A TRANSACTIONAL LEVEL ANALYSIS OF RESIDENTIAL REAL ESTATE: IMPLICATIONS OF FOREIGN INVESTMENT, MIS-PRICING & DISPOSITION EFFECTS

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ABSTRACT

Australia, as a large resource country, has relied on foreign investment to meet the shortfall of domestic savings against investment needs. However, recent concerns around the real effects of foreign investment in residential real estate on local prices has been an issue yet unaddressed due to the lack of reliable data. This thesis attempts to fill this gap by offering three analyses utilising a novel set of granular, transactional level data for improved objectivity and transparency. While several research papers have focused on residential real estate from a high level, these studies are generally inadequate, especially for policy makers due to the use of aggregated data. The three studies presented in this thesis use a small, open economy (the Gold Coast) as a setting to address key issues from an ex-post empirical and behavioural perspective to better understand the influence of foreign investment in the Australian residential real estate market. This market provides an interesting setting due to its emerging presence as a global city attracting foreign participants. I test the hypothesis that foreign investors pay more for properties compared to owner occupiers (inferring positive influence on local prices) and whether this is because it is cheaper to buy than rent (evidence of mispricing) or whether heuristic biases were prevalent (evidence of the disposition effect). The OLS estimations using data for the period FY 2000-2018 provide support for the hypothesis that foreign investors paid more for units (not houses) compared to owner occupiers; mispricing is evident within the market (it is cheaper to rent than to buy) and only weak evidence of disposition effect. However, baseline results show a robust and statistically significant impact of foreign investment policies in all three studies, where the increase in transaction costs imposed by two separate policies substantially curtailed foreign investment in Australian residential real estate.

Keywords: Foreign investment in residential real estate, mispricing, disposition effects, heuristic biases.

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STATEMENT OF ORIGINAL AUTHORSHIP

The work contained in this thesis has not been previously submitted to meet requirements for an award at this or any other higher education institution. To the best of my knowledge and belief, the thesis contains no material previously published or written by another person except where due reference is made.

Signature: QUT Verified Signature

Date: 16th February 2022

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Chapter 1: Introduction

Since the 1980s, deregulation of foreign investment in Australia has unfolded in stages. While foreign investment overall adds value to the economy, the impact of foreign investment on residential real estate in Australia is a publicly debated topic, which is largely unsupported by empirical academic research. This thesis examines the effect of foreign investment on residential real estate, attempting to fill this gap in the literature utilising a novel, unique and detailed dataset to measure the effects. The key contribution of this thesis is the granularity of the transactional level data, which allows for manual classification of different residential buyer types, as opposed to aggregate state level data as used in prior studies. As a result of this classification, I gain new insights into the degree of price variation, the level of mispricing and disposition effect explained by foreign investors, which were previously unexplored due to the lack of reliable data.

Australia's need for foreign investment is greater than most countries monitored by the OECD due to a perpetual deficit in trade and financial relations with the rest of the world (Uren, 2015). Belkar et. al. (2007) assert that this has historically been sustainable for Australia due to profitable investment opportunities which have been greater than domestic savings. Constant deficits can only be balanced by either foreign borrowings or foreign investments. At certain times in Australia's history, foreign borrowing seems to be preferable as this leaves underlying assets under local ownership, though debts must eventually be repaid with interest and often contracted with secured assets (UNCTD, 2017).

In Australia, there are two opposing political positions on foreign investment in residential real estate. The popular public view is that foreign investment claims local market share and increases prices beyond reach of local buyers. The second view is that strengthening global ties is more important than supporting local entities. Current policy attempts to allow Australia to benefit from both positions. Foreign investors are permitted to purchase Australian residential real estate, providing an open and free market. However, foreign investors must seek approval from the Foreign Investment Review Board (FIRB) and are required to pay additional fees compared to Australian investors. This allows the Australian government to control the level of foreign investment and raise funds from these transactions. A lack of empirical studies continues to leave this debate unresolved, with only a limited number of

studies formally examining the nature of foreign ownership of residential real estate in detail. Macro level reporting has failed to explain the fundamental dynamics of the residential real estate market in Australia (FIRB, 2018).

The balance between protecting national interests and allowing free trade globally is closely monitored by the Paris-based Organisation for Economic Co-operation and Development (OECD). On their scoring of advanced economies, Australia is more restrictive of foreign investment than European Union (EU) countries. More recently, Japan, the USA and the UK became more liberal in allowing foreign investment. Only New Zealand, Canada and Iceland have similar regulatory barriers for foreign investors equivalent to Australia's (Uren, 2015).

Gauder et.al. (2014) and the Parliament of Australia (2014) provide extensive reviews on the various observations and arguments around the impacts of foreign investment, including crowding out first home owners, increased exposure of the Australian housing market to international business cycles and, increased value of Australian dollar, which reduces the competitive edge of international trade. Following the GFC, house prices have significantly increased, with suggestion that these price increases may be influenced by increased foreign investment in residential real estate, especially after the implementation of Quantitative Easing (QE) by other major economies around the world (Law, 2014). This allegation was addressed in the Parliamentary Inquiry in 2014, which concluded that there were no real indications of foreign investment causing price increases as no conclusions could be drawn from the available data.

In 2017, the Australian Bureau of Statistics (ABS) reported that housing occupancy and costs of the nation's housing market has a value of around US$7 trillion. While it is difficult to determine how much foreign investment contributes to this share, figures by the Foreign Investment Review Board (FIRB) suggested that there was a significant increase in residential approvals as shown in Figure 1.1 below.

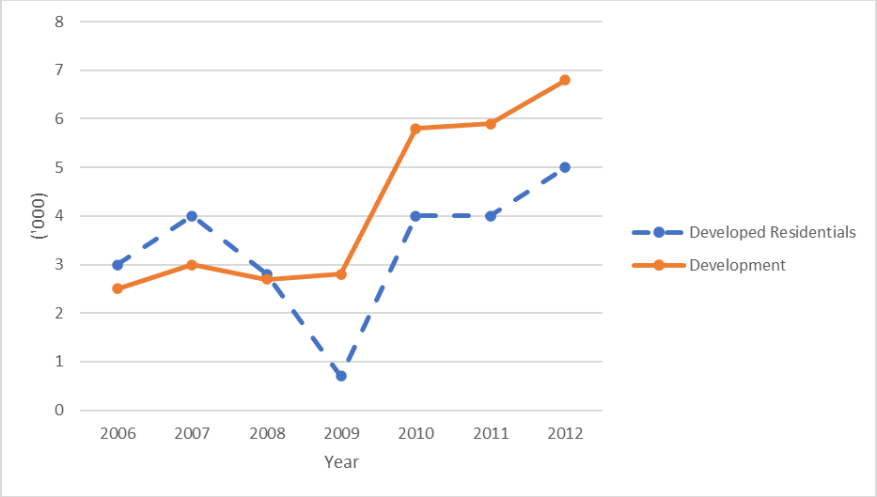

Figure 1.1. Residential Real Estate Approvals for Foreign Investors (FIRB, 2018)

Corelogic (2018) stated that tax revenue for individual states has increased with stamp duty collections alone contributing to almost 53% of total revenue received in 2017. This implies that an increase in residential real estate transactions has occurred in conjunction with the increase in FIRB foreign approvals. Looking at the components of population growth in the 12 months to March 2017, there was an additional 142,427 persons due to natural increase and 231,890 persons due to net overseas migration. The rate of natural increase has fallen while the rate of net overseas migration has risen. Net overseas migration accounted for 60% of total population growth, with its highest proportion around 2009/10, as seen in Figure 1.2 below. This adds to the importance of understanding the implications of foreign influence both as migrants and investors, on housing prices.

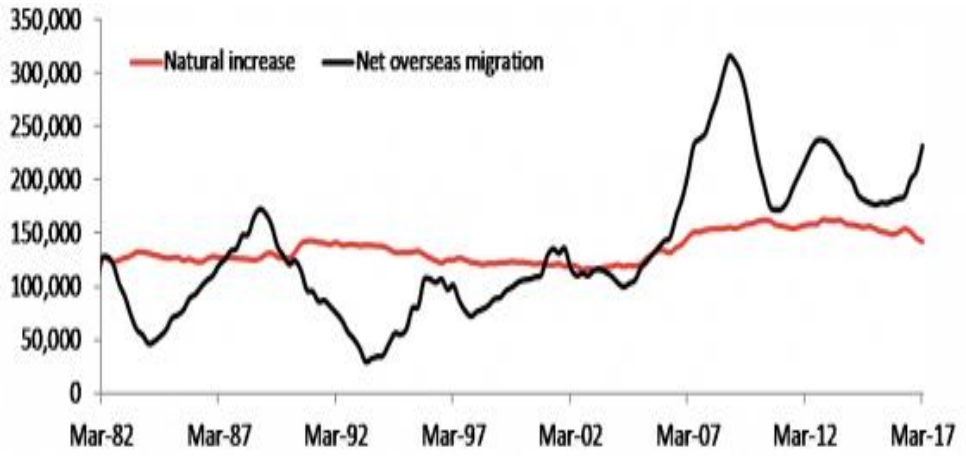

Figure 1.2. Annual Change in Net Migration 2017 (Corelogic, 2018)

Culturally, home ownership is still perceived as the ‘Great Australian Dream’ which makes Australia’s housing market unique compared to other countries (Ge, 2014; Lee, 2017). Nonetheless, this record high home ownership rate has been declining since the GFC in 2008 (HILDA, 2017). RBA governor Philip Lowe (2017) expressed his concerns on this matter and cited that Australian private debt has soared to 187% of average income, from about 70% in the early 1990s. While most households are managing these levels of debt, many have felt they are closer to their borrowing capacity than ever before. Figure 1.3 below shows Australia having the highest household debt over GDP among G20 nations.

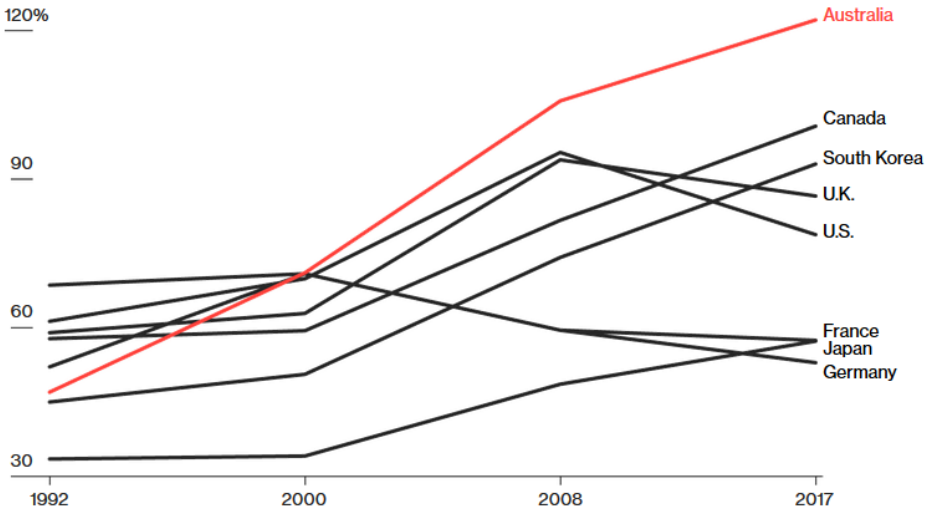

Figure 1.3. Household Debt as Percentage of GDP (RBA, 2017)

In 1995, the median house value nationally was $111,500 and since that time values have risen by an average of 6.8% per annum to the current level of $571,400. The typical Australian property owner who has held their house for the past 25 years would have seen an average dollar value increase of almost $18,400 per annum. With major banks having the capacity to refinance mortgages based on valuations, it is not surprising that today, mortgage levels too have risen in conjunction with home prices, making mortgage levels equivalent to 80% of Australia’s GDP (Figure 1.5).

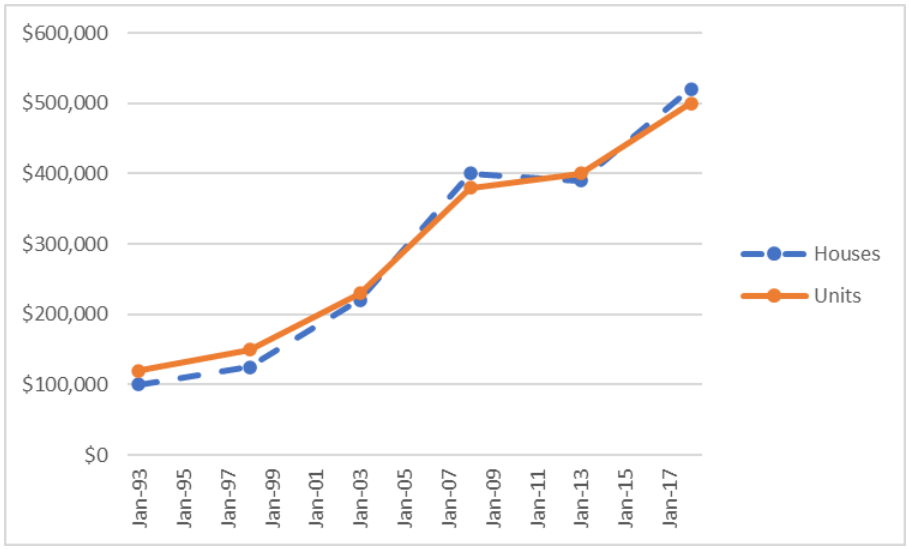

Figure 1.4. National Median House and Unit Value (Corelogic, 2018)

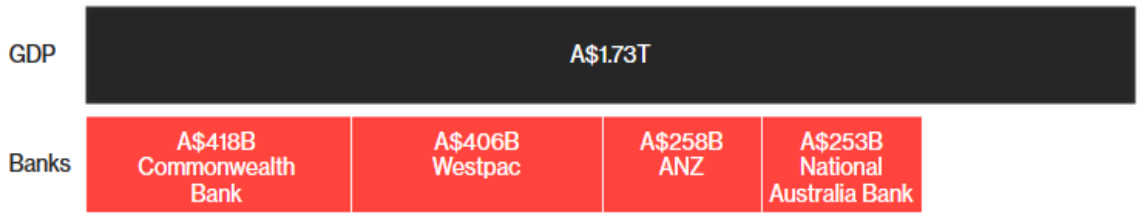

Figure 1.5 Australian Major Bank Mortgages Proportionate to GDP (ABS, 2015a)

Considering the housing market is the single largest asset class for two-thirds of a typical Australian household portfolio (ABS, 2015a) and contributing approximately 56% of the total value of Australian household assets (ABS, 2015b), it has become crucial for us to understand this under-researched area. This thesis attempts to further investigate this matter by using one of Australia's growing cities in Queensland, the Gold Coast as a case setting.

This research is the first attempt in Australia to capture both local and foreign buying trends at a Suburb level, drawing insightful conclusions which were not previously possible due to the lack of detailed (disaggregated) data. The unique contribution of this study lies in the granularity and disaggregation of its data. The conclusions in this research will bring more clarity to both industry participants and policymakers to better understand the dynamics of local house prices. As previous studies were unable to clearly distinguish the degree of market

distortions by foreign influence, this research presents a valuable contribution to the literature and public debate.

