Dynamic Relationship Between Residential Prices And Stock Prices In New Zealand

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Abstract

The purpose of this dissertation is to examine the relationship between house prices and stock prices in New Zealand, using quarterly data from 1990 to 2016. Employing Cointegration and Granger Causality tests, Variance Decomposition and Impulse Response Function, this study finds that while the two markets are generally segmented, there is some weak evidence showing that house prices lead stock prices in short-term and stock prices lead the house prices over long-run.

Keywords: housing, residential, stock, New Zealand, Granger Causality, wealth effect, credit price effect

Contents

Attestation of Authorship

I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person (except where explicitly defined in the acknowledgements), nor material which to a substantial extent has been submitted for the award of any other degree or diploma of a university or other institution of higher learning

Signed____________________ Date 01/ 06/ 2017

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I. Introduction

Nowadays, both residential properties and stocks are viewed as two important investment choices. Properties can be classified as either a consumption or an investment category, and this characteristic differentiates it from the pure asset investment category of stocks (Algieri, 2013). Many researchers have documented that real-estate properties provide diversification benefits to their stockholders because commercial real estate and stock prices normally have a low correlation (Quan and Titman 1999). Additionally, a variety of studies demonstrates the interaction between stock and residential prices (Kapopoulos and Siokis, 2005; Piazzesi et al., 2007). Understanding this type of relationship is vital because this is one of the key behaviours of real monetary movement in a national economy. The stock and housing price relationship can be of importance for economies such as New Zealand, whose housing market is larger than the stock market.

Several motivations to conduct this study arose from reading the literature. Although the prior literature has studied intensively the dynamic relationship between stock prices and housing prices, the conclusions remain somewhat controversial and that both prices can move in the same or opposed direction.

For example, two competing theories have been proposed to explain the causality between housing and stock prices. The first is called the "wealth effect", suggesting that households that earn unanticipated gains from investing in stocks will invest more in housing. In other words, the wealth effect attributes the increase in housing prices to the leading increase in stock prices. As mentioned above, investment in residential properties can be seen as either consumption goods or investment goods, and the wealth effect can occur through three channels. The first route occurs when there is an increase in stock market profits, which leads to a growth in total consumption. The second route is the adjustment in the household investment portfolio. When the stock price rises, the stock in a household's investment portfolio will consequently escalate. To balance their portfolios, investors will sell their stocks and purchase alternative assets, including residential real estate. On the other hand, the effect of an increase in stock prices may influence the growth in housing prices through another channel. The stock price is one of the profitability indicators of a firm, and an increase in the price demonstrates that a company could increase their employees' remuneration in the form of wages or bonuses. Consequently, this increases the incentive to spend on housing as consumption goods and investment goods, which means housing prices will increase due to the increase in demand (Green, 2002). In general, the wealth effect theory indicates that the growth in stock prices passively increases housing prices through the classification of housing investment as both consumption and investment goods.

In contrast to the wealth effect principle, the "credit price" effect introduces the same relationship, but the direction is from the house price to the stock price. In particular, an increase or decrease in residential real estate causes the stock price to change in the same direction. The credit price effect emphasizes the importance of the financial position and credit level of the firms. As properties are tangible, they can be used by a firm as collateral to borrow against for loans. When the property price increases, the collateral value of them also increases, which means that a firm has more funds for business investments. A rise in profitability from undertaking new activity is, therefore, likely as firms usually invest in successful projects and as a result, their stock price will rise as a reflection of improved performance. Additionally, the credit price effect argues that the property market will lead the stock exchange because with the unrealized gain from the holding properties leading to higher stock prices. However, the after effect of the credit price effect is that with the unexpected gain, firms can demand more property to carry out projects, which in turn will increase property prices. This theory suggests the circular relationship and the persistent effect on the property and the stock markets. The stock market can be influenced by movements in the housing market through the credit price effect and the wealth effect, which, from the firm's perspective, can also happen after the event.

Most of the existing studies about the relationship between house and stock prices were performed at the short-term level (Sutton, 2002; Lean and Smyth, 2014; Ibrahim, 2010). In contrast, there have been only a limited number of studies that have attempted to investigate the long-term relationship. Understanding this relationship is particularly important for investors because property investment is typically classified as a long-term investment due to its high transaction costs (Oikarinen 2010). There is evidence that suggests the dynamic relationship between two asset prices may develop their covariation in the long run. For instance, Englund et al. (2002), suggested that the investment horizon plays a role in explaining how an experienced investor should behave.

This dissertation examines the relationship between house prices and stock prices in New Zealand, using quarterly data from 1990 to 2016. While there are studies available on this issue in the developed markets, such as the United State, the United Kingdom or Canada (Eichholtz and Hartzell, 1996), there is very limited research that has been conducted in New Zealand. A notable study in New Zealand is that of O'Donovan and Rae (1997). They, however, focused solely on the determinants in the housing market but not the relationship with the stock prices. By examining the housing and stock prices in New Zealand, the current study aims to add new evidence to this line of literature.

New Zealand has been chosen for this study because first, it is relatively small with a population of 4.4 million when compared to Australia, the United Kingdom, and the United States. New Zealand GDP is 10 percent of the Australia GDP while it is merely 8 percent of the United States GDP. In terms of the financial market, the total market cap of New Zealand is significantly smaller when compared to the United Kingdom and the United States. Therefore, diversification through cross-sector investing is likely to be from noncontemporary's response in different industries to economic fundamentals (Archer and Ling 1997). Second, Eichholtz et al. (1996) found that a single retail section outperforms a cross-sector portfolio in the United States. Dong and Li (2012) suggest that the reason for these results could possibly be because of the large variety of industry and moveable credit lines in the broader economy. Thus, New Zealand could be tested to check if the proposed theory will hold in a smaller economy. Third, New Zealand has two large cities that are separated from the others. These are Auckland and Wellington; whose GDPs represent approximately 49 percent of the national GDP. These cities have different functions, as Wellington is where the government is located and Auckland is the commercial centre. Because of these different characteristics, the geography, and economics diversification, the benefits of investing in properties would highly be present in New Zealand. In particular, the diversification benefit discussed in this study would come from holding properties in the same areas but in different industries, or in the same sector but in different areas. Zhi and Li (2012) used the Listed Property Trust return indices as the proxy for the property prices in New Zealand. The results suggest that holding a cross-sectional portfolio in

Auckland is preferable across all the economic phases in New Zealand. Also, in terms of regional cross diversification, Zhi and Li (2012) suggest investing in the major cities because of the small economy. The implication of these results is that property investors should consider prioritizing local choices in a smaller economy such as New Zealand. Clearly, this diversification benefit would be extended if there was a negative relationship between property prices and the stock price, which is a similar finding to the studies of Ibbotson and Siegel (1984), Hartzell (1986), Worzala and Vandell (1993), and Eichholtz and Hartzell (1996). Therefore, examining the relationship between real estate prices and stock prices would be beneficial for property investors in terms of confirming whether they should also hold a percentage of stocks in their portfolios.

Moreover, the New Zealand economy exhibits some unique features, such as the housing market is larger than the stock market. New Zealand has currently a relatively strong economy, and this could explain the relationship between housing and stock prices. According to O'Meara (2016), the importance of the housing market to New Zealand's economy is evident from the $220 billion residential-related debt owed by households, which is approximately 88 percent of the Gross Domestic Product output. With the documented importance of the housing market in New Zealand's economy, it is essential to analyse and understand the dynamic relationship between stock prices and housing prices.

Additionally, investing in real estate has always been a vital part of many financial institutions as well as individual investors' portfolios. Needless to say, the main feature of investing in property is to provide diversification benefits given that there is a weak or reversed relationship with other financial assets. This study largely focuses on residential and stock assets in New Zealand.

The main finding is that these two markets are generally segmented. However, there is weak evidence showing that house prices lead stock prices in short-term, whereas stock prices lead the house prices over long-run.

II. Literature Review

1. The Housing Market in New Zealand:

The housing market is the hotly debated topic in both academic literatures, popular newspapers, and the political fields. According to Lalaine (2016), the average house price has increased by 6.26 percent across New Zealand during the year to end of the third quarter in 2016, whereas the highest increase of 17.6 percent is in Waikato and Bay of Plenty during the same period. According to Eaqub (2016), the average house price is 6.5 times of the average household income, and more recently in Auckland, it is 10 times. Compared with other relatively affordable housing market of 4 times, New Zealand housing is one of the most expensive assets to acquire. This escalation in housing price faster than the household income has been happening since the 1990s and it is now higher than ever. In recent years, New Zealand's interest rate has relatively been low which contributes to the massive increase in borrowing. Eaqub (2016) describes that the New Zealand housing market is "getting unaffordable and the economy is bloated with debt". Since the property market plays a significantly larger and more importance role than the stock market in New Zealand economy, it is then suggested that stock prices are unlikely to cause the house prices to change but rather the macroeconomic fundamentals.

Given the importance of studying house prices in an economy, it is also worthwhile mentioning the determinants of these prices in New Zealand. O'Donovan and Rae (1997) attempt to identify these factors by using both an aggregate and a regional analysis. This study focused solely on the housing market but not in relation to the stock market. The goal of their study was to analyse the overall trend in New Zealand residential prices and to shape the key determinants of the trend. In their aggregate analysis, O'Donovan and Rea

(1997) predicted that housing prices are influenced by the housing consumption allocation between the consumer's housing spending and other goods and services spending. This allocation, combined with the supply and consumption function, has the power to predict house prices, despite the data limitation as the authors were forced to omit some variables. At the regional level, the results indicated the strong relationship between regional house price changes over the short term but these were not significant over the long term. The results were later confirmed by Dong and Li (2012), who showed an insignificant relationship between regional house prices and a diversification benefit in investing in the multiregional house market. In contrast to evidence from the UK (MacDonald and Taylor, 1993) low proximity region house prices in different regions tend to move together in the long run. Overall, O'Donovan and Rae (1997) suggest that New Zealand's house prices are affected by a region's economic performance, population, and agricultural commodity prices.

