Zealand (2007), the net permanent long-term migration gain in the year ended October 2007 was 7,500, which is below the annual average of 12,200 recorded for the December years from 1990-2006. Though CPI rose at a slower rate since 2006, there is still an “inflationary pressure in New Zealand which has been significantly boosted by the shock to personal consumption from the housing boom and the rundown in household savings. Higher prices for oil and other imported raw materials have also contributed through higher production costs” (Bollard, 2008). The changes of house prices appear to follow a cyclical trend. Low unemployment rates push up wages and inflation and affordability declines until the confidence in the property market weakens as house prices start to turn down. Reduced migration will further reduce demand for housing. Higher wages increase costs of labour that dampens business activities and investment in residential houses. The reduction of investment activities may result in increased unemployment rates for the next period. The higher costs of mortgage rates and higher prices mean that many consumers may not be able to enter the property market and some may have to leave the market. Building consents were issued for 25,732 new dwelling units for the year ended October 2007, a decrease of 3.2 percent from the previous year. Mortgage rates have increased since 2001:4 from 6.70 to 10 percent in 2007. Households

have to pay more for their debts or extend their re-payment period. Higher prices reduce the affordability of purchasing. The cut of interest rates will not have an effect immediately as the rate is still at a higher level that makes many families unable to afford, and people take time to restore their confidence to New Zealand's property market. International economic conditions may influence local markets. The USA sub-prime mortgage crisis induced economic recession and problems of financial institutes may be considered as some investors may sit back observing the property market performance. The statistical evidence suggests that house demand will be decreasing; thus house prices will fall at the end of 2007 to 2009, but there is not sign of a housing market crash as there is still underlying demand for housing and the government will continually implement monetary policy for market stabilization.

The future house price falls can result from a number of reasons:

- a) Reduced affordability means less demand for housing. The prices are so high because so many people are willing to pay so much for housing.
- b) The higher the risk, and the greater the volatility, the lower the demand for housing. New Zealand property market is a small market and new houses are limited for each period. A small change of demand will create a great impact on price changes, so that a small fall in demand will cause significant price falls.
- c) The less the confidence in the market, the less the investment in housing.

Real property is an instrument to hedge against inflation as well as to receive capital gain. When investors have less confidence in the investment return, they will withdraw their investment from the market. More houses are sold in the market; and the herd effect will cause even more houses to be taken out from the market, which will force prices to fall. When demand for housing decreases prices can not be maintained.

CONCLUSION

The research has identified the factors affecting residential house prices and explored their impact on changing patterns of house prices, as well as analysed the causes of house price decreases for New Zealand. The developed models suggest that the main drivers of house price decreases in the New Zealand property market are migration, investment expectations, unemployment rate, mortgage rate and building permits issued. It has shown that a one percent of the migration arrival is associated with approximately a ten percent increase in house prices with a one-year lag. This study has also concluded that house price in the national level will fall in 2008. The cut of mortgage interests will not result in immediate price increases because of lagged effect and time required for people to build their positive expectation and confidence in the market. Further study may be required to research the global economic impact to the local property market.

This study adds to our understanding of the nature of price variations and offers an

alternative method to detect signals of abnormal performance in the housing market and the economy. The models developed also provide instruments for analysing the effects on house prices resulting from different housing policies.

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Appendix 1: Transformation method of the variables

Symbol	Raw Data Name	Time series	Symbol	Raw Data Name	Time series
LRHPI	House price index	Real/Logarithm	CLRHPI	House price index	Changes
CBPN	Building permit issue	Changes	GDP	Gross Domestic Product	% differencing
LBPI	Building permit issue	Logarithm	CPI	Consumer price index	Logarithm
CLBPI	Building permit issue	Changes/Logarithm	RMR	First Mortgage Rate	Real Rate
UEPR	Unemployment rate	percentage	CRMR	First Mortgage Rate	Change real rate
MD	Migration departure	Logarithm	HON	No. of Household	Logarithm
LMAN	Migration arrival	Logarithm	DS	Dwelling density	Dwellings/POP
CLMAN	Migration arrival	Change/Logarithm	DI	Disposable Income	Logarithm
NMN	Net Migration	Changes			

Appendix 2: Correlations

	Real house Price	Real Price _{t-1}	Number of Household	Migration arrival	Building permit issues	Real mortgage rate	Unemployment rate
Real Price	1						
Real Price _{t-1}	.997(**)	1					
Household No	.901(**)	.902(**)	1				
Migration arrival	.688(**)	.677(**)	0.77(**)	1			
Building permit issues	.715(**)	.693(**)	0.61(**)	.488(**)	1		
Real mortgage rate	-.541(**)	-.542(**)	-.715(**)	-.598(**)	-.386(**)	1	
Unemployment rate	-.089	-.123	.182	.024	-.084	-.165	1

** Correlation is significant at the 0.01 level (2-tailed).

Appendix 3: Explanatory variables: basic statistics (Quarterly percent change, 1980:1-2007:2)

Explanatory Variables	Mean Average		Median Averages	
	Increasing years	Decreasing years	Increasing years	Decreasing years
Consumer Price Index	1.49	0.44	0.92	0.45
Population	0.25	0.36	2.95	2.99
First Mortgage Rate	0.42	-3.86	0.00	-3.66
Building Permit Issue	2.18	-5.25	3.23	-1.61
Birth Rate	0.19	-1.36	0.87	-2.47
External Migration Arrival	3.44	-0.50	9.45	5.95
External Migration Departure	1.20	3.94	-5.07	-1.84
Unemployment Rate	5.45	7.90	4.93	7.50
Total House Value	3.50	-4.44	3.57	-5.37

Appendix 4: Basic statistics for preceding decrease of prices

(Quarterly percent change)

Variables	Mean Average		Median Average		Mean Average		Median Average	
	1992	1990	1992	1990	2001	1999	2001	1999
	Increasing year	Decreasing year	Increasing year	Decreasing year	Increasing year	Decreasing year	Increasing year	Decreasing year
Consumer Price Index	0.31	1.19	0.34	1.14	0.43	0.25	0.43	0.25
Population	0.26	0.30	0.26	0.45	0.25	0.27	0.22	0.28
First Mortgage Rate	-5.78	0.84	-5.56	0.34	-5.76	-0.03	-6.59	-1.24
Building Permit Issue	1.69	0.09	2.99	0.84	5.23	4.02	4.77	3.55
Migration Arrival	5.14	3.83	11.54	4.37	10.31	-3.77	14.55	4.99
Migration Departure	-1.47	-4.02	-6.06	-9.59	-4.37	4.05	-15.88	-2.10
Unemployment Rate	10.35	7.38	10.30	7.30	5.28	6.60	5.25	6.60
Total House Value	2.14	2.52	2.82	3.06	6.14	1.43	2.32	1.16