Most industry observers stated during the 2014 inquiry that they do not believe that foreign investment is the main driver of price growth due to the lack of market share and different price brackets attracting local buyers (foreign investors tend to purchase higher priced and higher density dwellings). It was also argued that foreign buyers are long term investors, rather than speculative buyers (Rogers et. al., 2015). Industry observers and the RBA (2015) concluded that foreign investment in residential real estate is congruent with Australian housing policy. They argue that foreign investors bring benefits to the local building industry and suppliers, increasing the supply of new construction and offering potential transfer of technological skills in construction from foreign developers. These benefits were considered paramount to the local economy.

However, while the 2014 Parliamentary inquiry came to a consensus that foreign investment had positive influence on the residential real estate sector, the magnitude of this effect was inconclusive. The main reason was the lack of reliable data to conduct econometric analyses. Most, if not all, participants in the inquiry supported their arguments using only descriptive statistics and interviews of individual experiences (Gholipour et.al., 2019).

While the impact of foreign investment in stock markets has received considerable attention over the last two decades, for example, see Miziolek et.al. (2020), Wang and Shen (1999) and Brushko, IMF and Hashimoto (2014) studies concerning real estate investment, especially in residential markets is almost non-existent (Lee, 2013; Marzuki et.al., 2018). Liow et.al. (2019) analyse portfolio diversification strategies using cross border real estate investments, focusing on the advantages from an investors' perspective. In addition, several studies examine investor's behavioural biases and their impacts in different target markets (Adair et.al. 2006), however, to date these studies have not been conducted for residential real estate markets. While some analyses has indicated that foreign real estate investments reduce the volatility of portfolio returns (Wit, 2010) and others observe increased market liquidity (Falkenbach and Toivonen, 2017), Khan (2019) note that globalisation of real estate is not always welcomed as there are latent hostile effects from the fear of crowding out local investors. In addition, Rodriquez and Bustillo (2010) warn of the threat of economic stagnation when there is a decline in demand for local residential real estate.

However, only a limited number of academic studies have examined the effect of easing restrictions on foreign investment. For example, in 2014 the threshold for approval from the Foreign Investment Review Board (FIRB) was raised from $50 million to $800 million after the signing of the Australia-US free trade agreement 2014. Other regulatory changes that influence foreign investment include the cutting of company tax rates from 49 to 30 percent. Decisions to unwind protections have brought about side effects from increasing manufacturing exports which have also been largely ignored in the academic literature.

Foreign tax rates will also impact the level of foreign investment. It is beyond the scope of this thesis to provide a review on foreign taxation, however, there is considerable empirical evidence of income shifting (Clausing, 2016; Dowd et.al., 2016) in the USA due to high domestic tax rates. The high tax burden on immobile domestic capital leads them to lower-tax environments. In addition, a higher share of foreign ownership is observed to correlate with a higher average corporate income tax rate (Huizinga and Nicodme, 2006). This thesis examines foreign investment with specific reference to two foreign investment policy changes. Foreign investors have been subjected to different stamp duty costs and extra Foreign Investment Review board (FIRB) application fees at the time of purchase after 1st Dec 2015 as the *Foreign Acquisitions and Takeovers Fees Imposition Act 2015* (Fees Act) and *Foreign Acquisitions and Takeovers Fees Imposition Regulation 2015* (Fees Regulation) set the fees for foreign investment applications. Foreign investors are also liable for additional foreign acquirer's duties (*AFAD)* in addition to the FIRB application fees from 1st October 2016 (7% of purchase price).

Gauder et.al. (2014) and Parliament of Australia (2014) provide extensive reviews on the various observations and arguments around the impacts of foreign investment, from the crowding out of first home owners to the increase of exposure of the Australian housing market to international business cycles to increasing the value of Australian dollar, which reduces the competitiveness of Australia's international trade. In contrast, foreign buyers were argued to be long term investors, with no speculative mentality (Rogers et. al., 2015).

The purpose of this thesis is to examine foreign investment in Australian residential real estate and its effect on prices and ownership structures using the Gold Coast as a setting. The study begins by examining the characteristics of foreign investment in local residential real estate. Subsequently, a partial equilibrium study is conducted to measure the level of relative

mispricing found within the market. This further leads to an analysis of behavioural biases by local and foreign investors in the Australian residential real estate market.

1.1 Aim

There are three main aims to this study. Firstly, it is designed to support and expand arguments presented in the 2014 report published by the FIRB. The publication asserts that foreign investment in Australian real estate remains in Australia's national interest and there is no evidence to suggest that foreign buying unduly influences Australia's residential property prices. However, it was acknowledged that the absence of reliable empirical data could prevent us from understanding the degree of influence of foreign investment. This study is the first in Australia to utilise a unique set of granular data to examine the relationship between foreign investment and local residential real estate prices. This paper contributes to the literature by simultaneously investigating the impacts of Reserve Bank's decision to cut its cash rate to a historic low of 2.5 percent in 2020, resulting in low mortgage rates following the GFC. Foreign investment policies are also examined to show the effectiveness of government control.

Secondly, this study aims to examine whether mispricing (housing bubbles or market imbalance) is present in the residential real estate market by adopting the user-cost (UC) methodology. This paper is one of the first to include several property and investor types using the Imputed-to-Actual-Rent ratio (IAR). The IAR highlights overpricing of the residential real estate market compared to a benchmark, the rent received, and the breakdown by property and investor type allows for an examination of whether mispricing is only present in specific parts of the market. In particular, it allows for inference to drawn in relation to mispricing in the segment of the market that this owned by foreign investors, hence indicating any influence that foreign investors have on residential real estate prices.

Thirdly, this thesis investigates whether there has been a deviation from rational decisions by investors, foreign or otherwise. This is widely known as the disposition effect (DE), where investors tend to sell assets when prices are high and hold assets when prices are low. This thesis adds to the literature on the disposition effect which has previously been applied to equity markets. The findings suggest that neither foreign investors, or any other buyer type, exhibit disposition effects. Therefore, these markets should not exhibit slow incorporation of news or a lack of diversification in market downturns which are commonly attributed to disposition biases by investors.

1.2 Research Questions and Significance

There has been an emerging trend of research focusing on the impacts of foreign investment in residential real estate market, however they are limited to using aggregated level data. Despite this being an important topic, disaggregated transactional level data is difficult to obtain. Recent papers have raised concerns around the use of aggregated data in housing studies, arguing that aggregated values mask the effects of individual variables. Mehrhoff (2016) asserts that housing analysis should be performed using disaggregated transactional level data as aggregation obscures important information on regional heterogeneity. For example, empirical evidence in overheated housing markets showed that regional developments were often influenced by spatial transmission and geographical breakdown (Hseih et. al., 2015). This implies that there are insights which can only be harvested from case-by-case transactional analyses. Similarly, Andrle and Plasil (2019) who research house prices in Prague using aggregated values also report that the estimates were unstable and non-intuitive, urging further research to utilise disaggregated values.

The 2014 FIRB committee report concludes that the number of foreign investment approvals is too small to cause distortions in the Australian residential real estate market by using aggregated approvals. However, high level aggregated data from FIRB approvals presents limitations. Firstly, analysing aggregated figures in isolation conceals the full impact of foreign investment because they are not examined within the context of the full market (local buyers are not included for relative analyses). Secondly, FIRB figures do not reflect actual transactions as not all approvals result in purchases. Research such as ANZ Research (2017) applied an assumption of 30 percent to 50 percent of these approvals being actioned. Finally, foreign buyer price brackets are not quantified, only the number of approvals. A study presented to the inquiry examined 74,000 home sales in Sydney over the decade to 2011 identified that the proportion of buyers with Chinese surnames rose from 6.5 percent to 13.2 percent over that period (Casavecchia and Lee, 2014). They found that when controlling for variables such as suburb, housing quality and date, Chinese buyers paid, on average, 2 percent less, or $14,000 less than other buyers, suggesting that Chinese buyers were not the driving force behind rising prices.

All three empirical studies in this thesis avoid the problem of accessibility to disaggregated data. An extensive amount of work has been carefully carried out to decompose each individual residential transaction on a disaggregated level, controlling for different buyer

types accordingly. The significance of this is to conduct a detailed examination of the nature of foreign investment in Australian residential real estate transactions. A novel identification method is utilised in this thesis to identify buyer types, including foreign buyers, through full sales record data provided by Corelogic, a commercial re-seller of state and local government sales records. Owner addresses are obtained from the Titles Registry Office (TRO), which allows for the identification of ownership type by the destination where council rates are being sent. One critical reason why the filtering of foreign investor data is more accurate this way is because Australia has 40 percent more skilled migrants than skilled native-born residents, compared to an average of 11 percent across other advanced countries. According to FIRB chairman Brian Wilson, at least a third of skilled migrants come to Australia originally on temporary visas with owner occupation being the reason for acquiring Australian real estate.

The 2014 parliamentary inquiry report did not discuss any alternative strategy for governing foreign investment in residential real estate, accepting that foreign investment policy should increase supply in Australian housing. The report suggested that non-residents should be banned from permanent investment in established housing leaving foreign ownership available only for new dwellings. Further supporting the inquiry is the enforcement of new criminal penalties and a requirement to gain FIRB approval, a fee of $5,000 imposed on foreign purchases worth less than $1 million. The fee for properties sold at a price above $1 million is $10,000 for each additional million, all of which is monitored at the federal level by the Australian Taxation Office (ATO). Soon after the inquiry, state governments introduced an additional foreign acquirer's duty (AFAD) payable to the Office of State Revenue (OSR) applied to all foreign transactions. For Queensland, the amount was an extra 3 percent surcharge on stamp duty for non-resident purchases legally imposed in July 2016, with a further increase to 7 percent beginning July 2018. The 3 per cent surcharge was estimated to raise revenue for the Queensland government in future years, though independent researchers such as the AEC Group and Queensland Property Council of Australia urged the government to re-evaluate the considerable risks taken in further disincentivising foreign investment in Queensland's residential property market. When read in conjunction with housing affordability reports from Queensland's Productivity Commission (QPC, 2018), it is reasonable to posit that policymakers are constantly faced with a challenging task to not restrict demand or constrain supply over time.

The three studies presented below utilise an unprecedented set of disaggregated data to address various aspects of foreign investment in the Australian residential real estate market to achieve the corresponding aims discussed in Section 1.1.

Key Research Question 1: *Do foreign investors pay more for residential properties compared to local buyers, hence influencing the average price of residential real estate in Australia?*

Study 1: This study expands the orthodox hedonic pricing model to measure the effect of foreign investment on Australian residential prices using granular and detailed data not previously utilised in the literature. The findings highlight that *foreign investors pay more for units on the Gold Coast compared to owner occupiers*, followed by Interstate investors while QLD investors and suburb investors paid less on average, for units compared to owner occupiers. However, *all buyer types including foreign investors all paid less for houses* compared to owner occupiers throughout the data sample. The premium paid by foreign investors compared to owner occupiers for Australian residential real estate was reduced following the introduction of the foreign investment (FIRB) policy. The introduction of the Additional Foreign Acquirer Duty (AFAD) soon after also resulted in lower prices being paid by foreign investors compared to owner occupiers. Hence, there is evidence that both federal and state government policies have impacted on the comparative prices paid by foreign investors for Gold Coast residential real estate. From July 2000 to June 2018, interest rates were found to have had a positive relationship with property prices, suggesting that monetary policy has an ability to influence residential property prices.

Key Research Question 2: *Following the previous study, is mispricing evident in the residential real estate market for different buyer types?*

Study 2: This study attempts to improve the Price-to-Rent Ratio (PRR) methodology which has been widely used to evaluate mispricing in real estate markets. Current research measuring mispricing with PRR is inadequate and misleading due to its inherent lack of theoretical underpinning. When stakeholders utilise these figures, the fundamental cause of price appreciation is obscured as the calculation neglects the cost of ownership. In this study, an alternative measurement Imputed-to-Actual Rent ratio (IAR) is calculated using the empirical measure of user-cost (UC) as suggested by Himmelberg et.al. (2005). The findings

suggest that *mispricing is evident* in Gold Coast residential properties where it is more cost-effective to rent than buy. However, this finding is not applicable to all property types. Disaggregation of the data shows that *two and three bedroom units exhibit relatively accurate pricing; three bedroom houses were found to be relatively over-valued (cheaper to rent) while four bedroom houses were relatively under-valued (cheaper to buy) over the sample period.*

When controlled for buyer type, the findings show that *foreign investors exhibited inconsistent levels of mispricing.* Gold Coast properties in general were profitable investments for foreigners, especially before June 2011. Further analysis showed that this trend of profitable investments remained for houses (not units), even after the introduction of FIRB fees in 2015. However, there was a dramatic reversal after the implementation of AFAD as properties became significantly more expensive for foreign investors. All property types except *two bedroom units exhibited relative over-valuation for foreign investors after the implementation of AFAD*. This is likely to have resulted in the shift in foreign demand to cheaper investment properties in the Gold Coast.

When investigated from a Loan-to-Value Ratio (LVR) perspective, properties were priced appropriately only if they were bought outright, without incurring any debt. However, at both 50% and 80% LVR, the results showed that properties were relatively over-valued as the historical average rate of price appreciation was not sufficient to cover interest repayments. In this case, it would have been cheaper for all buyer types, especially foreign buyers to rent rather than buy.

Key Research Question 3: *Do residential property buyers sell their assets when prices are going up and hold their losing assets for relatively longer periods, exhibiting disposition bias?*

Study 3: The disposition effect is a well-recognised behavioural bias first termed by Shefrin and Statman (1985) in relation to share prices. It relates to the idea that investors tend to sell their assets which have gained in value while holding losing assets for longer periods. This paper contributes to the literature by examining whether this behavioural bias is evident for property owners in the Gold Coast residential market between July 2000 to June 2018. In addition, it examines the extent to which foreign investors exhibit this bias compared to local buyers. Results indicates that the disposition effect does not exist in the Australian residential real estate market. However, owner occupiers have the highest sensitivity to profit movements (evidence of higher disposition effect), followed by Queensland investors, foreign investors

and finally interstate investors. Foreign investors were most sensitive to the number of sales in the previous period. This suggests that foreign investors influence momentum effects in the Gold Coast residential real estate. In other words, foreign investors may be savvier and tend to exhibit more "herd behaviour" comparatively. Interestingly both FIRB and AFAD policies were shown to have a significant effect on the number of sales for foreign buyers. *Foreign investors do not appear to exhibit the disposition effect*.

1.3 Gold Coast Residential Real Estate Market

The Gold Coast is one of Australia's most significant urban coastal cities, with its population rising from 0.4% of the total Australian population in 1961 to 3.9% in 2015 (Stapledon, 2016). It is one of the fastest growing cities globally (United Nations, 2018) and is increasingly becoming known as a lifestyle urban centre, catering to tourists and retirees worldwide (Frost and O'Hanlon, 2009). Attracting over 13 million visitors and 12,500 new residents each year, the Gold Coast City Council is said to have committed to providing accessible housing through the Queensland Housing Strategy over the last two decades. However, more recently the Gold Coast has been listed as the 15th most unaffordable city in the world, where median house prices were compared with average salaries of 367 cities worldwide (Harbour and Houghton, 2016). It was noted that the Gold Coast median house price of $545,000, 8 times the average salary of $63,700, is now less affordable than Tokyo, Singapore, New York and almost every capital city in Australia. This is not surprising, considering Data from the Bureau of Infrastructure, Transport and Regional Economics which shows that while there were 981,916 domestic passengers flying into Coolangatta Airport in 1990, a time when there were no international flights; eighteen years later, 5,398,985 domestic and 1,080,098 international passengers arrived at Gold Coast Airport in 2018 (Larkins, 2019). While Salt (2020) suggest that wealthy interstate and foreign buyers could have skewed the findings, it is undeniable that the Gold Coast is increasingly becoming a luxury brand name for many investors. Since the 1950s, this city has been known for having more navigable tidal waterways than Venice, Italy. It is regularly seen in media reports that award winning canal homes now have even more extras such as helicopter landing pads, underground night clubs, private beaches and pontoons.