Diversification benefits arise from the asset allocation that decreases the exposure to a single asset in a portfolio. Dong and Li (2012) attempted to find diversification benefit by comparing the diversification benefit between cross-sector and cross-regions in New Zealand when making property investments. Dong and Li (2012) also analyse the benefit of diversification through different phases in the business cycle in the New Zealand perspective.

2. Short-term relationship between housing and stock prices

In the past, several studies have attempted to examine the short term relationship between house prices and stock prices. Initial studies focused on the correlation between the two alternative investments in more advanced markets such as the United States and the United

Kingdom. In the US market, a negative correlation, ranging from -0.06 to -0.25, has been found in studies by Ibbotson and Siegel (1984), Hartzell (1986), Worzala and Vandell (1993) and Eichholtz and Hartzell (1996), using either annual or quarterly data. On the other hand, in the UK market, Worzala and Vandell (1993) and Eichholtz and Hartzell (1996) found mixed results with the former finding a positive correlation (0.039) while the latter discovered a negative correlation (-0.08). Following those studies, Quan and Titman (1999) examined the relationship between real estate prices and stock prices through cross-sectional and panel regressions for 17 developed and emerging markets and found a positive correlation in most countries. The relationship between house prices and stock prices became weaker after the changes in macroeconomic variables were controlled. It indicates that in the smaller economies, macroeconomic changes play a great role in such a relationship as they affect both prices. Additionally, despite the correlations, whether positive or negative, that have been confirmed in these studies, the correlation results are sufficiently low to indicate possible diversification opportunities (Oikarinen 2010).

Eichholtz and Hartzell (1996) using international data examined the relationships between three assets; property stock indices, the stock market, and appraisal-based indices. Three countries were examined in their study, Canada, the United Kingdom, and the United States. Quarterly property stock data was used for the three countries, with Canada's data starting in the first quarter of 1985, the United Kingdom's in the second quarter of 1977 and the United States beginning in the last quarter of 1977. All three series end with the fourth quarter of 1993. Their study used standard Ordinary Least Square to regress property stock index returns with a constant and the correspondent non-property stock indices. This model, however, does not control for any macroeconomic variables, as compared to Quan and

Titman (1999). The results from Eichholtz and Hartzell (1996) confirm that there is a simultaneous relationship in the United States market between the property and stock markets and the same results can also be found in Ibbotson and Siegel (1984), Hartzell (1986) and Worzala and Vandell (1993). However, the relationship was not found in Canada since the positive coefficients for the stock market are insignificant. Because of the data limitation, Eichholtz and Hartzell (1996) could only conclude with a theoretical explanation for this difference between the three countries. Differences in the tax system and the market size between countries are the prominent factors that contribute to property and stock risk. The differences in terms of rent contracts could be another reason that contributes to the differences between the three countries. Overall, this early study introduced a new area to look at, which led to other studies by confirming the negative relationship between the property market and the stock market in the United States.

After the study by Eichholtz and Hartzell (1996), Quan and Titman (1999) overcame the issue of a low number of data by examining 17 different countries over a time span of 14 years. The authors examined the relationship between the stock market and the changes in the values of properties and rent. In particular, Quan and Titman (1999) examined the relationship in 17 countries that included the world's biggest developed economies and also several smaller economies in the emerging market in Asia. The countries (and cities) in this study included the Netherlands (Amsterdam); Spain (Madrid and Barcelona); Belgium (Brussels); Germany (Berlin, Dusseldorf, Frankfurt, Hamburg and Munich); France (Paris and Lyon); Italy (Milan); the U.K. (London); Australia (Sydney and Melbourne); New Zealand (Auckland); Malaysia (Kuala Lumpur); Japan (Tokyo); Singapore; Hong Kong; Taiwan (Taipei); Thailand (Bangkok); Indonesia (Jakarta), and the

U.S. (Boston, Chicago, Houston, Los Angeles, New York, Philadelphia, San Francisco and Washington). The period of the study was from 1984 to 1996 and looked at annual data. Quan and Titman (1999) also used Ordinary Least Square for the cross-sectional tests. In contrast to Eichholtz and Hartzell (1996), Quan and Titman (1999) used inflation, interest rates and GDP as the three variables to control for macroeconomic factors, in conjunction with the stock price as the independent variable. Furthermore, time series tests were carried out to assess the mutual relationship between stock prices and real estate prices in terms of a single country and on an annual basis. Quan and Titman (1999) separated the total period into two equal sub periods to ensure the stability of the test. In addition to that assurance, the European and Asian markets were examined separately because, in Asian countries, the stock indices also included a significant portion of the property stock, which then illustrated the overestimated relationship between property and stock indices. According to Gyourko and Keim (1992), real estate indices, in fact, incorporate the information from past transactions. To reflect this finding, Quan and Titman (1999) included a lag of one year of stock indices as the assumption. In particular, no test has been carried out to determine the optimal lag, but including one lag would have assumed to be sufficient and economically reasonable. The findings of this study are that in most countries, there is a significant positive relationship between stock returns and property values. The relationship becomes stronger if the economic variables affect both corporate profits and rents simultaneously. Quan and Titman (1999) also suggested that the major portion of the signification relationship is due to the economics factors in their models, namely, inflation, gross domestic product, and interest rates. This observation is further confirmed by the time series test, as once they controlled for business-cycle factors and rents, the relationship between the stock return and property values became insignificant. As Quan and Titman (1999) used annual data, it is suggested that the price changes are less accurate compared to more frequent data. As the results, the methodology this study need to be demonstrated with more thoughtfulness.

Nevertheless, there are only a few studies that attempted to explain whether the stock price triggers the changes in housing price or vice versa. The Granger causality test or the impulse response function enables a particular set of studies to examine the short-run dynamics between house prices and stock prices. These studies were conducted by Chen (2001); Takala and Pere (1991); Green (2002); Kakes and Van Den End (2004), and Kapopoulos and Siokis (2005), using Taiwanese, Finnish, Californian, Netherlands and Greek data, respectively. In general, these studies found that the stock price predicts the housing prices in the short run.

Additionally, Sutton (2002) studied the short-run relationship between stock prices and house prices for Netherlands, Ireland, the United States, the United Kingdom, Canada and Australia by using the vector autoregressive model proposed by Sims (1980). The author observes that the increase in the stock prices would increase the national income. For instance, a 10 percent rise in the stock market would results in 0.7 percent increase in household income for over the next 3 years for the United Kingdom, whereas 0.3 percent in Australia. However, Sutton (2012) suggests that the impact of the changes in the stock market on national income is not appeared to be significant enough to justify the stock price influence on the house prices. Combining with the stock ownership that is relatively widespread, Sutton (2002) indicates that the positive relationship may include the wealth effects from stock prices to house prices.

3. Long-term relationship between housing and stock prices

There are relatively few studies that test the long-term relationship between the housing and stock prices. Understanding this relationship is particularly important for investors because property investment is typically classified as a long-term investment due to its high transaction costs (Oikarinen 2010). There is evidence that suggests the dynamic relationship between two asset prices may develop their covariation in the long run. For instance, Englund et al. (2002), suggested that the investment horizon plays a role in explaining how an experienced investor should behave. The authors examined a portfolio that contained T-bill, bonds, stocks in property firms, common stocks and housing. The results indicated that in the short run, investors should not hold any amount in housing whereas, over the long term, a 15 to 50% portion is efficient. A VAR model estimated the correlation coefficients in this research. According to Oikarinen (2010), if housing and stock prices are correlated, then the horizon effect concluded by Englund et al. (2002) would be undervalued.

Among a small number of studies, Takala and Pere (1991) found a long-term relationship between stock and house prices by using quarterly data from Finland between 1970 and 1990. A study using wavelet analysis by Chou and Chen (2011), examining the relationship in the United States market found mixed results for the wealth and the credit effect. The wealth effect claims that people with unexpected gains will spend more on housing, whereas the credit effect suggests that housing prices will lead the stock prices (Lean and Smyth, 2014).

In the Hong Kong market, Hui and Ng (2012) also found a long-term relationship between stock and house prices by using cointegration test. They also found evidence for the credit effect but this disappeared over time, and the market became segmented. Additionally, there are several studies, from authors including Gharaibeh and Alrabadi (2012), Liu and Su (2010), T. C. Lin and Z. H. Lin (2011), and Ibrahim (2010) that have examined the relationship between housing and stock prices in developing countries. The results of these studies provided conflicting evidence on the credit and wealth effects as well as on market segmentation.

In a recent review on this topic, Ibrahim (2010) used more recent data from 1995 to 2006 to test for the wealth effect and the credit price effect in the Thailand context. Differently to prior studies, Ibrahim (2010) used a vector autoregression framework to study the relationship between housing and stock prices. In particular, the Granger causality test, impulse response function, and variance decomposition were used to analyze the implications and the results. Following a suggestion from Quan and Titman (1999), Ibrahim (2010) included real GDP and consumer prices to control for macroeconomic factors. Due to the data availability, the author used the quarterly data from the beginning of 1995 to the end of 2006, which strictly speaking is from before the global financial crisis. Unlike the previous studies, Ibrahim (2010) separated housing into four types - semi-detached houses; semi-detached houses with land; townhouses, and townhouses with land. The findings of this study strongly confirm the unidirectional relationship between housing and stocks. In particular, the stock prices lead the house prices for all four types of housing. Therefore, the wealth effect strongly dominates in the Thailand market. Similarly, to Quan and Titman (1999), Ibrahim (2010) confirms the importance of real GDP and the consumer price index. This finding highlights the importance of studying the housing market and the national economy, because the stability of the housing market would, indeed, be affected by the stability of the stock market.

4. Other theories about relationship between housing and stock prices

In addition to the theories of "wealth effect" and "credit price effect" as discussed in the introduction, several explanations have been suggested in the literature to describe the relationship between housing prices and stock prices, due to the previously mentioned unique characteristics of housing.Algieri (2013) illustrates that housing can be a supplement to goods on the stock market, which is called the substitution effect. According to Shiller (2014), because housing and stocks are both contingent assets by nature, each of these assets can be considered as the investment alternative of the other. This relationship between the two assets can be economically interpreted as the substitution effect. In particular, if investors consider the stock market to be profitable, they will leave the housing market alone to focus on the more profitable market and therefore the demand for housing will decrease accordingly. Consequently, stock prices and housing will have a reversed relationship. Alternatively, this theory could be described as the "income effect" from the consumer perspective. When either housing or the stock price increases, given the same consumption plan a household's income would be less restricted, meaning it could spend more on goods in the original consumption plan. Once a new consumption plan is formed, the difference when compared to the old plan represents the change in the price of both housing and stocks. In particular, one unit of housing can now be traded for a different amount of stocks compared to the same situation before the prices changed. Overall, from the consumer's perspective the reversal relationship between housing and stock prices can be explained economically by the substitution effect and the income effect.

An alternative theory for the relationship between stock and housing prices is through the composition risk (Lean and Smyth, 2014). This theory highlights the sensitivity of household expenditure to asset price changes. The consumer's saving on expenditure depends on not just the plan for future consumption, but also on how the proportion of housing and other goods is allocated. During the recession of 2007-2008, for example, it was expected that investors and consumers would sell off their stock to increase current expenditure as they would expect a higher future consumption due to the nature of the economic recession. This activity from investors would clearly lower the stock price in general because the supply of stocks would suddenly increase due to a reduction in demand. The difference between current and future consumption is considered to be one of the factors that greatly decreases the stock price in bad times. Piazzesi et al. (2007) developed a model to measure the composition risk in an investor's consumption plan, and the results infer that the magnitude of the inter-temporal influence depends on how investors allocate housing expenses in their consumption plan. According to Piazzesi et al. (2007), recessions would be most severe in cases where consumers apportioned the lowest amount to housing consumption. Additionally, their model illustrates the small frequency changes in the stock price as the housing proportion changes are also very slow over time. Overall, the magnitude changes in stock price depend on how consumers organize their consumption plan for both current and future periods.

The alternative theory implies that the slow-moving and connected adjustment from residential prices to the stock market creates a spiral relationship in the economic fundamentals. In other words, a sluggish relationship can cause the movement in stock prices to have an effect on movements in the housing market or vice versa. Due to the nature of housing, residential prices will take longer to adjust to economic-specific factors when comparing the stock price movements to the same shocks. Additionally, if the Granger Causality test identifies that the stock price is leading the housing price, the reason might simply be due to the slow-moving characteristic of the housing price. In particular, economic factors are important in explaining the changes in housing prices. However, house prices could change slowly due to the shock of these factors which is opposed to the rapid reactions in stock prices. Overall, the lead-lag relationship between stock and house prices could simply represent the special characteristic of slow movements in the housing market (Clayton, 1996; Himmelberg et al., 2005).

III. Data and Empirical Methodology

1. Data

The raw data contains the quarterly housing index of New Zealand, at the suburban level, for the period from 1990 to 2016 which is collected from the Quotable Value (QV). There is data available for 76 areas in New Zealand. The NZX All will be used as the proxy for the stock index to examine the relationship between the two underlying assets. Due to availability, the NZX50 will also be used, but only for the period from Q1 2001 to Q1 2016. The purpose of using both indices is to check the robustness of the results. Both NZX All and NZX 50 are collected from DataStream.

Quotable Value Ltd is government-owned enterprises and the largest company in term of real estate valuations. Quotable Value (QV) covers all categories of properties and maintains the database of the property indices. The database is computed based on the sales data that QV acquires from 74 regional authorities. This data includes private and developer sales in conjunction with property agent sales. QV customs the indices using a method known as SPAR, or sale price appraisal ratio, for all data acquired from the 74 regions. The final net sale price of all property is divided by the sum of the capital value of the sold real estate in the same quarter. This ratio is then enlarged to apply to the whole capital value for each of the 74 regions. The sales data includes detached houses, flats, and apartments sales.

Once all the quarterly housing indices are collected from the suburban areas, they were grouped into the seven largest areas; Auckland, Wellington, Waikato, Bay of Plenty, Manawatu, Canterbury, and Otago. The seven areas have been chosen because, according to Statistics New Zealand, together they represent approximately 84 percent of the national GDP. Additionally, the grouping is for the simplicity of displaying the results, rather than testing all 76 areas, which could mix up the overall trend. The total New Zealand housing index is also used along with the seven areas mentioned above to verify the relationship at the country level. Apart from Auckland and Wellington's data being ready to use, other areas have been grouped together according to their district. In particular, the Waikato area contains Thames-Coromandel, Hauraki, Waikato, Matamata Piako, Hamilton City, Waipa, Otorohanga, South Waikato, Waitomo, and the Taupo District. The Bay of Plenty area contains the Western Bay of Plenty, Tauranga, Rotorua, Whakatane, Kawerau and the Opotiki District. The Manawatu – Wanganui region includes Stratford, Ruapehu, Wanganui, Rangitikei, Manawatu, Palmerston North City, Tararua and the Horowhenua District. The Canterbury area includes Kaikoura, Hurunui, Waimakariri, Christchurch, Selwyn, Ashburton, Timaru, MacKenzie and the Waimate district. The last region is Otago, which includes Waitaki, Central Otago, Queenstown Lakes, Dunedin City and the Clutha District. Once the groups are shaped, the average among the districts has been used to represent the housing price index for that group. Due to the limitation of the data and because the raw data is not provided, taking the average is the only option available.

As suggested by Quan and Titman (1999) and Ibrahim (2010), the country's economic fundamentals play an important role in the relationship between housing and stock prices. The reason behind this suggestion is that economic factors have been proven to drive the stock and housing markets. Thus, economic factors have to be controlled for in the system. Interest rates, real gross domestic product and the consumer price index are the factors that appear in the equation. The setup is consistent with Quan and Titman (1999), where they also use the inflation rate for the price level, the interbank money rate as the interest rate, and real GDP for their 14 countries. In particular, the consumer price index is collected from DataStream, where the 5-year T-bond is used as the proxy for interest rates, also gathered from the same source. Additionally, gross domestic product is collected from Statistics New Zealand. It is worth mentioning that it would be ideal to get the gross domestic product figures at the regional level to get the most accurate results. However, due to data availability, the national gross domestic product is used in this study.

The following are the codes that were entered to collect the data:

NZSEALL: S&P/NZX All Index is the base stock index for this study. It combines all the eligible equities listed on the NZX Main Board (NZSX). Quarterly data is retrieved dated first day of the month.

NZ50CAP: NZX 50 index (NZ50) is the alternative stock index to test for the consistency of the results. It contains the largest 50 stocks by market capitalization that are currently traded on the NZX Main Board (NZSX). The data window is from the first quarter of 2001 to the first quarter of 2016.

NZGDP...B: This is the quarterly national gross domestic product and is used for all seven areas.

NZCONPRCF: This is the consumer price index, which represents the price level for a particular quarter.

NZGBY5Y: This is the five-year government bond yield and is the proxy for the national interest rate. 1-year, 2-year, 10-year rates are also collected to test the consistency of the results.

The descriptive statistics for the seven areas, along with the three macroeconomic variables in New Zealand, are presented in Panel A of Table 1. Amongst the tested areas, Auckland has the highest mean return with 1.648 percent and Canterbury as the second highest. Only Auckland and Canterbury outperform Total New Zealand on quarterly housing return. On the other hand, the least risky area is Wellington since its standard deviation is 1.85 percent where the riskiest area is Bay of Plenty with 3.15 percent. Interestingly, the average housing returns are all higher than the NZX All returns over the same period. In particular, the quarterly return for Total New Zealand properties is 1.439 percent where it is 0.66 percent for NZX All. Conversely, the risk and standard deviation associated with the stock returns is about three times higher than the housing returns and risk. In particular, the standard deviation of quarterly returns for Total New Zealand is 1.88 percent and is approximately 6 times lowers than the standard deviation for NZXAll. Additionally, the correlation table in Panel B of Table 1 shows relationships between two assets for Total New Zealand. The benefit of investing in housing property is evident by these patterns.

Table 1. **Panel A:** Descriptive Statistics of Variables

	NZXALL	Total New Zealand	Auckland	Wellington	Waikato	Bay of plenty	Manawatu	Canterbury	Otago	Interest Rate	Consumer Price Index (CPI)	Real GDP
Mean	0.66%	1.439%	1.648%	1.143%	1.207%	1.154%	0.968%	1.516%	1.405%	6.240%	945.740	37,201.596
Median	1.89%	1.298%	1.348%	1.198%	0.980%	1.120%	0.488%	1.323%	1.179%	6.135%	913.500	34,733.500
Std. Dev	6.91%	1.888%	2.471%	1.848%	2.539%	3.153%	2.400%	2.420%	2.674%	2.082%	157.816	13,651.589
Max	20.20%	6.551%	8.338%	5.283%	9.637%	12.048%	9.512%	10.009%	12.544%	12.81%	1,204.000	63,139.000
Min	-27.50%	-4.496%	-4.277%	-5.352%	-5.890%	-5.748%	-3.972%	-4.409%	-3.844%	2.720%	716.100	18,564.000

Notes: The table reports descriptive statistics of the first difference of the log value for Total New Zealand, Auckland, Wellington, Waikato, Bay of Plenty, Manawatu, Canterbury, Otago areas. Originally, there are housing indices for 76 areas in New Zealand. However, for the simplicity of this study, the data are grouped into 8 areas. The housing indices are collected from Quotable Value and their period is from Q1 1990 to Q1 2016. 5-year T-bill is the proxy for Interest Rate. Interest Rate, Consumer Price Index and Real GDP are collected from DataStream for New Zealand as a whole. Interest Rate, Consumer Price Index (CPI) and Real GDP are reported as the raw data.