The volatility of property prices in the Gold Coast can be very complex, especially when most asset pricing studies are conducted from an aggregated perspective where buyer dynamics cannot be clearly demonstrated. The lack of reliable data further exacerbates the issue of empirical measurement, where actual mispricing of properties cannot be identified. As highlighted by Hull (1997), irresponsiveness of housing policies can be detrimental, particularly in small open economies like the Gold Coast. Therefore, this thesis is unique and important for home owners, investors and policy makers.

The unique features of the Gold Coast property market limit the extent to which the results may be generalised to other Australian residential real estate markets. However, the benefits of being able to gain an in-depth understanding of foreign investment in this market (due to highly granular data) far outweigh any losses from generalisability. In addition, the impact of foreign investment is likely to be more apparent in a city such as the Gold Coast. Hence the limited effects found from foreign investment on the Gold Coast property market suggest that other Australian cities will suffer only minimal effects from foreign investment in the property market. This study may be useful for cities in other countries that share similar traits to the Gold Coast.

1.4 Data Summary

With a population growth of around 2.5% per annum, Gold Coast comprised approximately 690,000 residents at the beginning of 2019, of which approximately 75% resided in the suburbs included in this thesis. The sample covers 44 suburbs in Gold Coast's urban zoning, including special development areas and all coastal suburbs. The period of study is from 1st July 2000 to 30th June 2018 for all transactions of properties with 2 or more bedrooms and categorised as units or houses.

Full sales record data for all house and unit transactions in these suburbs were provided by Corelogic, a commercial re-seller of sales records subscribed by Queensland University of Technology (QUT). These records are also publicly available for purchase. Information provided in the data includes structural characteristics of the residence: address, number of bedrooms, bathrooms and car spaces, lot size, property size, sale price, sale date (contract date), settlement date, zoning, sale type and buyer and seller details. All non-arm's length transactions, part sales, multiple transaction sales, transfers and court order transactions have been removed. Individual developers who purchased multiple adjacent blocks with above

average market values are also removed, as well as all transactions below $60,000 which appear to be de facto and family transfers. Data on lot and property sizes, zoning and sale type, including the age of the property were only randomly available (highly scarce), therefore these variables are not included in the analysis. Vacant land sales were also excluded.

A manual classification method has been adopted to categorise the buyer groups as owner occupier, Queensland investors, interstate investors, foreign investors or suburb investors. Raw sales data provided the necessary information to determine the buyer type, as shown in Table 1.1 below.

Table 1.1 *Example of Raw Data*

PROPERTY	OWNER ADDRESS	PRICE	DATE
32 Queens St, Miami, QLD	32 Queens St, Miami, QLD	$550,000	06/09/16
69 Mikael Rd, Labrador, QLD	21 Tenor Rd, Labrador, QLD	$620,000	09/01/18
48 Peters Ave, Tugun, QLD	58 Morning Dr, Doonan, QLD	$563,000	01/06/20
15 Rudd St, Broadbeach, QLD	30 Albert Ave, Sydney, NSW	$450,000	20/11/98
26 Christine Crt, Robina, QLD	888 La Brea Ave, USA	$870,000	28/09/05

Row 1 represents a purchase by an ***owner occupier*** as the owner address is the same as the address of the property purchase

Row 2 represents a purchase made by a ***suburb investor*** as the address of the property purchased is different to the owner address, but the owner address (Labrador) is within the same suburb

Row 3 represents a purchase made by a ***Queensland investor*** as the address of the property purchased has a different owner address and suburb, but the owner address is in Queensland

Row 4 represents a purchase made by an ***interstate investor*** as the address of the property purchased has a different owner address, and the owner address (in New South Wales) is outside Queensland but within Australia

Row 5 represents a purchase made by a ***foreign investor*** as the address of the property purchased has a different owner address, and the owner address (in the US) is outside Australia

Categorisation of this nature was manually completed for 253,057 transactions. The raw sales data also included buyer names (contract name), allowing manual categorisation of buyers into different entity types which is used as a control variable in the regression models. For example, classifications were made for transactions completed through a personal name, company name, trust, church, association, foundation, union or state. Following the data preparation and cleaning, the total number of observations removed was 1,716, leaving the final data set with 251,341 transactions of unit and house sales in the Gold Coast from 1 July 2001 to 30 June 2018.

Table 1.2 *Summary Statistics of Buyer & Property Types*

Panel A: Number of Purchases

BUYER TYPE	UNIT PURCHASES	HOUSE PURCHASES
Owner Occupier	43,953 (41.03%)	87,275 (60.52%)
QLD Investor	27,351 (25.53%)	30,163 (20.92%)
Interstate Investor	25,239 (23.56%)	14,808 (10.27%)
Foreign Investor	3,031 (2.83%)	1,653 (1.15%)
Suburb Investor	7,557 (7.05%)	10,311 (7.15%)
All Transactions	**107,131 (42.62%)**	**144,210 (57.38%)**

Panel B: Value of Purchases

BUYER TYPE	MEAN	SD	MEDIAN	MAX
Owner Occupier	$494,739	397,847	415,000	18,000,000
Queensland Investor	$430,569	394,404	343,000	13,500,000
Interstate Investor	$422,924	406,640	340,000	20,000,000
Foreign Investor	$582,079	497,220	460,000	8,000,000
Suburb Investor	$442,853	394,310	361,500	9,900,000

As shown in Table 1.2, the sample consists of 107,131 transactions involving units (43%) and 144,210 transactions involving houses (57%). Of these transactions, the largest buyer type is owner occupiers (41.0% of unit purchases and 60.5% of house purchases), followed by Queensland investors (25.5% of unit purchases and 20.9% of houses), interstate investors (23.6% of units and 10.3% of houses), suburb investors (7.1% of units and 7.2% of houses) and foreign investors (2.8% of units and 1.2% of houses). The entity types used for the purchase of these transactions were predominantly personal names (92%) followed by company owned properties (7%). 40% of transactions occurred before the GFC, 29% of

transactions occurred between 2006 and 2012 and 30% of transactions occurred from 2012 to 2018. The month with the highest average number of sales is March and the month with the lowest average number of sales is December. On a suburb level, Surfers Paradise recorded the highest number of transactions (7%), followed by Southport (6%), Robina (5%), Upper Coomera (5%) and Labrador (4%). This analysis is further broken down in Figure 1.6.

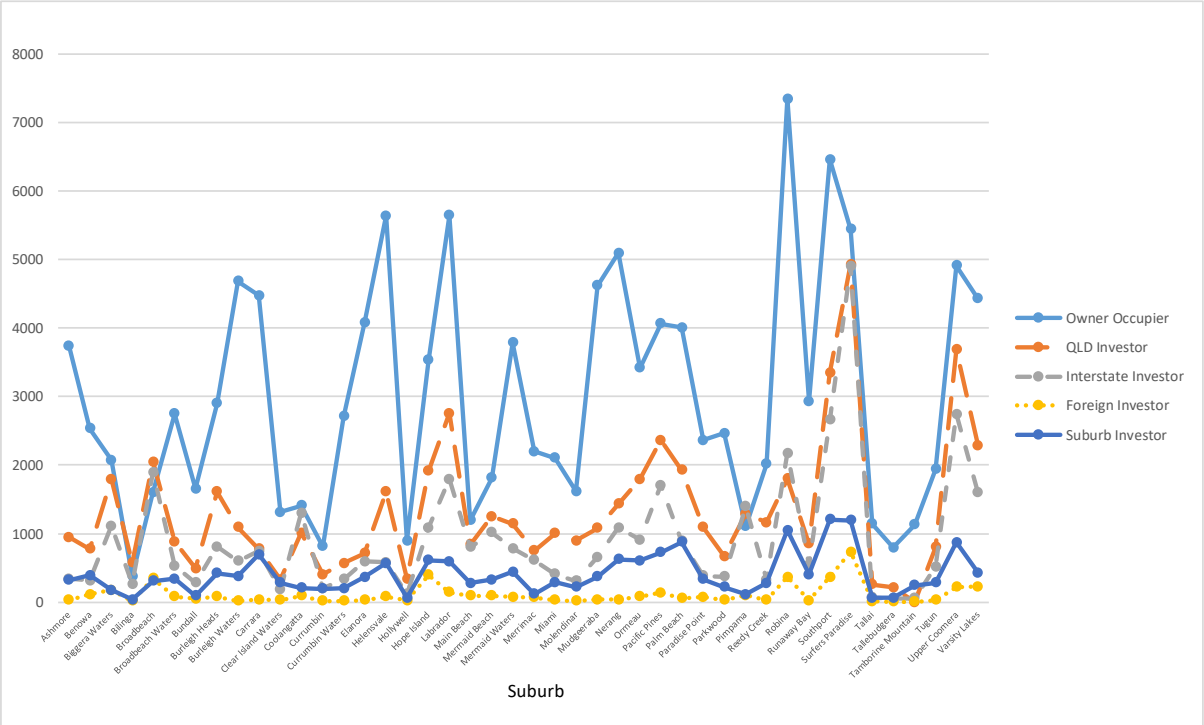

Figure 1.6. Number of Transactions for Different Buyer Types at Suburb Level

Panel B of Table 1.2 shows that foreign investors have the highest recorded mean and median sale price. This is comparable to the findings of Gauder et al. (2014) where purchases by temporary residents and foreign investors are concentrated in the higher-priced sector of the housing market. However, foreign investors did not pay the highest value for a property, these purchases were by owner occupiers and interstate investors.

Mortgage interest rate data was obtained from the RBA Variable Standard Housing Loan Rates series Table F05. While interest-only loans are not uncommon for investors, they are unusual for owner-occupiers. As the sample data comprise of 46% of owner-occupiers and the results are interpreted in comparison to owner-occupier purchase price, this research assumes that the loan is a variable standard home loan with loan-to-valuation ratio at 80%. The nominal

variable interest rate (Table F05) captures the prevailing effects of temporary fluctuations due to global events that will affect foreign investments. The mid-point between the sales date (contract date) and settlement date was used to determine the rate applicable at the time of the transaction.

The remainder of the document is as follows. Chapter 2 highlights the existing research on hedonic price modelling from a theoretical and empirical perspective, followed by the results and analysis. Chapter 3 presents the argument for an improved methodology to measure mispricing in the Australian residential real estate market, followed by the results and analysis. Chapter 4 presents a literature review of the disposition effect, followed by the results and analysis. Chapter 5 draws a conclusion of the previous 3 chapters and Chapter 6 is a bibliographical reference.

Chapter 2: Foreign Investment influence on Residential Real Estate Prices

2.1 Hedonic Modelling & Residential Real Estate Studies

Studies examining the relationship between foreign investment and local housing prices were almost non-existent prior to the GFC, although there have been several studies more recently due to extensive media attention around this issue. Guest and Rohde (2017) state that an increase in foreign approvals by FIRB have contributed substantially to price increases in Sydney and Melbourne, though found no such results for Brisbane and Perth. It remains unclear the degree of distortions created by foreign investment today, though as Swieringa and Wokker (2016) note that foreign investment in new dwellings is in line with Australia's policy to increase national GDP.

In traditional real estate studies, hedonic pricing models are used to link prices to structural characteristics and exogenous variables such as number of bedrooms, bathrooms and car spaces, size of living area, land size, interest rates, population, location and access to transportation. Seminal research on the prediction of house prices using hedonic models dates back to Kain and Quigley (1970) who included the number of bedrooms, neighbourhood characteristics and distance to CBD as their main explanatory variables. There have also been a number of studies predicting property values using the natural environment and location as part of the pricing model (Alonso, 1964; Mills 1972). While these studies assume a linear relationship between residential prices and structural characteristics and exogenous variables, Bender and Hwang (1985) find that hedonic pricing models do not adequately explain residential price decreases. Similarly, Coulson (1991) observe that traditional hedonic models are unable to explain declining in land values, arguing that the assumption of employment being concentrated in CBDs no longer reflects the patterns of contemporary urban areas.

International studies show that distance to the CBD appears to be less significant than accessibility to employment (Song, 1994). A similar result was found by Franklin and Waddell (2003) where accessibility to four types of employment using congested travel times helped to explain property prices. Herath and Maier (2010) suggest that the implicit value of structural characteristics has been largely under-researched due to the difficulties in sourcing reliable

data. This concern is addressed in our research, where a large sample with structural characteristics is used.

Several major cities around the world are heavily impacted by foreign investment in their local housing markets such as Hong Kong, Singapore, New York and London. In Australia, Allen and Brown (2013) report that in Melbourne and Sydney approximately 14% to 18% of new dwellings are being purchased by foreigners. Although there exists a paucity of academic research into the effect of foreign investment on residential real estate prices, it has been the target of many governmental policies, for example in 2011 Singapore created an additional 10% tax on foreign buyers, followed by Hong Kong in 2012 in the form of foreign buyer's stamp duty (BSD) of 15%.

Since 1975, Australia began implementing foreign real estate investment purchasing laws and national policies through the Foreign Acquisitions and Takeover Act 1975 (FATA). The Foreign Investment Review Board (FIRB) was created as a regulatory body to ensure foreign investors comply with FATA and obtain approval from the Australian government before making an investment in Australia. FIRB overlooks foreign investment in the real estate market by tracking foreign investors and their investments. By the end of 2012, Business Migration Visa Programs were introduced and attracted considerable attention especially from high-net-worth investors and entrepreneurs. An enquiry conducted by the Parliament of Australia (2015) into the Business Innovation and Investment Programme highlighted that visa streams 132, 188 and 888 were particularly popular and held the view that it would be beneficial to assess their benefit to the Australian economy. However, the inquiry faced a major challenge most notably due to the distinct lack of empirical data. This chapter furnishes indirectly the evidence of these visas in affecting local residential prices.

In 2015, more stringent approval requirements were implemented as a result of a series of allegations by the media that local buyers were being priced out of the real estate market by foreign investors. More recently, additional changes were made by the FIRB to prevent foreign investors from taking advantage of tax breaks and loopholes. From 1st December 2015, every foreign investment application for a real estate purchase incurs a fee of AU$5,000 for property valued under AU$1M and an increment of AU$10,000 for every AU$1M thereafter. In addition, an extra 3% stamp duty is applicable to foreign purchases from 1st October 2016, also known as the Additional Foreign Acquirer's Duty (AFAD). Though it was originally conjectured that the introduction of a foreign property tax could improve the welfare of the overall economy (Abelson & Joyeux, 2007; Chao & Yu, 2015), latest research by the Property

Council of Australia (2017) noted that if foreign investment for new residential dwellings fell by 20% it would reduce Australia's economic output by $14.8 billion over a 10 year period and reduce annual real GDP by $2.3 billion.