Panel B: Correlation Table

	NZXALL	Total New Zealand	Auckland	Wellington	Waikato	Bay of plenty	Manawatu	Cantebury	Otago
NZXALL	1.000								
Total New Zealand	0.283	1.000							
Auckland	0.280	0.902	1.000						
Wellington	0.195	0.642	0.477	1.000					
Waikato	0.168	0.572	0.351	0.557	1.000				
Bay of plenty	0.229	0.560	0.356	0.486	0.664	1.000			
Manawatu	0.180	0.570	0.329	0.581	0.604	0.517	1.000		
Cantebury	0.259	0.647	0.393	0.460	0.607	0.546	0.645	1.000	
Otago	0.078	0.614	0.412	0.415	0.500	0.459	0.483	0.580	1.000

Note: Correlation table for stock price and housing prices for 8 areas which are Total New Zealand, Auckland, Wellington, Waikato, Bay of Plenty, Manawatu, Cantebury and Otago.

Panel B: Correlation Table

	NZXALL	*Total New Zealand*	*Auckland*	*Wellington*	*Waikato*	*Bay of plenty*	*Manawatu*	*Cantebury*	*Otag*
NZXALL	1.000								
Total New Zealand	0.283	1.000							
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Waikato	0.168	0.572	0.351	0.557	1.000				
Bay of plenty	0.229	0.560	0.356	0.486	0.664	1.000			
Manawatu	0.180	0.570	0.329	0.581	0.604	0.517	1.000		

Cantebury	0.259	0.647	0.393	0.460	0.607	0.546	0.645	1.000	
Otago	0.078	0.614	0.412	0.415	0.500	0.459	0.483	0.580	1.0

2. Research Methodology

The analysis test for the dynamic relationship between stock and housing prices in New Zealand is conducted by the standard VAR test, which contains the Granger causality tests, impulse response functions, and variance decomposition.

a. Unit root test and order of integration of the variable

Unit root is the characteristic of a variable that strongly influences how the series behaves, and its properties. For instance, the series that contains a one-unit root can permanently response to a shock. It is important to identify whether the shock has a permanent effect because it will negate the quality of the inference. Hendry (1980) points out the problem of having a non-stationary series in the model with a problem called "spurious regression." This issue suggests that despite the fact that two series, in theory, should not interact with each other when the series are not stationary, the credibility of standard inference could be questioned. In particular, Henry (1980) tries to explain the price level across time against the cumulative rainfall in the UK and surprisingly, the coefficient of determination is about 0.998. The problem is critical for the variable of interest in this study because if stock and housing prices are non-stationary, the relationship between the two could be overstated. In the more technical terms, if the unit root appears in any variable in the regression system, the t-statistic will not follow the t-distribution, which then will not allow us to validly take the hypothesis under the standard t-test for the significance of the parameter.

The first applied method to test for the unit root is called the Augmented Dickey-Fuller unit root test (Dickey and Fuller, 1979). The intuition behind the test is to check if the lag values have the power to predict the current value changes. In particular, the variable of interest is tested using the Ordinary Least Square to estimate the coefficient of the following model:

$$\Delta y_t = \sum_{j=1}^{p} \alpha_j y_{t-j} + e_t$$

where Δy_t is the first difference and e_t is the error term, or white noise, which satisfies the condition of independent and identically distributed zero-mean error terms. The null hypothesis of the test is the existence of a unit root in the time series. Specifically, $\alpha = 0$ is the null hypothesis which is based on the standard t-test in OLS to conclude whether $y_t$is a random walk or therefore, non-stationary. Additionally, the results of the Phllips-Perron (PP) unit root test, developed by Phillps and Perron (1988), will be presented to show the robustness of the results. An advantage of the PP test is that it does not need to select the level of serial correlation or in other words, it is non-parametric testing.

However, another issue needed to be taken into account is that there is a breaking trend that appears in response to a one-time change in the intercept or the slope (or both) of the trend equation. Perron (1989) suggests that the statistical power to reject the null hypotheses drops when there is a unit root or, the presence of a structural break. In fact, Gregory, Nason and Watt (1996) provide evidence showing that the standard Augmented Dicky Fuller test can fail dramatically when there is a structural break because it is biased towards the non-rejection of the null hypothesis. Therefore, to enhance the credibility of the results, the "Breakpoint unit root test" function that is available in Eviews is used to control for trends and to intercept when testing for a unit root in a particular series. This methodology follows Perron's (1989) procedure, which is implemented by adding a known structural break in the supported theory. Perron (1989) customizes a standard Dickey-Fuller unit root test into a model that includes dummy variables to account for one underlying structural break. The break point of the trend function is predetermined and chosen independently of the data. Perron's (1989) modified unit root test allows for a structural break under both the null and alternative hypotheses. However, given the benefit of granting more flexibility, these analyses have a lower statistical power than the standard DF type test, when there is no break. Perron (2006) later points out that his model is consistent whether there is a break or not. Moreover, the results are irrelevant to the break parameters, and thus the model power is not altered by the magnitude of the break. To strengthen the results of this study, both standard ADF and breakpoint unit root test results will be reported. As mentioned above, the lag-lengths are predetermined, and therefore the maximum number is set to four. This is consistent with the selection in Lean and Smyth (2014) and Ibrahim (2010).

If the t-test of the coefficient is higher than 10%, it suggests that we have the unit root in the series. Thus, we then need to take the first difference and check again for the unit root in the first difference theory. In case the unit root still appears in the time series data, then we need to keep taking the difference at the higher level to exclude the persistent shocks in the series. Assuming that once we take the first difference, the ADF and Perron's (1989) test then suggests rejecting the null hypothesis, which means there is no unit root in the series. Thus the series is said to have the integration of one, or I (1).

b. Cointegration and Granger Causality Test

Once the orders of integration of all the variables are determined, the next test to be carried out is the cointegration test. This test is necessary to determine whether the Vector Auto

Regression or the Vector Error Correction Model should be used for the Granger causality test. The reason this selection will be presented later in this study.

In the technical terms, we have a two-time series that has the order of integration of one on its own, but when combining, the new time series can become stationary or I (0). In simpler terms, each of the series does not have a constant mean, but when combined, the new mean becomes constant. This connection can be called the long-term equilibrium relationship. In terms of empirical finance, understanding the cointegration relationship helps to form the pair trading strategy. Suppose that we have found the cointegration between two variables in such a way that the price of stock A is twice as much as the price of stock B and, A and B are in the same industry, and they have "substitution" goods. Alternatively, we have the following equation:

$$A = 2B + C$$

where C is a stationary series of zero mean. In particular, in order to satisfy the conditions of the zero mean, the cointegration relationship indicates that the relationship of stock A can always be predicted to be twice the stock price of B and that is the long-term equilibrium. If stock A is priced at less than two times stock B, to satisfy the given condition, either the price of stock A will increase or the price of stock B will decrease and vice versa. In this particular case, both stock A and B are mispriced and thus investors can form their strategy by buying stock A and selling stock B. Additionally, in terms of empirical analysis, understanding cointegration is a necessary process to check if the model is intuitive or not. For instance, if there is a cointegration relationship in the model, it is necessary to use the model where the relationship can be separated into long term and short term relationships, such as by using the Error Correction Model.

There are several tests for cointegration, such as the Engle–Granger two-step, developed by Engle and Granger (1987) or the Johansen test (1988). However, in this study, the cointegration test has been conducted based on the bounds test developed by Pesaran and Shin (1999) and Peseran et al. (2001). There are three main advantages to using the bounds test when compared to the other two noted standard cointegration methods. The first advantage is that the bounds test does not require that all or any of the variables under the system must be integrated of the same order and the test can be functional when the underlying variables are integrated of order one, I(1), order zero I(0), or a combination of the two. According to Lean and Smyth (2014), the small sample size would weaken the tests when detecting the true underlying order of the integration of the variable. In this study, there are only 105 quarter observations that are considered to be a small sample size, and therefore using the bounds test would certainly enhance the validity of the results by bypassing the importance of the order of the integration. However, unit root tests are still required because the bounds test cannot accept the order of integration that is beyond one. The second advantage is that the bounds test is considered to be more efficient in the case of small and limited sample data sizes, as is the case for this study. The third advantage of using the bounds test is that by applying the Auto Regressive Distributed Lag technique, which is part of the bounds test, unbiased long run estimates are gained (Harris and Sollis, 2003). This is possible because the suitable lag can be based on the lag selection criteria, the Schwarz Criterion, which is sufficient to overcome the problem of the endogenous repressor and serial correlation problem.

As mentioned above, the first step in applying the bounds test is to make sure no variables have an order of integration that is beyond one. The next step is to use the Ordinary Least Square technique to estimate the following Unrestricted Error Correction Model equation:

$$\Delta Residential\ price_t = \propto \ + b_1 Residential\ price_{t-1} + b_2 Real\ GDP_{t-1} + b_3 CPI_{t-1} + b_4 IR_{t-1} + b_5 NZXALL_{t-1} + \sum_{i=1}^{p} \Delta Residential\ price_{t-i} + \sum_{i=1}^{q} \Delta Real\ GDP_{t-i} + \sum_{i=1}^{r} \Delta IR_{t-i} + \sum_{i=1}^{s} \Delta CPI_{t-i} + \sum_{i=1}^{u} \Delta NZXALL_{t-i} + \varepsilon_t$$

where b_i are the long-term parameters. p, q, r, s, u represent the optimal numbers of lags used for the residential price, real GDP, interest rates, the consumer price index and the stock prices. The optimal number of lags is determined by the standard Schwarz Criterion, and the maximum number of lags is four, which is consistent with Lean and Smyth (2014). The model that contains more than four lags will not give intuitive results. Once the above equation is estimated, the F-test is used to test for the null hypothesis such that:

$$H_0: b_1 = b_2 = b_3 = b_4 = b_5 = 0$$

The critical values are reported in the Eviews report, where the computed F-stat is used to compare against. If the computed F-stat is above the upper bound of the critical tables, the null hypothesis is then rejected and the alternative hypothesis, that there is a cointegration relationship between variables, is accepted. If the computed F-stat is lower the lower bound of the critical value table, then the null hypothesis that there is no cointegration relationship in the equations cannot be rejected. If the computed F-stat lies between the lower bound and upper bound, then the test is inconclusive. The long run and short term coefficient can be derived from the above equation. In particular, according to Bardsen (1989), the long run coefficients or real GDP is computed by - b_2/b_1, for the CPI, which is - b_3/b_1, and for IR, - b_4/b_1. In contrast, the short run variables are represented by the rest of the coefficient. These coefficients are presented by using the function "ADRL Cointegrating and Long Run Form". For the simplicity of the study, in terms of the short run relationship, only the level coefficients have been reported and the rest are available upon request. If the F-stats display inconclusive results, it can be determined whether this is due to the cointegration relationship by the significance of the long-term coefficients.