Wong (2017) documented that foreign investment has now surpassed many traditional economic indicators as a leading determinant of housing price growth in Australia. This study concludes that more research is critical to better understand the nature of foreign investments, highlighting the influence of foreign High Net-Worth Individuals1 (HNWIs) in the Asia Pacific region as one of the main drivers of housing price growth. This is again highlighted in the recent IMF (2018) and World Wealth Report (2018), where the wealth of HNWIs was noted to have surpassed US$70 Trillion for the first time in history. In the late 1990s, HNWIs predominantly focussed on investment in commercial real estate, leaving residential housing for smaller investors. However, this dynamic changed after the GFC, with many HNWIs purchasing residential properties at the bottom of the market, especially in the U.S. (Fu and Qian, 2014). This can be seen in recent statistics from the U.S. Census Bureau (2018), where the number of rental households rose steadily while the number of home owners fell. A similar trend was also documented in Australia (AIHW, 2017). In the UK, however, Braakmann (2019) showed that increased immigration has almost no effect on mean property prices.

Another important factor relevant to this study is the fluctuation of interest rates (Shiller, 2006; Mishkin, 2007; Goodhart and Hofmann (2008); Bernanke, 2010; Niklewski et.al., 2014; Piazzesi & Schneider, 2016). Mixed results have been found in relation to the effect of interest rates. (Fraser et al., 2008) and Taylor (2007, 2009) find a positive relationship between interest rates and residential property prices, while Bollard and Smith (2006), Jou et. al. (2014), Hui et. al. (2003) and McDonald and Stokes (2013) find a negative (and unstable) relationship. Glaeser et.al. (2010) conclude that interest rate decreases only explain approximately 20% of increases in real house prices.

In Australia, the RBA (2015) and Yates (2015) acknowledge that significant house price rises prior to the mid-90s can be attributed to low prevailing interest rates. Other constraints have also been examined with the conclusion that initial access to borrowing capacity and deposit requirements are as important as interest rates in contributing to residential price growth (Bourassa, 1995; Flatau et.al., 2006; Simon & Stone, 2017). While Stapleton (2016) noted that

[1] Individuals with liquid assets in excess of USD 1m.

declining interest rates do not fully explain residential price growth, Saiz (2010) questions the aggregation of different house prices across cities and regions which may cloud the relationship between interest rates and price movements. Taking this into consideration, Lim & Tsiaplias (2018) conduct an analysis using a non-linear approach across five major capital cities in Australia. They conclude that there is a 'soft' threshold point whereby interest rates can cause housing prices in some cities to become unstable and deviate from fundamental values if breached. Instead, house prices in these areas are particularly sensitive to individual housing supply and owner sentiment (Glaeser et. al., 2008; 2018). It is becoming apparent that house prices react to city-specific economic conditions more than domestic interest rates.

The absence of empirical data on the degree of residential price changes caused by interest rate changes in a disaggregated context has fuelled debate in Australia as to whether the RBA maintains its influence over residential property prices. This is a significant gap in the Australian real estate literature and this paper seeks to provide empirical evidence to gain better insight into the effect of foreign investment and interest rates policies on Australian residential real estate prices.

2.2 Methodology

The hedonic pricing model adopted in this research is consistent with Malpezzi (2002) as indicated below:

$$\boldsymbol{lnSalePrice_{it}} = \boldsymbol{\alpha} + \boldsymbol{\beta_1 Bed_{it}} + \boldsymbol{\beta_2 Bath_{it}} + \boldsymbol{\beta_3 Car_{it}} + \boldsymbol{\beta_4\, EntityType} + \boldsymbol{\beta_5\, BuyerType_{it}} + \boldsymbol{\beta_6 Month_{it}} + \boldsymbol{\beta_7 Year_{it}} + \boldsymbol{\beta_8 Suburb_{it}} + \boldsymbol{\varepsilon} \quad \text{(Eq. 2.1)}$$

where $lnSalePrice_{it}$ is the log of the sale price for property i at time t, Bed_{it} is the number of bedrooms, $Bath_{it}$ is the number of bathrooms, Car_{it} is the number of car spaces, $EntityType_{it}$ is the type of Entity (personal, company, trust, church, association, foundation, union or a state), $BuyerType_{it}$ is the type of buyer (owner occupier, foreign investor, interstate investor, Queensland investor or suburb investor), $Month_{it}$ and $Year_{it}$ are the month and year when the transaction occurred, $Suburb_{it}$ is the suburb code and ε is the error term[2]

[2] "The age, condition and other subjective measures of the property are important variables to consider when pricing a property. However, there is currently no adequate data available to represent these variables and hence these factors must be considered when interpreting the results."

Two policy dummy variables are used to examine whether foreign investment policy impacts on the prices paid by foreign investors. The first policy change for foreign transactions was from 24th Nov 2012 which captures the policy impact of new Business Migration Visas Subclass 132, 188 and 888. The second policy change relates to all foreign transactions from 1st October 2016 to capture the impact of additional application fees from FIRB as well as also the Additional Foreign Acquirer Duty (AFAD) of 3%.

Additional variables are included to capture mortgage interest rates[3] and policy effects across time, as follows:

$$\begin{aligned} \boldsymbol{lnSalePrice_{it}} &= \boldsymbol{\alpha + \beta_1 Bed_{it} + \beta_2 Bath_{it} + \beta_3 Car_{it} + \beta_4 EntityType +} \\ &\boldsymbol{\beta_5 BuyerType_{it} + \beta_6 Month_{it} + \beta_7 Year_{it} + \beta_8 Suburb_{it} +} \\ &\boldsymbol{\beta_9 InterestRates_{it} + \beta_{10} ForInv * Policy\_1_{it} + \beta_{11} ForInv * Policy\_2_{it} + \varepsilon} \end{aligned}$$

(Eq. 2.2)

where all previous variables are as above, and Interest $Rates_t$ are the RBA nominal variable standard housing loan rates and ForInv*$Policy\_1_{it}$ is an interaction dummy variable for the introduction of the Business Migration Visa for foreign investors, while ForInv*$Policy\_2_{it}$ is a dummy variable reflecting the introduction of the AFAD fee for foreign investors.

The dataset is also divided into three even subperiods of six years each for more detailed examination, namely: pre-GFC from 1st July 2000 to 30th June 2006; GFC from 1st July 2006 to 30th June 2012; and post-GFC from 1st July 2012 to 30th June 2018. The GFC period is the six-year period including the GFC which was most notable evident during 2007 and 2008.

The granularity of the sample data in this study is unique and addresses one of the major limitations cited in previous studies that utilise aggregated data. The OLS regression models in this study incorporate robust standard errors which detect heteroscedasticity in the residuals.

[3] Alternative proxies for interest rates or interest rate variables could have been used. I have chosen this rate to best reflect the impact of interest rates via housing loans. I have only included the one interest rate variable for model parsimony (RBA, 2019).

2.3 Results & Findings

This section presents the results of analysis conducted to examine the effect of foreign investment on residential real estate prices. Initially, I present the impact of structural characteristics of properties on prices. The effect of the different types of buyers is then highlighted to examine any differences between foreign investors compared with owner occupiers. Further analysis will highlight the effect of interest rates and government policy on the prices paid for residential property by foreign investors.

Table 2.1 shows that structural characteristics, represented by coefficients $\beta_1, \beta_2, \beta_3$ in both equations (2.1) and (2.2) have a positive relationship with the log sale price. This result is expected as increasing the number of bedrooms, bathrooms and car spaces, ceteris paribus, should increase the sale price of a property. Increases in the number of bathrooms has a positive impact on sale price ($\beta_2 = 0.202$) along with the number of bedrooms ($\beta_1 = 0.133$), with the effect more prounounced for units ($\beta_2 = 0.270, \beta_1 = 0.158$) than houses ($\beta_2 = 0.170, \beta_1 = 0.083$). These relationships are statistically significant at the 1% level. The number of carspaces also has a statistically significant positive relationship with property prices, albeit with a lower impact than the number of bedrooms or bathrooms, with β_3 = 0.0483 (0.0518, 0.0365) for all properties (units, houses). These results also show that the number of bedrooms, bathrooms and car spaces has more impact on unit prices compared with house prices.

Table 2.1 also shows the effect of different buyer types on property prices for units and houses across varying time periods. There are several key observations which can be drawn from these results. The purchases by foreign investors are highlighted across the second last row in Table 2.1. The results suggest that foreign investors, β_5^{for} on average pay 8.8% more for properties compared to owner occupiers. For example, if an owner occupier pays $500,000 for a particular property, a foreign investor would pay $544,100 for an equivalent property. Similarly, an interstate investor would pay less than the owner occupier for the same property, purchasing it at 12.9% less, at $435,500. In addition, the results show that foreign investors pay more on average for units only, paying less than owner occupiers, on average for houses. Moreover, the trend of foreign investors paying higher average prices for units is observable for all periods pre-GFC, during the GFC and post-GFC, though this trend decreases, with a coefficient of $\beta_5^{for} = 0.287$ prior to the GFC becoming $\beta_5^{for} = 0.204$ in the post GFC period. Foreign investors appear to pay less than owner occupiers for houses for all periods pre, during and post-GFC, though the coefficient in the post-GFC period is not statistically significant.

There could be several reasons for foreign investors to purchase more units than houses and to pay a larger premium for these units. For example, there are fewer units compared to houses in our sample, making unit purchases more competitive. Alternatively, foreign investors may be more concerned with an income stream, as opposed to capital appreciation, thereby minimising large management fees often associated with the purchase of houses, compared to units.

QLD investors, interstate investors and suburb investors all pay less on average for property purchases in general compared to the price paid by an owner occupier. This is shown by the negative and significant coefficients in the first column of Table 2.1 for these variables. Interstate investors β_5^{int} pay more for units ($\beta_5^{int} = 0.024$) and less for houses ($\beta_5^{int} = -0.193$) compared to owner occupiers. This suggests that interstate investors pay, on average, about -19% less than owner occupiers for houses and 2% greater than owner occupiers for units. QLD and suburb investors pay less, on average, for both units and houses compared to owner occupiers. However, this trend is not observable during the GFC.

Table 2.1 *Effect of Buyer Type on Property Prices for Units and Houses across Varying Time Periods*

LOG SALE PRICE	ALL	UNIT	HOUSE	UNIT			HOUSE		
				PRE GFC	GFC	POST GFC	PRE GFC	GFC	POST GFC
No. of Bedrooms	0.133***	0.158***	0.0826***	0.157***	0.144***	0.169***	0.0794***	0.0656***	0.0978***
β_1	(99.55)	(55.90)	(48.76)	(31.48)	(27.22)	(39.40)	(28.29)	(21.39)	(35.67)
No. of Bathrooms	0.202***	0.270***	0.170***	0.257***	0.277***	0.274***	0.141***	0.193***	0.193***
β_2	(116.51)	(94.36)	(82.58)	(55.29)	(52.15)	(58.91)	(43.13)	(50.53)	(59.42)
No. of Car Spaces	0.0483***	0.0518***	0.0365***	0.0395***	0.0558***	0.0644***	0.0165***	0.0427***	0.0620***
β_3	(45.88)	(24.38)	(31.81)	(11.17)	(14.50)	(18.19)	(9.10)	(19.14)	(33.58)
QLD Investor	-0.156***	-0.00998***	-0.237***	-0.00627	0.00608	-0.0297***	-0.276***	-0.245***	-0.125***
β_5^{qld}	(-74.66)	(-3.35)	(-88.81)	(-1.20)	(1.14)	(-6.25)	(-62.25)	(-51.89)	(-28.42)
Interstate Investor	-0.101***	0.0240***	-0.193***	0.0514***	0.0344***	-0.0222***	-0.226***	-0.184***	-0.118***
β_5^{int}	(-43.25)	(8.09)	(-54.76)	(10.72)	(5.84)	(-4.54)	(-40.08)	(-24.69)	(-22.66)
Foreign Investor	0.0882***	0.257***	-0.0861***	0.287***	0.253***	0.204***	-0.109***	-0.0992***	0.000137
β_5^{for}	(13.15)	(33.45)	(-7.61)	(22.37)	(17.98)	(16.04)	(-5.80)	(-4.62)	(0.01)
Suburb Investor	-0.129***	-0.0177***	-0.175***	-0.0215**	0.00182	-0.0307***	-0.217***	-0.179***	-0.0907***
β_5^{sub}	(-40.90)	(-3.74)	(-44.72)	(-2.58)	(0.21)	(-4.17)	(-32.97)	(-26.36)	(-14.06)
All Regressions have Time (Month & Year), Entity Name and Suburb Fixed Effects									
R-Squared	0.605	0.585	0.668	0.561	0.447	0.474	0.606	0.547	0.606
Observations	251,341	107,131	144,210	41,772	30,877	34,482	56,971	42,875	44,364

t statistics in parentheses. *, **, *** denote significance at the 5%, 1% and 0.1% level respectively

Table 2.2 *Effect of Buyer Type on Property Prices for Units and Houses with Interest Rates and Policy Impacts*

LOG SALE PRICE (Fixed effects are included)	**ALL**	**UNIT**	**HOUSE**	**UNIT**			**HOUSE**		
				PRE GFC	**GFC**	**POST GFC**	**PRE GFC**	**GFC**	**POST GFC**
QLD Investor	-0.169***	0.0209***	-0.296***	-0.00807	0.00612	-0.0299***	-0.276***	-0.246***	-0.135***
β_5^{qld}	(-70.30)	(6.24)	(-89.52)	(-1.55)	(1.15)	(-6.30)	(-62.21)	(-52.08)	(-27.65)
Interstate Investor	-0.127***	0.0324***	-0.286***	0.0462***	0.0344**	-0.0231***	-0.226***	-0.185***	-0.128***
β_5^{int}	(-46.78)	(9.57)	(-64.04)	(9.66)	(5.84)	(-4.71)	(-40.12)	(-24.84)	(-22.77)
Foreign Investor	0.136***	0.329***	-0.123***	0.275***	0.253***	0.386***	-0.109***	-0.0998***	-0.0340
β_5^{for}	(13.78)	(30.67)	(-6.77)	(21.69)	(17.98)	(5.35)	(-5.81)	(-4.64)	(-0.89)
Suburb Investor	-0.128***	0.00170	-0.197***	-0.0210*	0.00182	-0.0304***	-0.217***	-0.179***	-0.1000***
β_5^{sub}	(-35.47)	(0.32)	(-41.02)	(-2.53)	(0.21)	(-4.14)	(-32.90)	(-26.50)	(-14.75)
Interest Rates	0.0412***	0.0422***	0.0442***	0.177***	-0.00376	-0.108***	0.0217**	0.0296***	0.0451***
β_9	(14.03)	(9.46)	(12.05)	(19.53)	(-0.85)	(-6.42)	(2.98)	(7.94)	(4.60)
Immigration Policies x Foreign Investor	-0.0590***	-0.0757***	0.0485			-0.182*			-0.166
$\beta_{10}^{immi}\ x\ \beta_5^{for}$	(-3.45)	(-4.04)	(1.47)			(-2.47)			(-1.63)
FIRB & AFAD Policies x Foreign Investor	-0.121***	-0.106**	-0.0234			-0.256**			-0.192
$\beta_{10}^{firb}\ x\ \beta_5^{for}$	(-3.59)	(-2.60)	(-0.41)			(-3.27)			(-1.80)
R-Squared	0.477	0.459	0.509	0.567	0.447	0.475	0.606	0.547	0.606
Observations	251,341	107,131	144,210	41,772	30,877	34,482	56,971	42,875	44,364

t statistics in parentheses. *, **, *** denote significance at the 5%, 1% and 0.1% level respectively

Table 2.2 presents the results of the regression model described in Equation 2 which incorporates interest rates and policy changes on local residential prices. Structural characteristics have significant positive relationships with prices consistent with the results presented in Table 2.1, hence they are not displayed in Table 2.2. The regression results for the pooled set of both unit and house transactions on the Gold Coast are presented in the first column of Table 2.1. The significant negative coefficient for β_{10}^{immi} (-0.0590) shows that following the introduction of the investor visa policy, foreign investors reduced the premium for properties relative to owner occupiers than before the introduction of the policy. This implies that they would only pay a premium of approximately 8% compared to a premium of approximately 14% prior to the introduction of the policy. The introduction of the Foreign Investment Review Board (FIRB) and the Additional Foreign Acquirer Duty (AFAD) policies further added pressure on foreign investors, with foreign investors now paying approximately 4% less than owner occupiers. This result appears to be driven by pressure on unit prices as the coefficients for house prices are statistically insignificant. These results clearly indicate that since the implementation of FIRB and AFAD policies, foreign investor sale prices were largely reduced compared to the prices paid by owner occupiers, possibly dampening speculative behaviour by foreign investors, as discussed by Lee and Reed (2014).