Once cointegration is detected among variables, checking whether there is a long-term relationship cannot then proceed to the most important part of the study, the Granger causality test. If there is no cointegration in the system, VAR, or vector autoregression, can be used as a model for the Granger causality test. In contrast, if the bounds test indicates that there is a cointegration relationship amongst variables, then employ the VECM, or Vector Error Correction Model, should be employed, where the first difference in the error-correction term is added to the VAR equation. In particular, the model VAR/VECM is represented as:

$$\begin{bmatrix} \Delta Residential\ Price_t \\ \Delta Stock\ price_t \\ \Delta Real\ GDP_t \\ \Delta CPI_t \\ \Delta IR_t \end{bmatrix}$$

$$= \begin{bmatrix} \alpha_1 \\ \alpha_2 \\ \alpha_3 \\ \alpha_4 \\ \alpha_5 \end{bmatrix} + \begin{bmatrix} b_{11,1} & b_{12,1} & b_{13,1} & b_{14,1} & b_{15,1} \\ b_{21,1} & b_{22,1} & b_{23,1} & b_{24,1} & b_{25,1} \\ b_{31,1} & b_{32,1} & b_{33,1} & b_{34,1} & b_{35,1} \\ b_{41,1} & b_{51,1} & b_{52,1} & b_{53,1} & b_{54,1} \\ b_{51,1} & b_{52,1} & b_{53,1} & b_{54,1} & b_{55,1} \end{bmatrix}$$

$$* \begin{bmatrix} \Delta Residential\ Price_{t-1} \\ \Delta Stock\ price_{t-1} \\ \Delta Real\ GDP_{t-1} \\ \Delta CPI_{t-1} \\ \Delta IR_{t-1} \end{bmatrix} + \cdots \begin{bmatrix} b_{11,k} & b_{12,k} & b_{13,k} & b_{14,k} & b_{15,k} \\ b_{21,k} & b_{22,k} & b_{23,k} & b_{24,k} & b_{25,k} \\ b_{31,k} & b_{32,k} & b_{33,k} & b_{34,k} & b_{35,k} \\ b_{41,k} & b_{51,k} & b_{52,k} & b_{53,k} & b_{54,k} \\ b_{51,k} & b_{52,k} & b_{53,k} & b_{54,k} & b_{55,k} \end{bmatrix}$$

$$* \begin{bmatrix} \Delta Residential\ Price_{t-k} \\ \Delta Stock\ price_{t-k} \\ \Delta Real\ GDP_{t-k} \\ \Delta CPI_{t-k} \\ \Delta IR_{t-k} \end{bmatrix} + \begin{bmatrix} \rho_1 \\ \rho_2 \\ \rho_3 \\ \rho_4 \\ \rho_5 \end{bmatrix} * \ [ECT_{t-1}] + \begin{bmatrix} e_1 \\ e_2 \\ e_3 \\ e_4 \\ e_5 \end{bmatrix}$$

Where k is the optimal number of lag and $[ECT_{t-1}]$ is the error correction term estimated by the following equation:

$$ECT_t = Residential\ Price_t - a - b_1 Stock\ Price_t - b_2 Real\ GDP_t - b_3 CPI_t - b_4 IR_t$$

The optimal lag for the VAR/VECM model is determined by the lowest number of the Schwarz Criterion. This VAR/VEC framework gives the direction of the causality between variables within the system. If house prices Granger cause the stock prices, then the lag values of house prices should be able to predict the current stock price. In a more technical way, if the stock price is Granger caused by house prices, then the lag coefficient of house prices should be significant. The Granger causality framework can differentiate between long term and short term causality in the case of the existence of cointegration. The short run dynamic on house prices is captured by the first difference in independent variables, stock prices, and other controlling variables. The coefficients of the error correction terms represent the long-term relationship, and they can be tested statistically by using a standard t-test, where the short-term dynamic of the other lagged differences can be tested by using the F-test. There are four hypotheses patterns in this study, which are:

H_0: House prices Granger causes stock prices, where all the coefficients of house prices are significant in the equation, with the stock price as the dependent variable. Additionally, all the coefficients of stock prices are insignificant in the equation with house prices as the dependent variable. This result would support the wealth effect theory.

H_0: Stock price Granger causes house prices, where all the coefficients of stock prices are significant in the equation with the house prices as the dependent variables. Additionally, all the coefficients of house prices are insignificant in the equation with stock prices as the dependent variable. This result would support the credit-price effect theory.

H_0: Stock prices and house prices are interdependent, where all the coefficients of stock prices are significant in the equation with the house prices as the dependent variables. Additionally, all the coefficients of house prices are also significant in the equation with stock prices as the dependent.

H_0: Stock prices and house prices are independent, where all the coefficients of stock prices are insignificant in the equation, with house prices as the dependent variables. Additionally, all the coefficients of house prices are also insignificant in the equation, with stock prices as the dependent. In this case, the New Zealand market would be described as having market segmentation.

Once the test has been performed, the impulse response function (IRF) and variance decomposition (VDC) will add completeness and robustness to the model, because the

Granger Causality framework is considered as the in-the-sample test, whereas implementing the IRF and VDC are the out-of-sample tests (Ibrahim 2010). These steps assess the direction, magnitude, and persistence of the responses from one asset to another. In particular, the IRF shows a particular variable response to a standard deviation innovation of another variable. In particular, we will be able to examine whether the shocks in a particular variable would have a permanent response, or whether they will gradually decrease in the long term. These results would confirm whether investors should invest according to a long-term horizon. In contrast, the VDC shows how much of a variable can explain how the other variables change in term of percentage.

IV. Empirical Results

1. Unit Root Analysis:

Table 2 reports the ADF, PP and Breakpoint unit root test for all variables in the equation system. Based on the standard ADF test results, there are NZXALL, Total New Zealand, and Auckland, Wellington, Manawatu and Canterbury that have significant test statistics, at least at a 10% level, to accept the alternative hypothesis of the variables that are stationary at the surface level or I (0). In contrast, Waikato, Bay of Plenty, Otago have three macroeconomic variables that are nonstationary because their test statistics are insignificant. However, the PP unit root tests indicate that all the prices, including the stock price, are significant at a 1% level. The significance of the test statistics in the PP test for three macroeconomic variables remains consistent, compared to the ADF test. It is worthwhile pointing out that the disadvantage of the PP test is that it only properly functions for a large sample size as it is based on the asymptotic theory. Therefore, we then must accept inconclusive results for Waikato, the Bay of Plenty and Otago as there might be a unit root for those house prices.

Table 2. Unit Root test

Variables	Level ADF	Level PP	Level Breakpoint	First Difference ADF	First Difference PP	First Difference Breakpoint
NZXALL	-9.023412***	-9.012146***	-9.8784***	-6.905081***	-56.27907***	-12.853***
Total New Zealand	-4.118266***	-4.135759***	-5.0422*	-11.42935***	-13.026263***	-11.954***
Auckland	-4.510345***	-4.477184***	-5.1474***	-11.5127***	-17.13875***	-12.123***
Wellington	-5.524861***	-5.677188***	-7.9086***	-10.11135***	-14.94054***	-10.538***
Waikato	-2.49275	-6.01047***	-4.8149*	-11.96732***	-26.236673***	-12.910***
Bay of plenty	-2.431979	-9.247428***	-5.2589**	-8.473528***	-38.01842***	-10.694***
Manawatu	-2.854609*	-5.518645***	-4.4888	-2.594962*	-18.52682***	-17.683***
Canterbury	-2.851249*	-7.117743***	-5.0550*	-9.425093***	-18.1566***	-16.334***
Otago	-2.126709	-7.351992***	-4.8918**	-9.365614***	-23.04722***	-14.711***
Interest Rate	-2.504932	-2.500452	-4.7678*	-8.294826***	-8.130484***	-9.0989***
Consumer Price Index (CPI)	0.429084	0.419409	-1.2056	-7.613096***	-7.609262***	-9.5572***
Real GDP	2.580128	3.114637	-3.5638	-9.041227***	-9.086736***	-10.589***

Notes: This table reports the results of three unit root tests on the variables. The sample period is from the Q1 of 1990 to the Q1 of 2016. Three unit-root tests were applied which are ADF, PP and Breakpoint. ADF is Augmented Dickey-Fuller test, PP is Phillip-Perron test, and Breakpoint is unit root test allow for a structural break. ADF and PP test do not allow for Intercept and Structural break where Breakpoint allows for both Intercept and structural break. The variables tested for unit root include NZXALL, Total New Zealand, Auckland, Wellington, Waikato, Bay of Plenty, Manawatu, Canterbury, Otago, Interest Rate, Consumer Price Index (CPI), Real GDP. Figures in the table are the t-statistics. Figures are t-values. * (**) *** denote statistical significance at the 10%, 5% and 1% level respectively.