Interestingly, the coefficients for interest rates (β_9) are positive and statistically significant for both unit (0.042) and house (0.044) transactions. This suggests that increases in interest rates are associated with increases in residential real estate prices. While this result appears to be counter intuitive, further analysis reveals that interest rates actually have a negative relationship for unit sales following the GFC period, though not for houses. This negative coefficient is consistent with the arguments made by Stevenson (2008) and Lin and Fuerst (2014), who argued the importance of interest rates as a policy tool and the potential adverse effects on residential real estate prices if neglected (He and Cava, 2020).

Gauder et. al. (2014) and several other researchers note that foreign investment in Australian residential real estate occupy only a small share of the overall economy. However, I find statistically significant differences in the prices paid by foreign investors compared to owner occupiers. This indicates that foreign purchases may

contribute to inflationary pressures of residential prices, regardless of market share, and require special attention to understand its dynamics. Javorcik et.al. (2011) and Lee et. al. (2015) argue for a better understanding of foreign investment from a historical context to further gauge the trends in global cross-border capital movements. More importantly, they provided a critical assessment to support the results found in this research; that global real estate relations are not only defined and managed by governments but are increasingly influenced by the government policies that allow foreign real estate investments. They encourage research into foreign investments in Australian residential real estate, alongside urban planning rules and various other factors such as migration incentives, building laws and foreign investment rules to encourage broader public discussion around the issue of foreign investment and affordable housing.

Empirical evidence provided in this research has provided valuable insights into buying practises of foreign investors. Whether foreign investment is for asset protection purposes or political security, as argued by Ley (2010) and Short (2010), the trade-offs between balancing Australia's current account deficit and housing affordability for local buyers remains an interesting debate.

2.4 Conclusion

Several studies have investigated the relationship between traditional drivers (such as population growth, structural characteristics and employment accessibility) and house prices. However, research on the relationship between foreign investment and residential house prices is somewhat limited despite increasing flows of cross-border capital into the Australian housing market.

Some studies have been conducted using data sourced from the FIRB to examine the effects of foreign investment on residential real estate prices. However, the aggregated nature of data available through FIRB has resulted in significant limitations. This study expands a traditional hedonic model to measure the effects of foreign investment on Australian residential prices using granular and detailed data not previously utilised in the literature. Thus, this study provides new insights into the relationship between foreign investors and Australian residential prices.

The findings highlight that foreign investors pay more for units on the Gold Coast compared to owner occupiers. This trend was consistent throughout the pre-GFC, GFC and post GFC periods. Interstate investors also paid higher prices for units in the pre-GFC and GFC period, while QLD investors and suburb investors paid less for units compared to owner occupiers, except during the GFC period. Foreign investors, along with Interstate, QLD and suburb investors, tended to pay less for houses compared to owner occupiers, particularly in the pre-GFC and GFC periods.

Following the introduction of the investor visa policy, foreign investors did not pay such a high premium for residential properties compared with owner occupiers. The introduction of the Additional Foreign Acquirer Duty also resulted in lower prices being paid by foreign investors compared to owner occupiers. This demonstrates that government policy does have an impact on the premiums paid by foreign investors compared with owner occupiers for Australian residential real estate. During the period of this study, FY 2000 to 2018, interest rates have a positive relationship with property prices. Given the historically low interests prevailing in Australia, the government has limited potential to dampen property prices through interest rate cuts.

Chapter 3: Degrees of Mispricing in Residential Real Estate User-Cost Analysis

3.1 Fundamentals of User-Cost (UC) Studies

Since the 1980s, most modern housing price models have been based on an intertemporal utility-maximisation life-cycle model. These models assume scarcity of resources and concern themselves with optimal allocation between housing, non-housing consumption and savings. Prior to Gillingham (1980) and Poterba (1984), one of the earliest neoclassical investment models was developed by Jorgenson (1963) and Tobin (1969) based on the theory of inelastic rent proposed by Ricardo (1821). The basis of these models is that the user cost of capital (UC) is determined by parameters such as the purchase price, opportunity cost of funds, depreciation, maintenance, taxes and more recently, risk premia. A large body of literature has since emerged to assess the relative valuation of house prices using an equilibrium asset pricing approach; where the measurement approved is to find a non-arbitrage condition between the price-to-rent ratio (Alford, 2010; Chinco et.al., 2015; 2016). Himmelberg et al. (2005) is a leading example in applying this method, and I rely heavily on this methodology in our study.

One of the main concerns with this approach is the negative output in valuation measures (when price appreciates more than UC). This was addressed in Diewert (2004), who suggests that negative values could be eliminated by using an ex ante measure of UC, arguing that housing consumption decisions are often based on ex ante rather than ex post costs. However, Brown et al. (2011) explain that the choice to use ex ante or ex post calculations is dependent upon the user's purposes. For example, ex ante measurements are based on expected, rather than actual property prices and taxation charges. Hence, while many residential research companies prefer to use this method for convenience, it can be misleading when I choose to ignore actual trends observable from ex post measurements. It is not unusual to observe negative results when using ex post measurements. For example, Adams and Yang (1994) who utilised Korean data from 1971 to the first half of 1987 observed that UC was generally

negative before 1981. Barham (2004) who measured owner occupied housing in Ireland also reported negative UC for most of the period from 1976 to 2003. Furthermore, Brown et. al. (2011) estimate UC in Brisbane, Melbourne and Sydney from 1988 to 2010 presented varied results for various major cities, highlighting various negative UCs. For this reason, I have decided to use ex post residential prices rather than ex ante measurements to investigate whether similar trends are observable using disaggregated transactional level data.

The central issue in measuring the UC is the expected rate of house price appreciation (Hatzvi and Otto, 2008; ECB, 2011; Fox and Finlay, 2012; Hill, 2012; Hill and Syed, 2012; Stapledon, 2012; OECD, 2012; Philiponnet and Turrini, 2017). While Dougherty and Van Order (1982) formed expectations using simple distributed lags of past actual inflation, others such as Fox and Tulip (2014) assumed an appreciation rate based on a constant-quality net-of-depreciation basis. In other words, they presented estimates forecasting price growth from an average annual rate of 2.4% based on Stapledon (2007, 2012). This was then compared to an average of the past ten years at 1.7%, taking into account the merits of different forecasters believing that house prices are likely to grow at a slower rate in the future (Ellis, 2013). Brown et. al. (2011) utilised city-wide medians from the Real Estate Institute of Australia (REIA) at the aggregated level, concluding that the specification of price growth rates (including the rates of potential forgone investments) are always debatable and a higher appreciation rate will decrease the UC, ceteris paribus. Consequently, there have been some studies in Australia that implicitly assumed 'reasonable numbers' in a 1-year holding period without the use of actual data of property prices or incomes (Fane and Richardson, 2005; Abelson and Joyeux, 2007). Garner and Verbrugge (2009) developed several time series models for US house prices with implied strong appreciation rates leading to estimates of UC to be mostly negative. It is clear that the UC is more sensitive to the central tendency of price appreciation (median, more than mean). The price growth rates in this study are calculated directly from our ex-post dataset, annualised from quarterly median residential prices across different buyer types to eliminate this uncertainty.

Previous research shows that the choice and calculation of variables is also important in estimating the UC. Himmelberg et al. (2005) note that a lower interest

rate will reduce the UC due to lower debt financing cost while higher tax rates will increase the UC due to higher disposal cost. While Saunders and Tulip (2019) released a report stating that changes in interest rates are the primary driver behind the movement in housing prices, Chapter 2 of this thesis find contrary conclusions in empirical findings, where interest rates have little effect on property prices when studied using disaggregated level data for the Gold Coast region. Reserve Bank Governor, Philip Lowe, made a statement at odds with the RBA report when he spoke at The Australian Financial Review Business Summit (2019) stating that, "The origins of the current correction in prices do not lie in interest rates and unemployment. Rather, they largely lie in the inflexibility of the supply side of the housing market in response to large shifts in population growth."

Concerns arise in previous studies where the use of aggregated data in housing studies masks the effects. Mehrhoff (2016) states that housing analysis should be performed using transactions level data, as aggregation tends to cloud important information on regional heterogeneity. For example, empirical evidence in overheated housing markets has shown that regional developments are often influenced by spatial transmission and geographical breakdown. Consequently, Mehrhoff (2016) base its analysis on a broad set of indicators, clearly acknowledging that there is no homogenous method to address over-or-under-valuation of all residential properties. On a similar note, Andrle and Plasil (2019) base their analysis on an approach focusing on fundamental data (justifying the use of a structural model) with house prices in Prague, also concluding that their estimates are unstable and not intuitive. These concerns are both addressed in this paper by incorporating fundamental analysis and using transactional level data. I also decompose buyer types (ie: owner occupiers, local and foreign investors) using transactional level data, which is a unique contribution to the literature.

3.2 Methodology

The annual ex post UC of property ownership, also known in the house pricing literature as the "imputed rent," is based on three phases of property ownership as outlined in Brown et.al. (2011). The three phases of property ownership are the

acquisition phase, $\tau = 0$, the intervening quarters holding phase $0 < \tau < n$ for integer values of n and the disposal phase at $\tau = n$.

Acquisition Phase ($\boldsymbol{\tau = 0}$)

After adjusting all purchase costs including foreign duties, both local and foreign buyers typically face similar costs in this phase. The acquisition outlay for a purchase made by an owner occupier, UC_0^{owner}, is defined as follows,

$$UC_0^{owner} = (1 - v_0)[P_0 + P_0 c + SD_0], \qquad \text{(Eq. 3.1)}$$

where $(1 - v_0)$ is the equity contributed to meet the purchase price of the property and P_0, the purchase price with the costs of conveyance, c as a proportion of the purchase price, and the relevant state government stamp duty SD_0 as a dollar amount and v_0 is the ratio of the loan to the total acquisition cost.

Similarly, local investors (UC_0^{lclinv}) have initial UC costs as defined below, where SD_0^{lclinv} is different to SD_0 as they have higher stamp duty fees than owner occupiers.

$$UC_0^{lclinv} = (1 - v_0)\left[P_0 + P_0 c + SD_0^{lclinv}\right], \qquad \text{(Eq. 3.2)}$$

where SD_0^{lclinv} is different to SD_0 as they have higher stamp duty fees than owner occupiers. Suburb investors are consolidated as QLD investors to avoid complications.

In addition, foreign investors are subjected to different stamp duty costs and extra Foreign Investment Review board (FIRB) application fees at the time of purchase after 1st Dec 2015 as the Foreign Acquisitions and Takeovers Fees Imposition Act 2015 (Fees Act) and Foreign Acquisitions and Takeovers Fees Imposition Regulation 2015 (Fees Regulation) set the fees for foreign investment applications and notices made under the Foreign Acquisitions and Takeovers Act 1975 (Act) and the Foreign Acquisitions and Takeovers Regulation 2015 (Regulation). Hence, the initial UC for foreign investors is defined as follows:

$$UC_0^{forinv} = (1 - v_0)\left[P_0 + P_0 c + SD_0^{forinv} + FIRB\right], \qquad \text{(Eq. 3.3)}$$

Foreign investors are also liable for additional foreign acquirer's duties (AFAD) in addition to the FIRB application fees from 1st October 2016 (7% of purchase price). Hence the UC for foreign investors is defined below:

$$UC_0^{forinv} = (1 - v_0)\left[P_0 + P_0 c + SD_0^{forinv} + FIRB + AFAD\right] \qquad \text{(Eq. 3.4)}$$

Holding Period Where $\mathbf{0} < \boldsymbol{\tau} \leq \boldsymbol{n}$

During the holding period, annual UC for all buyer types holding their properties at $\tau > 0$ is:

$$UC_\tau^{all} = R_\tau(1 - m) - \{P_0(h_\tau - cpi_\tau)(v_0) + P_0 d + O_\tau(1 - v_0)\}, \qquad \text{(Eq. 3.5)}$$

where R_τ is the annualised rental payment (income on the property) with m as the annual maintenance costs on fixtures and fittings as a proportion of rental deduction collected by the QGSO. I assume no extra costs for unit body corporate fees as that is often equalised by owners' out-of-pocket expense for maintenance of extra land or garden for houses. $(h_\tau - cpi_\tau)$ is the annual real mortgage interest rate, d is the annual depreciation rate and O_τ is the opportunity cost of forgone earnings from the equity used as deposit in the acquisition phase. I eliminate the annual rental income tax adjustments here as these are individual rates but include them at the final phase, assuming no capital works depreciation.

Disposal date ($\boldsymbol{\tau} = \boldsymbol{n}$)

Costs arising from the disposal of an owner occupied property are as follows:

$$UC_n^{owner} = [P_n(1 - c - SC)]\ for\ owner\ occupiers, \qquad \text{(Eq. 3.6)}$$

where P_n is the selling price and by $P_n = P_0(a)$, where $P_0$is the purchase price and a is the price appreciation rate used (see Appendix A), c is the conveyance cost, SC is the sales commission to be paid to the agent, where it is assumed to be 2.5% of the sale price such that $SC = 2.5\%\ (P_n)$

Costs arising from the disposal of a property belonging to a local investor are as follows:

$$UC_n^{lclinv} = \left[P_n\left(1 - c - SC - Tax_n^{lclinv}\right)\right]\ for\ local\ investors, \qquad \text{(Eq. 3.7)}$$

Where in addition to the variables defined above, Tax_n^{lclinv} is the amount of tax payable calculated as follows:

$$Tax_n^{lclinv} = Tax_n \begin{Bmatrix} (R_n(1-m) - \{(P_0(h_\tau - cpi_\tau)(v_0) + d)\}) + \\ \left(P_n(1-c-SC) - (P_0(1+c) + SD_0)\right) \end{Bmatrix}, \quad \text{(Eq. 3.8)}$$

Foreign investors have similar liabilities when selling their properties where,

$$UC_n^{forinv} = \left[P_n\left(1 - c - SC - Tax_n^{forinv}\right)\right] for\ foreign\ investors, \text{ (Eq. 3.9)}$$

Though the tax portions slightly differ, where Tax_n^{forinv} is calculated by:

$$Tax_n^{forinv} = Tax_n \begin{Bmatrix} (R_n(1-m) - \{(P_0(h_\tau - cpi_\tau)(v_0) + d)\}) + \\ \left(P_n(1-c-SC) - (P_0(1+c) + SD_0 + FIRB_0 + FD_0)\right) \end{Bmatrix}, \quad \text{(Eq. 3.10)}$$

where Tax_n^{forinv} is the amount of income tax payable and Tax_n corresponds to the historical tax brackets applicable to various investor types, assuming no other income source is obtained[4]. Foreign income tax brackets are applied to all foreign transactions. If the calculated value of the taxable capital gain is negative, it is automatically reset to zero. I exclude vacancy fees and the first home owner grant in our study.