Furthermore, when we take the first difference from all variables, all variables become significant in both the ADF and PP tests, at least at a 10% level. Overall, the conclusion is that NZXALL, Total New Zealand, Auckland, Wellington, Manawatu and Canterbury follow I(0), whereas Waikato, the Bay of Plenty, Otago, the interest rate, the CPI and real GDP follow I(1). The macro variables are non-stationary in New Zealand, which is consistent with the results in Lean and Smyth (2014) and Batayneh and Al-Malki (2015) as for Malaysia and Saudi Arabia. Additionally, Lean and Smyth (2014) find mixed results for the unit root test for different types of property, while Batayneh and Al-Malki (2015) find that their only proxy for house prices for the country follows I (1). The mixed results for the New Zealand housing market are also consistent with Grimes et al. (2010), who find that "the largest trend (which may or may not be stationary) differentiates between rural areas versus large urban and tourist areas"

Similarly, the results of the Breakpoint test that allows for both Intercept and Trend are somewhat similar to the ADF and PP unit root tests. In particular, Manawatu and three macroeconomic variables are non-stationary at the level, but the unit roots are eliminated at the first difference.

2. Cointegration and Granger Causality

a. Cointegration result

Table 3 represents the results of the bounds test for the existence of cointegration. At the aggregate level, there is a cointegration relationship in the regression, since the F-stats for Total New Zealand are significant at a 1 percent level. Similarly, Auckland, Bay of Plenty and Wellington also indicate cointegration, with a significant long-term relationship with the stock price and NZX ALL. Canterbury and Otago's test statistics are lower than 2.2, which is the lowest point in the lower bounds, indicating that there is no long-term relationship in the system. On the other hand, the test statistics are conclusive for Manawatu and Waikato, because the test statistics lie between two critical values bounds. Since there is no significant long-term coefficient, the Manawatu data will be analyzed using the VAR model. In contrast, there are long-run relationships in Waikato, meaning data from there will be analyzed under the VEC model.

Table 3. ARDL bounds test for cointegration

Location	ARDL model	F-stats	Long Run				Short Run			
			NZX ALL	*IR*	*GDP*	*CPI*	*NZX ALL*	*IR*	*GPD*	*CPI*
Total New Zealand	1,1,0,0,0	5.544920***	0.166531**	-0.007514**	-0.0000	-0.00070	0.015213	-0.005803**	0.000001	-0.000044
Auckland	1,1,1,0,0	4.733045***	0.256488**	-0.008816*	-0.000002	0.000077	0.03042	-0.010984***	-0.000001	0.000242
Bay of Plenty	2,0,0,0,0	5.003568***	0.094425	-0.003947	0.000010***	-0.000895***	0.049071	0.004613	0.000005	-0.000481
Waikato	3,1,0,0,0	3.080279 (inc)	0.224080**	-0.005113	0.000009***	-0.000857***	0.02473	-0.001291	0.000009**	-0.000957***
Manuwatu	3,0,0,0,0	2.414097 (inc)	0.296742	-0.046672	0.000007	-0.001058	0.052169***	-0.006749**	0.000002	-0.000316
Canterbury	4,0,0,0,0	1.708341	0.227202	-0.020483	0.000000	-0.000212	0.043987*	-0.006680*	0.000005	-0.000710**
Otago	3,1,0,0,0	1.916229	0.12676	-0.0108.4	0.000005	-0.000559	-0.012585	-0.005632	0.000004	-0.000566
Wellington	1,0,0,0,0	9.008183***	-0.005145	-00008481***	0.000003	-0.000378	-0.019191	-0.002398	0.000001	-0.000286

Notes: The table reports the ARDL test for cointegration for 8 areas which are Total New Zealand, Auckland Bay of Plenty, Waikato, Manuwatu, Canterbury, Otago and Wellington. The sample period is from the Q1 of 1990 to the Q1 of 2016. ARDL is Autoregressive-Distributed Lag. ARDL best fit model is computed by Eviews with the model selection criteria of Schwarz criterion. For example, the model for Total New Zealand should be estimated as follow:
TOTAL_NEW_ZEALAND = C(1)*TOTAL_NEW_ZEALAND(-1) + C(2)*NZXALL + C(3)*NZXALL(-1) + C(4)*INTEREST_RATE + C(5)*CONSUMER_PRICE_INDEX__CP + C(6)*REAL_GDP + C(7)

Figures in "Long Run" and "Short Run" column are coefficients that are also retrieved from Eviews. "F-stats" are f-statistic values for ARDL model. These coefficients are retrieve from Eviews by going to Views, then choose Coefficient Diagnostic. Then select Cointegration and Long Run Form. * (**) *** denote statistical significance at the 10%, 5% and 1% level respectively. Figures with "***" to be considered as having cointegration in the equation whereas (inc) means inconclusive.

Total New Zealand, Auckland, the Bay of Plenty, Waikato and the Wellington areas show cointegration between house prices and other independent variables. However, this cointegration does not necessary means that there is a long term relationship between house and stock prices, but it can be house price with other control variables. Total New Zealand and other areas show mixed results, and there is no clear pattern. In the short term perspective, most house prices in these areas have a positive relationship with the NZX, except for Otago and Wellington. For instance, over the short horizon, 1 percent increase in the stock prices would result in approximately 1.52 percent increase in Total New Zealand house price. However, there is a lack of a long-term relationship between housing prices because the long run coefficients of the NZX ALL are insignificant, except for Total New Zealand, Auckland, and in Waikato. For example, in the long run, 1 percent increase in stock price would result in approximately 16 percent increase in Total New Zealand house price. According to Oikarinen (2010), a substantial increase in foreign investment would inject a long duration of deviation from the long-term relationship between housing and stock prices. As reported in Lean and Smyth (2014), a quick increase in foreign ownership of both property and stock would explain the lack of a long-term relationship between the two underlying assets. In fact, New Zealand is very similar to Finland and Malaysia, as according to CAFCA (2014), there was an increase of over 1000 percent from 1989 to 2013. Therefore, the impact of significant overseas investment may explain the lack of a long-term relationship between stock prices and house prices.

According to the ADRL tests, in the long run an increase in stock prices tends to have a positive effect on house prices in general as shown in the "NZX ALL" column under Long Run in Table 3. This observation can be explained by the wealth effect theory, where a profitable company has a positive relationship with their employee bonuses. However, the causation relationship can also be attributed to the fact that house prices tend to reflect the changes in macroeconomic variables more slowly than the stock price. In other words, the unidirectional causation from stock prices to house prices can simply be due to the slow reaction of house prices in response to changes in economic fundamentals, as suggested by Clayton (1996), Himmelberg et al. (2005); Eickmeier, Hofmann (2010) and Oikarinen et al. (2010).

Additionally, the interest rate has a significant inverted relationship with house prices at the national level in the long run. For instance, if there is an increase of 1 percent in the interest rate, there would be a decrease of 0.75 percent in the house price. This relationship can be explained by the fact that when the interest rate is low, rather than saving money, people will tend to invest in another type of asset, in this case, housing. This relationship is also indicated by a short run perspective, with the significantly negative coefficient of -0.007514. The inverse relationship between interest rates and housing prices are generally consistent with Lean and Smyth (2014) in the case of Malaysia.

The relationship between stock and housing prices may indicate an investment opportunity, since the long term relationship between two assets is not significant. Investing in the Wellington area would be ideal as the connections of house prices and stock prices in both long run and short run do not hold for both areas. Also, in terms of the sign of the coefficients, Wellington is the only area that indicates an inverse relationship between the stock price and the housing price in both the long and short terms. Overall, as confirmed by Dong and Li (2012), the results of this study imply the importance of property location when including property assets in an investor's portfolio.

b. Granger Causality test

Table 4 represents the Wald test for the Granger Causality results under VAR/VEC models and coefficients for the error corrections term. The coefficients of the ECT give us very weak evidence indicating the wealth effect, and therefore it is safe to infer that stock prices and residential prices are segmented. Under the econometric theory, these coefficients should be negative and significant because they indicate the speed of returning to the equilibrium following the exogenous shock. According to the results, all the coefficients for the error correction terms for Total New Zealand, Auckland, Waikato and Wellington are negative and significant at a one per cent level. Though most of the housing coefficients are not significant at a 5 percent level, their signs still give us weak evidence of an adjustment towards long-term equilibrium. For instance, at the national level, if the house price is currently higher than the equilibrium level, it will decrease at the speed of 6.19 percent. However, for all five areas, the error correction coefficients for NZX All are positive and significant at a 1 percent level, meaning that following the exogenous shocks, the model tends to diverge from the equilibrium. For instance, at the national level, if the stock price is currently higher than the equilibrium level, it will keep increasing at the speed of 130 percen. Therefore, we can safely conclude that house prices do not Granger cause the stock price. These results are fairly similar to Ibrahim (2010) and Lean and Smyth (2014), as the coefficient error correction terms for the stock price are all positive. However, their results are not significant when compared to New Zealand.