Himmelberg et. al. (2005) note that equilibrium in the housing market implies that the expected annual cost of owning a house should not exceed the annual cost of renting. In other words, if the UC rises without a commensurate increase in rent, house prices must fall to convince potential buyers to buy instead of renting or investing elsewhere. The converse happens if UC falls. This natural correcting process implies a "no arbitrage" condition which states that the one-year rent (R) must equal the sum of the annual costs of owning a property. Therefore, the "no arbitrage" condition implies that, $R = P \text{ x } uc$, where uc is expressed as a percentage of price ($uc = \frac{UC}{Price}$), and uc can be defined as the sum of all 3 phases for any of the buyer types (Owner, QLD investor, Interstate investor and Foreign investor):

$$P \text{ x } uc = P \times (uc_0 + uc_\tau + uc_n)$$

[4] Income tax figures used here assumes no other income is made by the investors at time of selling, except for capital gains due to the lack of relevant information.

According to Fox and Tulip (2014), expressing the equation this way is particularly useful because re-arranging $R = P$ x uc as $P/R = 1/uc$ allows us to see that the equilibrium price-to-rent ratio should equal the inverse of the uc. Thus, fluctuations in uc (caused, for example, by changes in interest rates and taxes) lead to predictable changes in the price-to-rent ratio that reflect fundamentals, rather than pricing bubbles. However, comparing price-to-rent ratios over time without considering changes in the actual uc can lead to misleading interpretations. As mentioned earlier, the theory underpinning traditional price-to-rent ratios are measurements designed to compute the over-valuation of properties from a financier's perspective, comparing prices to income levels only, which does not necessarily reflect the over-valuation from a buyer's standpoint, as various costs considered in the uc measurement is omitted in the general price-to-rent measurement.

After computing the P x uc, I examine the level of mispricing by computing the Imputed-to-Actual Rent Ratio (IAR), which can be thought of as the excess cost/return over the rental rate of a particular property, P x uc/R. This computation offers valuable perspectives on the long run trends of the relative price of owning versus renting in the absence of major shocks. When the IAR exceeds 1, owning a property is more expensive than renting. I assert that the mispricing ratio (IAR) in this study reflects more closely the changes in fundamentals (interest rates, bond rates etc.) affecting property prices than the traditional price-to-rent or price-to-income ratios and thus resembles mispricing more closely. Refer to the three examples provided in Appendix B for further clarification on calculating the IAR.

The computation of IAR is highly sensitive to the price appreciation rates. Hence, while disaggregation by property type limits the generalisability of the results, it is important to consider the details of the comparisons. Table 3.1 summarises the annualised median price appreciation rates measured directly from our data. It shows that the median appreciation rate for 4 bedroom houses is more than double that of 2 bedroom units.

Table 3.1 *Median Appreciation Rates across Property Types*

Property Type	**2B Units**	**3B Units**	**3B Houses**	**4B Houses**
Appreciation Rate	1.34%	2.79%	2.56%	3.99%

Table 3.2 summarises the main components used to calculate the percentage user-cost (uc) measurement. Running costs are the annual maintenance costs on fixtures and fittings of a property, transaction costs are the 10-year average of legal fees, agent fees and duties associated with the acquisition and disposal of the property, real interest rates are the annual inflation adjusted borrowing costs at 80% LVR, depreciation rate is the annual building depreciation assumed to be fixed at 1.06% as in Fox and Tulip (2014) and the price growth rates are the annualised median appreciation rates calculated from our data as summarised in Appendix A Table A6.1. Each transaction will incur a different percentage user-cost (uc) value in this study, as I aim to produce an enhanced result on the mispricing of properties.

Table 3.2 *Median Percentage Share Components of User-Cost (UC) Measurement*

Property Type	**Running Costs** ***(m + O)***	**Transaction Costs (c + SD + SC + Tax) / 10**	**Real Int. Rates** ***(h- cpi)***	**Depreciation Rates** ***(d)***	**Price Growth** ***(a)***
2 Bed Unit	2.91%	1.02%	3.27%	1.06%	1.40%
3 Bed Unit	2.95%	1.02%	3.27%	1.06%	2.81%
3 Bed House	2.85%	1.01%	3.22%	1.06%	2.65%
4 Bed House	2.79%	1.00%	3.21%	1.06%	4.01%

I provide three circumstances in Table 3.3, where buyers either obtain 80% LVR, 50% LVR or purchase their property without a mortgage. I note that the uc level across our data is consistent with Stevenson (2008), who posited that policy instruments such as changes in interest rates often have similar implications on the behaviours of both owner occupiers and local investors. However, as I decompose the buyer type, foreign investors were found to exhibit slightly lower uc levels comparatively, especially for properties transacted without incurring any debt. This is interesting to note, as it potentially means that foreign investors appear to buy properties in areas with higher returns compared to local buyers.

Table 3.3 *Summary of Median Percentage User-Cost (uc) for Different LVR Level*

Property Type	80% LVR	50% LVR	No Debt
2 Bed Units	0.07	0.06	0.05
3 Bed Units	0.07	0.06	0.04
3 Bed Houses	0.07	0.06	0.04
4 Bed Houses	0.06	0.05	0.03

I omit presenting the hypothetical annualised average capital gains figures in this study because differences in actual capital gains earned by each group of buyers often stem from differences in their respective exit timings. Table 3.3 serves as an indication of the average percentage user-cost (uc) for different loan-to-value ratios (LVR) and our results suggest that foreign investors appear to realise higher capital gains compared to other buyer types, when disposing their properties within 12 months from settlement. Owner occupiers in our sample generally do not exhibit any volatile figures compared to other buyer types. Reflecting on our calculation, I note that there is a higher probability for over-valuation of properties to occur in more 'foreign focused' suburbs like Broadbeach, Surfers Paradise, Southport, Hope Island, Robina and Upper Coomera.

3.3 Results & Findings

Preliminary analysis was performed to assess the aggregated Imputed-to-Actual Rent (IAR) ratios. The results shown in Table 3.4 clearly indicate that the Gold Coast residential properties contain variations of mispricing across all buyer and property type. IAR values above 1 indicate that it is cheaper to rent than buy. Our findings indicate that 4 bedroom houses are the only property type that are cheaper to buy rather than rent (IAR<1), while all other property types are relatively over-valued (>1). It is important to note that compared to PRR, IAR measures are more reliable as they are inherently supported by theoretical underpinnings. Furthermore, this calculation allows us to assess whether the imputed cost of owning a property relative to renting has changed over time. This allows for the cause of price appreciation to be better identified and policies more specifically targeted, especially when the data is decomposed across the market. For example, policymakers will be able to detect when certain policies are raising the IAR to unjustifiable levels (Asal, 2018). Unlike IAR,

PRR values do not actually reflect the cost of property ownership as it is mainly used by lenders to calculate the borrowers' capacity to repay their loans (without considering actual costs).

Table 3.4 *Comparative Median Imputed-to-Actual-Rent and Price-to-Rent Ratio*

Ratio Type	Buyer Types	2B Unit	3B Unit	3B House	4B House
Imputed-to-Actual Rent Ratio (IAR)	**Owners**	1.41	1.33	2.55	0.98
	QLD Inv	1.41	1.29	2.50	0.81
	Ins. Inv	1.49	1.17	2.48	0.87
	For. Inv	1.78	1.51	2.18	0.87
Price-to-Rent Ratio	**Owners**	18.18	18.70	20.81	21.91
	QLD Inv	19.47	20.36	19.90	16.70
	Ins. Inv	21.79	20.51	19.78	14.17
	For. Inv	27.71	24.69	23.94	14.67

Table 3.5 delineates the median IAR for different property types over time. Generally, I observe IAR values just above one for 2 and 3 bedroom units, with IAR values below one for only five of the eighteen years for 2 bedroom units and only 4 of the eighteen years for 3 bedroom units. Moreover, all of these observations of IAR values below one occurred between 2001 and 2008 after which time I observe constant overpricing for these two property types. There appears to be relative over-valuation for 3 bedroom houses with only one IAR value below one (in 2002). Hence, only in 2002 would it have been cheaper, on average, to buy rather than rent a three bedroom house. In contrast, 4 bedroom houses have consistently shown more under-valuation with ten of the eighteen average IAR values under one. These observations are shown more clearly in Figure 3.1 from FY 2001 to 2018.

Table 3.5 *Median IAR Ratio for Different Property Type Between 2001-2018*

Financial Year (FY)	2B Units	3B Units	3B House	4B House
2001	0.90	1.33	1.78	0.34
2002	-0.12	0.64	-0.57	-0.69
2003	0.07	0.18	1.32	1.12
2004	1.51	1.26	1.85	1.10
2005	1.62	1.35	2.11	1.72
2006	0.81	-0.69	1.07	0.48
2007	0.90	1.55	2.85	-1.53
2008	1.66	0.32	1.88	1.65
2009	1.27	1.10	1.90	-1.49
2010	1.82	1.98	1.63	-0.86
2011	1.58	2.05	2.20	0.68
2012	1.35	1.35	2.34	0.84
2013	1.33	1.51	2.21	0.79
2014	1.32	1.60	2.05	1.29
2015	1.23	1.25	2.17	1.03
2016	1.27	1.40	1.07	0.46
2017	1.14	1.69	2.34	1.33
2018	1.48	1.66	2.64	2.11

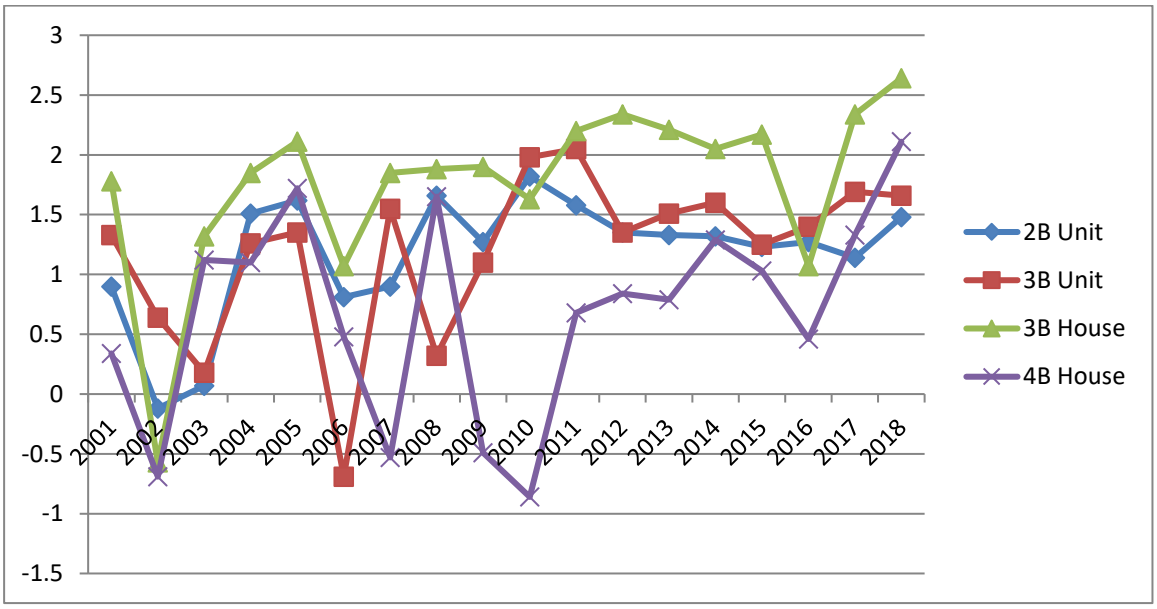

Figure 3.1. Median IAR Ratio for Different Property Type between FY 2001-2018

Table 3.6 Panel A presents the time series of IAR values. For example, an owner occupier renting a 2 bedroom unit for $1,000 per month in our sample would have to pay a median rate of $1,020 per month in real interest payments and other costs to purchase an equivalent property to live in FY 2001. By comparison, this ratio was 1.56 in FY 2017, so an owner occupier would have paid a median rate of $1,560 per month to purchase a 2 bedroom unit in our Gold Coast sample that rented for $1,000 per month. From an investment point of view, there is a trend for foreign investors to pay a higher premium for 2 bedroom units relative to other investors between FY 2012 and FY 2016. This is reasonable considering the period after the GFC where foreign capital flows left the US as investors searched for safer investment property opportunities. Tightening of fund outflows in China around FY 2017 may have contributed to the drop in IAR figures, however, FY 2018 IAR values for the same investor group rose dramatically. Further summary statistics per Figure 3.1 are interpreted the same way for all other property types with IAR values showing that property is generally overvalued for owner occupiers, QLD investors and interstate investors. I note foreign investor IAR values are highly volatile for all property types in our study, as shown in Figures 3.2 to 3.5, where I plot the IAR values for ease of observation.

Table 3.6 *Annualised Median IAR for Buyer & Property Types across Time*

Panel A for 2 Bedroom Units

2B Units	Owners	QLD Inv	Int. Inv	For. Inv
2001	1.02	0.91	1.10	0.38
2002	0.29	0.13	0.26	-0.29
2003	0.58	0.26	0.90	1.61
2004	1.96	1.65	1.79	1.89
2005	1.93	1.90	1.97	2.79
2006	1.07	0.95	1.12	1.11
2007	0.76	1.32	1.09	1.14
2008	2.00	2.00	2.33	1.30
2009	1.20	1.39	1.86	1.45
2010	2.24	2.15	2.45	2.33
2011	2.05	2.12	2.26	0.02
2012	1.30	1.63	1.64	2.77
2013	1.13	1.23	1.48	2.66
2014	1.35	1.32	1.61	1.98

2015	1.36	1.44	1.12	1.74
2016	1.48	1.28	1.50	1.27
2017	1.56	1.36	1.40	0.85
2018	1.59	1.60	1.63	2.07

Panel B for 3 Bedroom Units

3B Units	Owners	QLD Inv	Int. Inv	For. Inv
2001	1.24	1.21	1.71	0.68
2002	0.40	0.50	1.63	-1.75
2003	0.63	0.15	1.75	-0.75
2004	1.69	1.62	1.77	1.45
2005	2.02	1.81	1.73	1.15
2006	1.24	1.06	1.70	-9.41
2007	1.07	1.19	1.62	5.59
2008	2.06	1.74	1.31	-5.68
2009	0.90	0.94	1.47	-0.25
2010	2.08	2.09	1.46	0.02
2011	1.99	2.11	1.49	2.94
2012	1.39	1.56	1.63	-0.76
2013	1.28	1.42	2.12	1.91
2014	1.32	1.34	2.07	2.00
2015	1.39	1.12	1.96	1.47
2016	1.43	1.35	1.93	1.25
2017	1.68	1.73	2.03	2.01
2018	1.58	1.58	1.96	1.75

Panel C for 3 Bedroom Houses

3B Houses	Owners	QLD Inv	Int. Inv	For. Inv
2001	0.44	0.89	0.77	0.55
2002	-0.52	-0.13	0.17	-1.02
2003	-0.61	0.18	1.12	4.86
2004	1.61	1.76	1.59	4.40
2005	1.41	1.24	1.64	2.53
2006	0.49	0.99	0.80	-2.29
2007	0.59	0.90	1.08	1.40
2008	1.77	2.19	1.64	0.71
2009	0.99	1.20	1.41	-0.02
2010	1.96	2.19	1.61	-3.26
2011	1.76	2.01	2.43	-2.54
2012	1.27	1.56	1.47	2.87
2013	1.03	1.04	1.08	2.67
2014	1.24	1.31	1.52	1.90
2015	1.33	1.33	0.92	2.80

2016	1.30	1.49	1.41	-3.25
2017	1.52	1.83	1.83	1.51
2018	1.59	1.99	1.98	2.01

Panel D for 4 Bedroom Houses

4B Houses	Owners	QLD Inv	Int. Inv	For. Inv
2001	0.67	0.49	1.89	1.21
2002	-0.03	-0.14	-0.05	-1.02
2003	0.69	0.45	1.20	3.85
2004	1.96	1.35	0.70	-0.47
2005	1.87	1.60	1.17	1.54
2006	1.23	0.76	-0.19	0.56
2007	0.67	0.06	-0.86	-4.35
2008	2.46	2.25	1.29	1.33
2009	0.98	0.84	0.12	-9.41
2010	2.33	1.28	1.00	-10.80
2011	2.40	1.89	2.08	-2.44
2012	1.43	1.26	0.28	-1.06
2013	1.27	1.03	0.54	-0.34
2014	1.48	1.38	1.28	0.85
2015	1.53	1.48	1.37	0.72
2016	1.52	1.41	1.14	-1.54
2017	1.89	1.44	1.57	0.95
2018	2.05	2.00	1.87	2.03

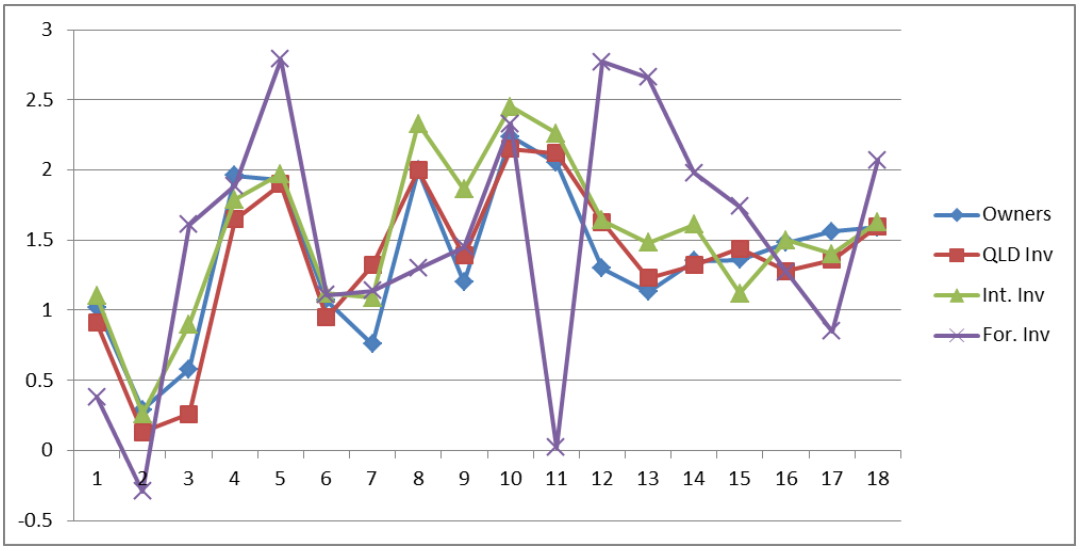

Figure 3.2. Plot for Annualised Aggregate Median IAR per Figure 3.1 for 2 Bed Units

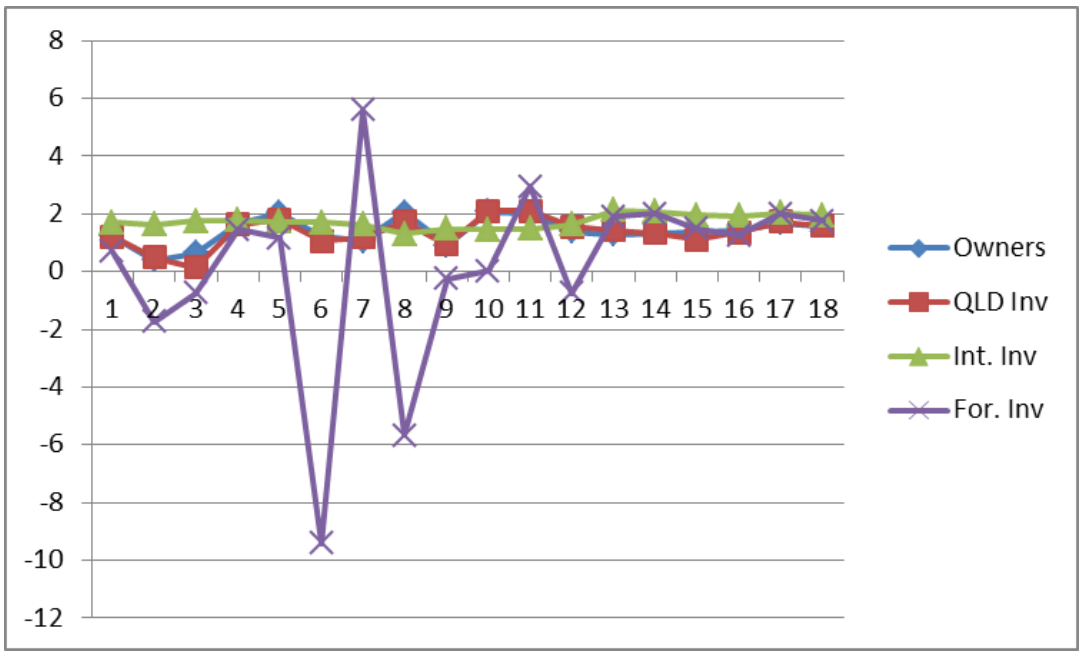

Figure 3.3. Plot for Annualised Aggregate Median IAR per Figure 3.1 for 3 Bed Units

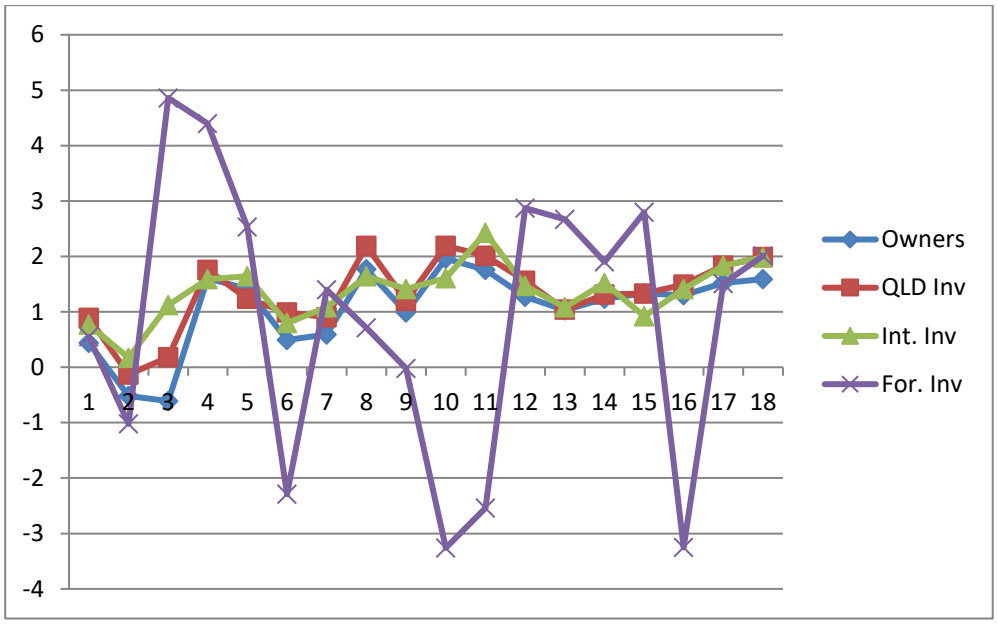

Figure 3.4. Plot for Annualised Aggregate Median IAR per Figure 3.1 for 3 Bed Houses

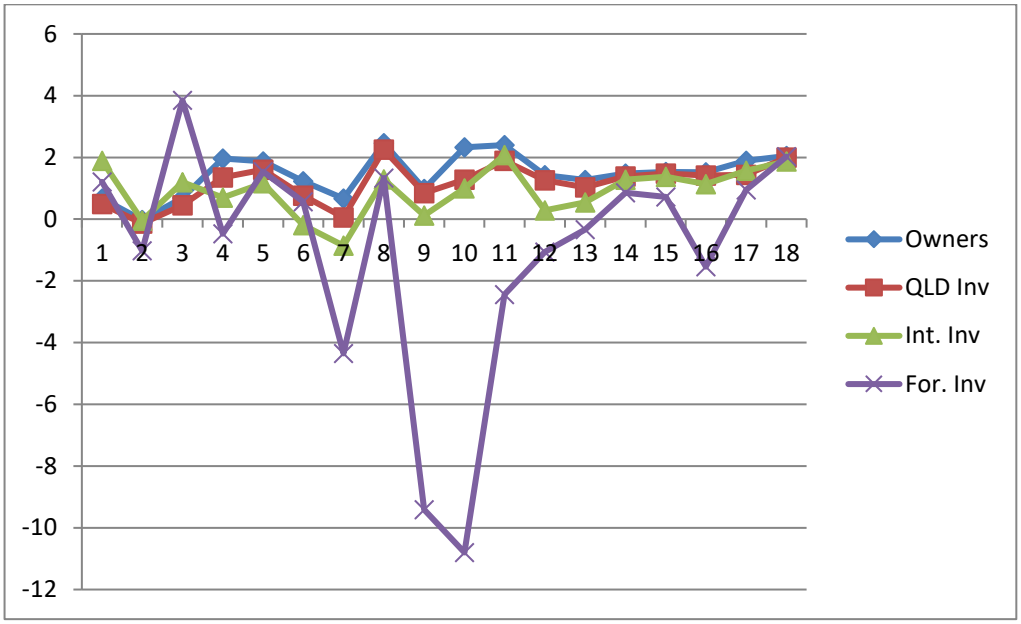

Figure 3.5. Plot for Annualised Aggregate Median IAR per Figure 3.1 for 4 Bed Houses

Table 3.7 and 3.8 summarize the IAR values for different unit types over time for different debt levels. There is an obvious increase in IAR values during the GFC period and a subsequent decrease post-GFC (though not back to pre-GFC levels) across all buyer types, except foreign investors, where the IAR values consistently increase. Interestingly, foreign investors are the only group with negative values before the GFC for 3 bedroom units and during the GFC period for 3 and 4 bedroom houses. The disequilibrium in IAR values showing up for foreign investors warrants further investigation, especially on the relationship between cyclical effects of the real exchange rate and residential investments (in AUD).

Table 3.7 *Imputed to Actual Rent (IAR) values for 2 Bedroom Units across Buyer Types for All Periods (Different LVR)*

Property		Period	80% LVR	50% LVR	No Debt
2 Bed Units	Owner Occupiers	Pre-GFC	1.20	0.97	0.60
		GFC	1.41	1.29	1.08
		Post-GFC	1.40	1.21	0.89
	QLD Inv.	Pre-GFC	0.91	0.60	0.28
		GFC	1.68	1.54	1.29
		Post-GFC	1.35	1.17	0.86
	Ins. Inv.	Pre-GFC	1.31	1.04	0.55
		GFC	1.89	1.72	1.40
		Post-GFC	1.43	1.25	0.93
	For. Inv.	Pre-GFC	1.36	1.03	0.47
		GFC	1.58	1.38	0.96
		Post-GFC	1.76	1.52	1.13

Table 3.8 *IAR for 3 Bedroom Units across Buyer Types for All Periods (Different LVR)*

Property		Period	80% LVR	50% LVR	No Debt
3 Bed Units	Owner Occupiers	Pre-GFC	1.35	1.14	0.73
		GFC	1.54	1.41	1.15
		Post-GFC	1.42	1.23	0.91
	QLD Inv.	Pre-GFC	1.14	0.93	0.47
		GFC	1.45	1.29	1.02
		Post-GFC	1.43	1.26	0.95
	Ins. Inv.	Pre-GFC	1.29	1.06	0.64
		GFC	1.68	1.51	1.20
		Post-GFC	1.30	1.12	0.90
	For. Inv.	Pre-GFC	-0.44	-0.41	-0.74
		GFC	0.26	0.08	-0.23
		Post-GFC	1.84	1.63	1.21

This suggests that foreign investors experienced a period of investment where properties were under-valued prior to the GFC for 3 bedroom units and houses and during and post the GFC for 4 bedroom houses. Although foreign investors have low market share, Lee and Reed (2014) claim that volatility in prices can often be largely driven by non-fundamental events such as activities that are strongly influenced by perception or individual investor behaviours. Wong (2016) who later identified the rise of private wealth investors in Asia Pacific and Residential Tourism (RT) as emerging

drivers of Australia's residential market, indicates that foreign investment activities are highly influenced by non-fundamental factors.

Table 3.9 *IAR for 3 Bedroom Houses across Buyer Types for All Periods (Different LVR)*

Property		Period	80% LVR	50% LVR	No Debt
3 Bed Houses	Owner Occupiers	Pre-GFC	1.06	0.82	0.50
		GFC	1.53	1.39	1.15
		Post-GFC	1.45	1.24	0.89
	QLD Inv.	Pre-GFC	0.92	0.80	0.53
		GFC	1.51	1.39	1.17
		Post-GFC	1.46	1.25	0.91
	Ins. Inv.	Pre-GFC	1.12	0.97	0.70
		GFC	1.40	1.26	1.00
		Post-GFC	1.39	1.18	0.81
	For. Inv.	Pre-GFC	0.97	0.58	0.28
		GFC	-0.62	1.36	-1.00
		Post-GFC	1.92	1.26	1.23

Table 3.10 *IAR for 4 Bedroom Houses across Buyer Types for All Periods (Different LVR)*

Property		Period	80% LVR	50% LVR	No Debt
4 Bed Houses	Owner Occupiers	Pre-GFC	1.16	0.99	0.59
		GFC	1.58	1.42	1.13
		Post-GFC	1.56	1.32	0.91
	QLD Inv.	Pre-GFC	1.23	0.60	0.60
		GFC	1.00	0.93	0.76
		Post-GFC	1.38	1.18	0.87
	Ins. Inv.	Pre-GFC	0.99	0.74	0.55
		GFC	0.17	0.12	0.00
		Post-GFC	1.26	1.11	0.80
	For. Inv.	Pre-GFC	1.60	0.97	0.68
		GFC	-3.78	-3.72	-3.80
		Post-GFC	0.70	0.59	-0.08

Our results show that most properties within our sample are priced appropriately should they be purchased outright without incurring any debt. However, at a mortgage rate of 50% and 80% LVR, all property types across buyers appear to be over-valued especially during GFC and post-GFC. In other words, the IAR measures of residential

prices in the Gold Coast indicate that relative over-valuation is largely driven by three factors:

1. Expansionary monetary policy in the form of low interest rates and financial innovations, amplifying the increase of mortgage credit to generate wealth effects etc. (Recent RBA figures highlight the increase in household debt surpassing superannuation assets as a cause for concern)
2. Consistent real exchange rate undervaluation, especially by China (who are the largest group of foreign residential investors according to FIRB) coupled with strong AUD encourages foreign investors, as they move funds to higher yielding investments
3. Counter-cyclical factors of the First Home Owner Grants (FHOG) where the grant encourages owner occupiers to buy. Reports indicate that property price increases which result from the FHOG are to the detriment of those not participating in the property market

To further investigate the policy implications, I measure the IAR values for foreign investors before and after the implementation of FIRB and AFAD fees. Table 3.11 presents our results indicating that firstly, the introduction of FIRB fees only played a marginal role in increasing the IAR values of unit investments but not for houses, and secondly, the AFAD policy did affect the IARs dramatically, except for 2 bedroom units. Taking into consideration the increase in unit vacancy rates, it is highly likely that the introduction of AFAD actually resulted in a shift in foreign demand from more expensive to cheaper properties, in this case 2 bedroom units, which brought about higher price appreciation compared to other property types. This finding advocates that policy makers should be cautious in formulating effective policy to curb foreign investments as our figures highlight that it is possible that both the FIRB and AFAD policies may have increased the demand for 2 bedroom units, which could lead to the crowding out of local buyers. This effect becomes an affordability issue, as local first home buyers cannot compete with foreign interests.