Table 4. Granger Causality results

	Total New Zealand Granger causes	NZX ALL Granger causes	Interest Rate Granger causes	CPI Granger causes	GDP Granger causes	Error Correction terms
Total New Zealand		0.068869	9.814593***	0.524958	0.269981	-0.061986*
NZX ALL	2.558147		0.75401	2.181735	0.212461	1.307998***
Interest Rate	0.216076	0.012915		0.43249	0.43876	-0.152906
CPI	2.35362	0.797052	1.335195		0.096809	4.641146
GDP	0.667283	1.682734	1.192191	0.583731		-2087.044*

	Auckland Granger causes	NZX ALL Granger causes	Interest Rate Granger causes	CPI Granger causes	GDP Granger causes	Error Correction terms
Auckland		0.227446	6.811764***	0.11055	0.32449	-0.062046*
NZX ALL	3.128123*		1.027647	1.709346	0.364946	0.8222521***
Interest Rate	0.886082	0.003931		0.288072	0.464224	-0.045705
CPI	3.133086*	0.720906	0.682469		0.087524	2.252673
GDP	0.226629	2.436056	0.951043	0.617728		-1613.231**

	Bay of Plenty Granger causes	NZX ALL Granger causes	Interest Rate Granger causes	CPI Granger causes	GDP Granger causes	Error Correction terms
Bay of Plenty		0.113329	2.184547	0.161386	1.184434	-0.027388
NZX ALL	15.23825***		0.548829	4.363906**	2.5486	0.754015***
Interest Rate	1.54877	1.016049		0.55488	0.140215	-0.935742
CPI	2.977490*	1.919725	2.759825*		0.266696	4.509075
GDP	0.003364	3.374729*	0.944301	0.328243		-1756.599***

	Waikato Granger causes	NZX ALL Granger causes	Interest Rate Granger causes	CPI Granger causes	GDP Granger causes	Error Correction terms
Waikato		0.514448	0.579912	0.71083	2.812535*	-0.090364**
NZX ALL	2.473133		0.213733	4.010197**	1.217214	0.897513***
Interest Rate	0.385559	1.333584		0.405338	0.188238	-1.425616
CPI	2.113486	1.248117	3.091023*		0.126755	5.357827
GDP	1.83679	2.696227	0.734845	0.22558		-1850.012**

	Manawatu Granger causes	NZX ALL Granger causes	Interest Rate Granger causes	CPI Granger causes	GDP Granger causes	
Manawatu		0.013241	0.096163	0.251925	0.161184	
NZX ALL	3.789885*		9.932217***	8.867290***	7.793119***	**NA**
Interest Rate	5.019597**	0.007783		4.437565**	4.050206**	
CPI	1.915409	0.020769	4.069024**		2.449139	
GDP	5.177016**	1.56413	2.872737*	3.405942*		

	Canterbury Granger causes	NZX ALL Granger causes	Interest Rate Granger causes	CPI Granger causes	GDP Granger causes	
Canterbury		0.414452	0.565862	1.160996	0.770514	
NZX ALL	1.214429		9.244299***	8.102979***	7.149004***	**NA**
Interest Rate	2.778805*	0.003793		4.006925**	3.650645*	
CPI	0.144331	0.091477	4.349121**		2.664521	
GDP	6.927292***	0.933784	3.303699*	3.3221348*		

	Otago Granger causes	NZX ALL Granger causes	Interest Rate Granger causes	CPI Granger causes	GDP Granger causes	
Otago		7.509226***	0.049853	0.054855	0.021508	
NZX ALL	3.898677**		8.777922***	7.276214***	6.430575**	**NA**
Interest Rate	1.706787	0.194306		3.414604*	3.049682*	
CPI	0.000577	0.175212	4.519308**		2.712713*	
GDP	4.336234**	2.491326	2.138732	2.400187		

	Wellington Granger causes	NZX ALL Granger causes	Interest Rate Granger causes	CPI Granger causes	GDP Granger causes	Error Correction terms
Wellington		0.000264	11.75372***	1.075498	0.125272	-0.011501
NZX ALL	0.510999		0.165303	2.839900*	1.762837	0.484232***
Interest Rate	0.000834	0.70816		0.480464	0.226343	-0.570641
CPI	6.314182**	0.8178	2.365434		0.002302	2.698466
GDP	1.781645	3.102769*	0.996102	0.345661		-1120.615***

Notes: First column on the left contains the dependent variables. The estimated equation is:

$$\begin{bmatrix} \Delta Residential\ Price_t \\ \Delta Stock\ price_t \\ \Delta Real\ GDP_t \\ \Delta CPI_t \\ \Delta IR_t \end{bmatrix} = \begin{bmatrix} \alpha_1 \\ \alpha_2 \\ \alpha_3 \\ \alpha_4 \\ \alpha_5 \end{bmatrix} + \begin{bmatrix} b_{11,1} & b_{12,1} & b_{13,1} & b_{14,1} & b_{15,1} \\ b_{21,1} & b_{22,1} & b_{23,1} & b_{24,1} & b_{25,1} \\ b_{31,1} & b_{32,1} & b_{33,1} & b_{34,1} & b_{35,1} \\ b_{41,1} & b_{51,1} & b_{52,1} & b_{53,1} & b_{54,1} \\ b_{51,1} & b_{52,1} & b_{53,1} & b_{54,1} & b_{55,1} \end{bmatrix} * \begin{bmatrix} \Delta Residential\ Price_{t-1} \\ \Delta Stock\ price_{t-1} \\ \Delta Real\ GDP_{t-1} \\ \Delta CPI_{t-1} \\ \Delta IR_{t-1} \end{bmatrix} + \cdots \begin{bmatrix} b_{11,k} & b_{12,k} & b_{13,k} & b_{14,k} & b_{15,k} \\ b_{21,k} & b_{22,k} & b_{23,k} & b_{24,k} & b_{25,k} \\ b_{31,k} & b_{32,k} & b_{33,k} & b_{34,k} & b_{35,k} \\ b_{41,k} & b_{51,k} & b_{52,k} & b_{53,k} & b_{54,k} \\ b_{51,k} & b_{52,k} & b_{53,k} & b_{54,k} & b_{55,k} \end{bmatrix} * \begin{bmatrix} \Delta Residential\ Price_{t-k} \\ \Delta Stock\ price_{t-k} \\ \Delta Real\ GDP_{t-k} \\ \Delta CPI_{t-k} \\ \Delta IR_{t-k} \end{bmatrix} + \begin{bmatrix} \rho_1 \\ \rho_2 \\ \rho_3 \\ \rho_4 \\ \rho_5 \end{bmatrix} * [ECT_{t-1}] + \begin{bmatrix} e_1 \\ e_2 \\ e_3 \\ e_4 \\ e_5 \end{bmatrix}$$

8 areas will replace the *Residence Price* in the equation. For example, in Total New Zealand table. NZXALL insignificant coefficient of 0.06889 means that NZXALL does not Granger causes Total New Zealand housing price. The far left column contains the dependent variables and the other columns are the independent variables. Hence, if the independent variables columns contain the significant values, then it is to be said that the independent variable Granger cause the dependent variables. The results of the table will be discussed in the next section. The other 6 columns are the independent variables. The sample period is from the Q1 of 1990 to the Q1 of 2016. * (**) *** denote statistical significance at the 10%, 5% and 1% level respectively.

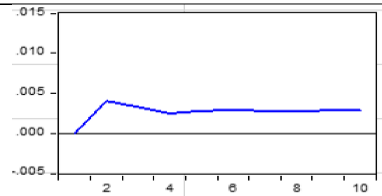
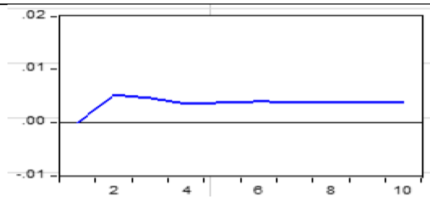
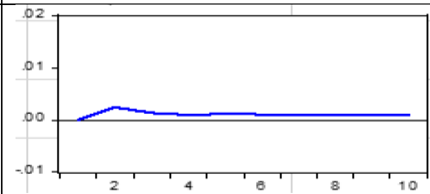
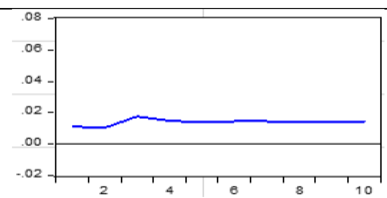
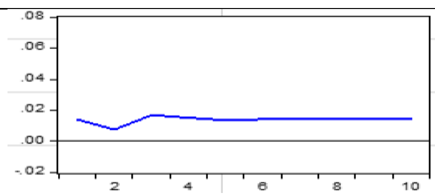
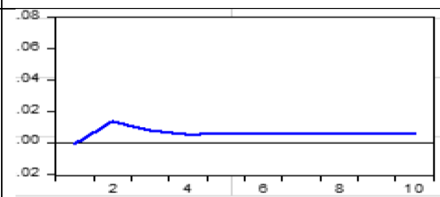
In the short term, the results are much more mixed, and there is no clear pattern throughout the eight areas in New Zealand as shown by the figures in column 2 and 3 in Table 4. The residential and stock prices are greatly segmented at a nation-wide level as well as in Waikato, Canterbury, and Wellington; the house prices Granger-cause, the stock price in Auckland, Bay of Plenty and Manawatu; two markets, have the bi-directional Granger causality in Otago. Even though mixed results are indicated, the interesting observation is that in the short run, except for Otago, there is no evidence to show that the stock price leads residential prices. Therefore, the results of this study provide weak evidence toward the credit price effect as compared to wealth effect in the short run. However, based on the data, there is no clear pattern to support a credit-price effect overall for New Zealand. Our results are similar to the findings in Lean and Smyth (2014) as they find that mixed short-run Granger causality directions depend on the location of the housing indices.

Overall, the housing and stock markets are segmented in New Zealand. In the long run, the results lean toward the wealth effect, while also hinting at the credit effect over the short term. However, there is no strong evidence for either case. According to Lean and Smyth (2014), mixed results could be due to the different characteristics of each area as some areas are “more developed and not financially advanced” when compared to other regions. Another possible explanation for the existence of both the wealth and credit effects is that owning a residential property might be the long term goal in New Zealand. When the house price increases, people may invest in the stock market, which leads to the wealth effect in the short run. Once there is a sufficient increase in the stock market, the investor then spends the returns on their housing expenditure plan. However, in order to confirm this explanation, more investigations would need to be carried out.

c. Impulse Response Function and Variance Decomposition

Table 5 indicates the IRF responses for all variables to Generalised Innovation, as suggested by Ibrahim (2010), for the 3 main areas which are Total New Zealand, Auckland and Wellington. Generally, both stock and housing prices respond positively to shocks in other variables. In particular, shocks in housing prices normally inject a positive response to stock prices after two quarters, and vice versa. The positive relationships are generally consistent with the findings in Worzala and Vandell (1993) for the UK market, as well as for the bound test in section ii. However, the responses of either stock prices to house prices or vice versa do not appear to be significant as support the inconclusive results from the previous section. For instance, after two quarter, the response of Total New Zealand to the one standard deviation shock in stock price is merely 0.005 percent point. Both Auckland and Wellington have similar responses compare to Total New Zealand and they are fairly minimal. Interestingly, the shock from the stock prices remains consistent over the horizon. On the other hand, panel B reports the responses of stock prices to the one standard deviation shock in house prices. Similar to Panel A, the response of the stock price is fairly little at around 0.02 percent point after 2 quarters regardless which areas. Interestingly, the shocks from house prices are also persistent across all 3 areas. Overall, the impulse response function support to the conclusion is that the two markets, stock and property, are segmented in New Zealand.

Table 5. Impulse Response Function

<table>
<tr><th colspan="4">Panel A: Response of Housing Prices to Stock Prices</th></tr>
<tr><td></td><th>Total New Zealand</th><th>Auckland</th><th>Wellington</th></tr>
<tr><td>NZXALL</td><td>
</td><td>
</td><td>
</td></tr>
<tr><td colspan="4"></td></tr>
<tr><th colspan="4">Panel B: Response of Stock Prices to Housing Prices</th></tr>
<tr><td></td><th>Total New Zealand</th><th>Auckland</th><th>Wellington</th></tr>
<tr><td>NZXALL</td><td>
</td><td>
</td><td>
</td></tr>
</table>

Notes: Panel A reports the responses of Total New Zealand, Auckland, and Wellington house prices to Cholesky One Standard Deviation Innovation in stock prices. Panel B reports the responses of the stock prices to Cholesky One Standard Deviation Innovation in housing prices. The sample period is from the Q1 of 1990 to the Q1 of 2016. The responses graphs in other areas are available on request.

Table 6 reports the Variance Decomposition for house and stock prices in eight areas. The results again confirm the results from part ii, that the two underlying markets are relatively segmented, since throughout eight quarters, the changes in the two markets seem to rely mostly on past changes within themselves rather than on the variations in the other market. For example, the lag of 2 years in the housing price for Total New Zealand can explain 85 percent changes in the current housing price where the past value of stock price can only explain about 5 percent. Similarly, the lag 2 years in stock price can explain approximately 60 percent of the current stock price changes whereas the past value of Total New Zealand can only explain about 20 percent which is a third of the stock price. Amongst all areas, housing prices in Manawatu seem to be almost unaffected by the stock price since after 8 quarters, the lag of its price can explain about 99.85 percent of the current changes where only about 0.01 percent variation comes from the changes in stock prices. On the other hand, the house prices, after eight quarters, can only explain 3.68 percent in explaining the changes in the stock prices. On the other hand, Auckland seems to have the strongest relationship compared to other 7 areas. After 2 years, the lag of Auckland house price can explain about 87.56 percent, lowest compared to other areas, of the current changes where approximately 4.54 percent variation comes from the changes in stock prices. Additionally, after 8 quarters, Auckland house prices can explain 22.73 percent in explaining the changes in the stock prices. However, these impacts are not always statistically significant o that we can conclude firmly about the causation relationship. In conclusion, it is prudential to infer that the housing market and stock market are segmented in New Zealand.

Table 6. Variance Decomposition

Panel A: Variance Decomposition of Housing Prices								
Period	**Total New Zealand**	**Auckland**	**Bay of Plenty**	**Waikato**	**Manawatu**	**Canterbury**	**Otago**	**Wellington**
1	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
2	89.96	92.06	95.93	91.36	99.98	99.47	94.00	90.65
3	87.54	89.77	96.55	92.15	99.95	99.16	73.18	90.29
4	86.78	89.05	95.52	91.82	99.93	98.89	92.87	89.16
5	86.13	88.51	95.51	91.72	99.90	98.68	92.72	88.64
6	85.62	88.07	95.12	91.54	99.88	98.53	92.62	88.23
7	85.30	87.78	95.03	91.51	99.87	98.42	92.56	87.95
8	85.06	87.56	94.84	91.44	99.85	98.35	92.51	87.74
	NZXALL	**NZXALL**	**NZXALL**	**NZXALL**	**NZXALL**	**NZXALL**	**NZXALL**	**NZXALL**
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	4.55	3.87	1.55	6.14	0.01	0.43	5.99	1.52
3	5.19	4.70	1.09	5.81	0.01	0.51	6.75	1.37
4	4.85	4.49	1.33	5.73	0.01	0.54	6.97	1.20
5	4.81	4.48	1.25	5.78	0.01	0.55	7.03	1.12
6	4.84	4.53	1.30	5.85	0.01	0.55	7.03	1.06
7	4.83	4.53	1.28	5.83	0.01	0.55	7.03	1.01
8	4.81	4.54	1.30	5.85	0.01	0.55	7.03	0.97

Panel B: Variance Decomposition of NZXALL								
Period	**NZXALL**	**NZXALL**	**NZXALL**	**NZXALL**	**NZXALL**	**NZXALL**	**NZXALL**	**NZXALL**
1	97.20	95.67	97.84	97.62	99.22	95.02	99.92	99.99
2	90.19	89.63	92.20	91.11	94.97	92.33	95.43	92.19
3	82.25	82.97	83.42	85.83	93.35	91.09	94.12	88.44
4	76.84	78.08	80.80	82.87	92.47	90.20	93.22	86.39
5	72.71	74.28	77.18	80.13	91.86	89.55	92.54	84.66
6	68.76	70.69	74.49	77.58	91.39	89.07	92.02	83.00
7	65.22	67.42	71.62	75.18	91.03	88.73	91.64	81.46
8	62.11	64.50	69.23	72.98	90.75	88.50	91.36	79.99
	Total New Zealand	**Auckland**	**Bay of Plenty**	**Waikato**	**Manawatu**	**Canterbury**	**Otago**	**Wellington**
1	2.80	4.32	2.16	2.38	0.78	4.98	0.08	0.01
2	4.88	5.25	2.28	5.94	3.16	5.87	2.88	3.84
3	10.39	10.27	9.37	9.12	3.52	5.83	3.03	4.89
4	13.47	13.64	10.23	10.02	3.51	5.79	3.00	5.34
5	15.81	16.07	12.90	11.60	4.50	5.81	3.00	5.91
6	18.21	18.50	14.48	12.84	3.53	5.85	3.03	6.43
7	20.36	20.75	16.44	14.01	3.60	5.90	3.07	6.89
8	22.22	22.73	17.93	15.09	3.68	5.94	3.11	7.34

Notes: Table 6 reports the Variance Decomposition for 8 areas which are Total New Zealand, Auckland Bay of Plenty, Waikato, Manawatu, Canterbury, Otago and Wellington. The sample period is from the Q1 of 1990 to the Q1 of 2016. Panel A reports how much the past changes of each area explain the current changes of themselves. It also reports how the past changes of the stock prices explain the changes of the housing prices in each area. Panel B reports how much the past changes of stock price explain the current changes of itself. It also reports how the past changes of the housing prices explain the changes of the stock prices. All figures are in percentages.

V. Conclusion

This dissertation examines the short- and long-term dynamic relationships between the stock market and the housing market in New Zealand. The data was obtained from 76 areas, divided into eight main areas, over the period of 1990 to 2016. The methodology applied was based on the VAR/VEC framework. The main finding is that the stock and housing markets are generally segmented. In terms of a longer horizon, even though the bound test yields a positive relationship between stock prices and housing prices, the Granger causality direction does not generally exist according to the coefficient of the error correction terms. However, there is weak evidence that the stock price Granger causes the house price. It is possible that because of the slow moving characteristics of housing prices in response to macroeconomic factors, there is no direct Granger causation relationship between the two prices. In the short run, the results are more mixed, and there is no clear pattern. The results mostly indicate that the two markets are segmented, including for New Zealand as a whole. Auckland, the Bay of Plenty and Manawatu, however, indicate that the housing price leads the stock price in the short run. Thus, in terms of a shorter horizon, the credit-price effect appears to be stronger than the wealth effect. The possible explanation for the difference between the short term and long term is that in New Zealand, property assets are considered to be a long term investment, in contrast to stocks, which are seen as a short term investment. When there is an unanticipated gain in the housing market, people invest in the stock market because there are fewer barriers and it provides much more flexibility in terms of options. Once the stock market increases to the desired level, investors will then invest in housing for a longer term gain.

Overall, the main contribution of this study is to provide evidence about the dynamic relationship of the stock and housing markets in a small country like New Zealand. It also highlights the importance of location when investing in the property market. According to the results of this study, to provide highest diversification benefits, an investor would need to invest in stock and in Wellington housing. Additionally, there are more tests required as the results of this study give slight support for both the wealth and credit price effect. The mixed results possibly reflect the fact different areas in New Zealand represent different levels of development and financial advancement. Within the scope of this study, the conclusion is more towards the mixed results.

There are several limitations and suggestions that might change and enhance the results of this study. First, similarly to Eichholtz and Hartzell (1996), the use of secondary data tends to smooth out the data so that the true dynamic relationship may not be consistent with the tests conducted by using the raw data. Secondly, the use of stock indices and the interest rate is not consistent for some areas. For instance, when the NZX50 is used as the stock price proxy, the short term Granger causation direction turns significantly and emphasizes the credit price effect in New Zealand and Canterbury. In terms of the interest rate, when the stock of 10-year is used, the short term Granger causality from Wellington on the NZXALL becomes insignificant as compared to the significant results when a 1-year bonds is used. Therefore, the use of proxy variables is likely to affect the final results. Thirdly, the weak long term relationship might be due to the substantial growth in the foreign investment in New Zealand property markets.

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