Capital gains tax does not appear to considerably affect the turnover of properties by non-homeowners, as might be expected. This would have been reflected in lower IARs for owner occupiers compared to other buyer types as it would be more beneficial

for these purchasers to buy rather than rent. However, the results do not suggest that this is the case.

Table 3.11 *Policy Implications affecting Foreign Investor IARs*

	Property	Policy	IAR
Foreign Investors	**2 Bed Units**	**Pre-FIRB**	1.595
		Post-FIRB	1.751
		FIRB + AFAD	1.109
	3 Bed Units	**Pre-FIRB**	0.406
		Post-FIRB	1.514
		FIRB + AFAD	2.378
	3 Bed Houses	**Pre-FIRB**	1.081
		Post-FIRB	-1.148
		FIRB + AFAD	1.508
	4 Bed Houses	**Pre-FIRB**	0.123
		Post-FIRB	-2.767
		FIRB + AFAD	2.046

Finally, it should be noted that equilibrium in the housing market assumes that buying and selling is frequent and reversible. This assumption may be challenged for the housing market, due to liquid constraints, particularly during property market downturns. However, buy-sell costs which directly impact the IAR have been included in the calculations and liquidity is likely to be captured in the price change calculations.

3.4 Conclusion

The novelty of this chapter lies in the availability of transactional level data, which has made the decomposition of buyer types possible. The disaggregated level data not only provides information on the effectiveness of various foreign investment policies in recent years, but also reveals a clearer picture of mispricing patterns for different buyer and property types between FY 2001 to 2018. Using the Gold Coast as an example, I use the Imputed to Actual Rent IAR value, as discussed by Himmelberg et. al. (2005), to indicate mispricing of residential property for owner occupiers, QLD investors, interstate investors and foreign investors purchasing 2 and 3 bedroom units and 3 and 4 bedroom houses

Results indicate that it is generally cheaper to rent than buy in the Gold Coast between FY 2001 to 2018. However, our analysis shows that 2 and 3 bedroom units exhibit relatively accurate pricing. 3 bedroom houses were found to be relatively over-valued while 4 bedroom houses were relatively under-valued over the sample period. Despite foreign investors exhibiting an erratic pattern of mispricing, I find that Gold Coast residential properties would have been a profitable source of foreign investment, especially before FY 2011. Further analysis shows that this trend remains for houses (not units), even after the introduction of FIRB fees in 2015. However, there was a dramatic reversal after the implementation of AFAD as properties became more expensive for foreign investors. All property types except 2 bedroom units indicated relative over-valuation for foreign investors. I attributed this reversal to a shift in foreign demand toward cheaper investment properties.

I find that the GFC had a significant impact on the mispricing of residential properties in the Gold Coast. IAR values significantly increased during the GFC and while the IARs decreased in the post GFC period for all buyer types except foreign investors, they did not return to pre GFC levels. For foreign investors, IAR values continued to increase after the GFC. This is likely attributed to the FIRB and AFAD fees which were introduced in the post GFC period.

When examined from a Loan-to-Value Ratio (LVR) perspective, I find that properties were priced appropriately only if they were bought outright, without incurring any debt. However, at both 50% and 80% LVR, our results show that properties are relatively over-valued as the historical average rate of price appreciation were not comparable to interest repayment rates. In this case, it would have been cheaper to rent rather than buy Gold Coast property.

I use the IAR values to examine is an effective method in revealing mispricing in different sub-markets and for different user types. It is also important to consider the inter-connectedness of different sub-markets. This paper contributes to the literature by using transactional level data to study mispricing in the property market.

Chapter 4: Measures of Disposition Effects in Residential Real Estate

4.1 Overview & Implications of Disposition Effect

The disposition effect is a well-recognised behavioural economic phenomenon first termed by Shefrin and Statman (1985). It relates to the idea that investors tend to sell assets that have gained in value while holding losing assets for longer periods. This paper contributes to the literature by examining whether this behavioural bias is evident in the Gold Coast residential real estate market between FY 2001 to FY 2018, and to what degree it occurs in different investor types. If it is apparent, the disposition effect is likely to cause slow incorporation of news in the market prices and a lack of diversification in market downturns. Barber and Odean (2011) and Genesove and Mayer (1997, 2001) study the disposition effect in the Boston condominium market in the 1990s, finding a strong positive correlation between prices and sales volume, which was driven by low downwards flexibility in house prices. Brown et.al. (2006) extended Odean's (1998) study by analysing the relative influence of the disposition effect among different categories of investor, including foreign and government investors in ASX IPO and index stocks. This thesis uses a large transactional dataset of residential real estate in the Gold Coast to examine the relative disposition effect among different investor types over time. The findings support the hypothesis that investors in this market are highly rational and not subject to this behavioural bias.

This study of the disposition effect among different investor types in the residential real estate market is possible due to uniquely categorised data which was previously unavailable. The data begins in July 2000 (FY 2001) as the Sydney Olympics was considered a catalyst to attract property investors, and the Gold Coast being one of Australia's premier tourist destination benefited from the spill-over effects of this event (Ko, 1998). I also considered it interesting to include the time prior to the GFC, as this will capture disposition patterns over time, accounting for external shocks affecting different investor types.

Our main findings are 1) the number of sales in the current quarter is highly correlated with the number of sales in the previous quarter, 2) there is very little

evidence of the disposition effect in Australian residential real estate markets, 3) the number of sales increases with the percentage of foreign or interstate investors (crowding out local investors and owner occupiers), 4) government policy which increases costs for foreign investors decreases the overall number of sales. These findings suggests that Australian residential real estate prices are not affected by slow price incorporation of news or a lack of diversification during a downturn in the market. The effect of momentum, however, may lead to greater over reaction to news adding to the volatility of prices.

Despite widespread attention on the disposition effect in the 1990s, there have been relatively few academic publications examining this effect. Case and Shiller (1988) report evidence of the disposition effect in real estate markets from interviews conducted with home owners in boom and post-boom housing price environments. However, the theoretical framework was posited by Shefrin and Statman (1985), stating that this behavioural bias can be explained by four related theories as discussed below.

One of the most popular explanations for the disposition effect is prospect theory, popularised by Kahneman and Tversky (1979) to show how people evaluate their actions or 'prospects' against a reference point. In this context, the disposition effect relates to how investors perceive their gains and losses when faced with a choice based on an initial point (buy price). The idea is that when people choose among risky assets, they tend to be risk-averse when the prospect is framed as possible profits and behave risk-seeking when prospects are framed as possible losses. Research attempting to explain the disposition bias with this theory includes Thaler and Johnson (1990), Tversky and Kahneman (1992) and Weber and Camerer (1998). However, more recent analysis such as Barberis and Xiong (2009), Kaustia (2010) and Hens and Vlcek (2011) find the opposite. Prospect theory can be used to predict ex-post disposition but not ex-ante disposition behaviours. These arguments warrant further investigation, with empirical evidence to demonstrate whether the reverse disposition effect can be found for foreign investors in residential markets, similar to Talpsepp (2011), who examine the disposition effect in the Estonian stock market.

Secondly, 'loss aversion' is suggested as an explanation for the disposition effect. Shefrin and Statman (1985) note that investors who are prone to avoid regret and seek pride in their investments may end up making bad choices in deferring losses.

A follow up paper by Samuelson and Zeckhauser (1988) link this behaviour with the notion of 'status-quo bias' whereby investors tend to remain inactive and not realise gains or losses. More recent research using advance brain detecting machines by Coricelli et. al. (2005) finds that people exhibit loss averse behaviours when presented with incoming stimuli traced in the amygdala. The amygdala influences decision-making based on emotional factors rather than logical reasoning ie. the expectation of loss, rather than actual experience. This study led to papers such as Alba and Pereira (2011) and Ziegler (2012) who contribute to the debate that women should join the male-dominated financial-services industry because they are more risk-averse and exhibit less aggressive investment behaviours. Thus, female participation may stabilise capital markets. Rau (2014) contends that women realise fewer capital losses (more capital gains) which leads to significantly higher disposition effects than men. He attributes this finding to loss aversion though concluded that cultural differences may also be important. Cheng et.al. (2013) conduct an empirical study over a six year period on the Taiwan Futures Exchange, finding that men and younger traders show less severe disposition bias. However, Da Costa et.al. (2008) and Talpsepp (2010) find the contrary, that female subjects often do not keep losing stocks. 'Loss aversion' behaviour can be difficult to capture in residential real estate markets due to 'property specific' characteristics and the long time frame of ex-post re-sale of properties. The distinction between disposition and speculation can also be difficult to determine and unique data and methodologies need to be designed to carefully examine these behaviours.

Thirdly, the term first coined by Thaler (1980), 'mental accounting' presents another explanation for the disposition effect. Mental accounting is where investors employ 'psychic accounting methods' to make investment choices, neglecting potential dependencies between separate gambles. Mental accounting is said to be present when an investor's willingness to sell differs when considering an asset in isolation versus the willingness to sell as part of an overall portfolio. Amarmani (2010) notes that mental accounting is the reason why investors often do not adjust their reference points, which aligns to our previous discussion on 'status-quo bias' coined by Samuelson and Zeckhauser (1988). Brown et.al. (2006) presented an empirical test for the 'house money effect' using the idea of 'mental accounting' and found that more sophisticated investors are more likely to realise losses. They assert that professional

training and expertise often reduces judgmental bias, mental accounting and disposition effects. False reference points (inflection points) allow 'mental accounting' to occur as well as an inconsistent view of the value of money depending on where the money originated. In the real estate context, Seiler and Seiler (2010) demonstrate how investors who have experienced a loss within an asset class can employ 'loss aversion' strategies by thinking in terms of the return on their overall portfolio. They suggest that avoiding loss through mental accounting will induce a cascade of biases in asset allocation, leading to greater levels of unavoidable loss in the long run (Seiler et.al. 2012). This chapter confirms the hypothesis that when investors attempt to avoid the realisation of losses by changing the lens through which they view them, they become more likely to hold onto bad investments. This behavioural bias is found to be more pronounced for men and foreign investors, particularly those from Asia (Seiler et.al., 2008).

Many empirical studies use tax-motivated trading to investigate investors' propensity to realise losses or gains. For example, Brown et.al. (2006) show that superannuation companies, incorporated companies and individuals have the strongest propensity to realise losses in June for IPO and index stocks in Australia. Papers such as Badrinath and Lewellen (1991) use US data to show that tax implications can explain investors' reluctance to realise losses, quoting tax-swap as a practice whereby sophisticated investors justify their propensity for loss-aversion. Similarly, Grinblatt and Han (2005) argue that momentum effects in the taxable accounts of investors are correlated with individual investor bias. Locke and Mann (2005) found that holding losers longer per se is not necessarily costly to investors, though they argue that 'discipline,' in terms of realising both gains and losses promptly without bias from the past assists in long term success.

A related explanation provided by Shefrin and Statman (1985) is the 'inner-doer' effect. While empirical studies are lacking in this line of reasoning, the idea is that certain investors sell winners early because they want to accelerate their feeling of pride when having chosen the right asset. However, they postpone feelings of disappointment by postponing the realisation of losses. With a similar line of reasoning, Fischbacher et.al. (2017) in more recent times investigate whether automatic selling devices reduce the apparent 'inner-doer' aspect of investors' disposition bias in a laboratory experiment. Their results show that these devices

significantly reduce the disposition effect by helping investors increase their proportion of losses realised, without affecting the proportion of winners realised. Interestingly, Heimer (2016) and Hermann et.al. (2017) contemporaneously find that investors who are subject to peer scrutiny or those making investment decisions for others, are more susceptible to the disposition effect. These papers support earlier findings by Hirshleifer and Teoh (2003) who asserted that investors have limited attention and processing power, thus unable to observe trading losses and gains as objectively as automated devices. Elster (2009) and Burks et.al. (2013) also find psychological mechanisms which cause investors to increase the disposition effect once they become 'leader traders' in a group or begin a crowd following as a trading master to maintain their social image.

4.2 Implications of Disposition Effects

Many papers have been published on the existence of 'disposition effects' in stock markets around the world for example, Brown et al (2006) produced an empirical paper for Australia, Lai et al. (2010) for Taiwan, Weber and Welfens (2006) for Germany, Odean (1998) for US investors, Lucchesi et.al. (2015) for Brazil, Prosad et.al. (2017) for India, Visaltanachoti et al. (2007) for China, Einio et al. (2008) for Helsinki real estate markets and in more recent literature linking neurological factors by Frydman et al. (2014), Cronqvist et al., (2014) and Pleßner (2017). Against this background, emerging asset-pricing models increasingly emphasize this well-recognised behavioural bias though some like Hung and Yu (2006) and Shumway and Wu (2006) acknowledged that its implications are not well examined.

Kaustia (2010) provides an overview of the implications of the disposition effect by first listing the welfare costs for investors and then describing that the bias increases investors' capital gains tax. A profit maximising investor operating in a tax-conscious manner may avoid realising gains before receiving a long-term tax status, lowering the tax burden for capital gains can sometimes be offset by transaction costs. Shumway and Wu (2006) posit that the disposition effect contributes to the momentum effect first documented by Jegadeesh and Titman (1993). This link was later examined by Birru (2015), who argues that while the disposition effect is likely to slow down the incorporation of news, though it is doubtful whether it alone explains the momentum

effect. Goetzmann and Kumar (2008) note that the prevalence of the disposition bias may contribute to the lack of diversification during a downturn in the market. For example, dot.com losing stocks may have similar traits such that private investors' may be tempted to keep these 'losers' until the industry rebounds. Cici (2012) nonetheless claims that this bias is found notably less in funds management, compared to private investors, who are less aware of the disposition effect.

4.3 Transaction-Based Empirical Studies & Motivation

Pleßner (2017) conducted a comprehensive bibliometric analysis using approximately 600 papers worldwide through EBSCOhost to investigate the disposition effect. This study concludes that the disposition effect is been found in both private and professional investors around the world, although professional investors appear to be less prone to this bias. Traditional studies analysing the intensity of the disposition effect apply Odean's (1998) methodology using the proportion of gains realised (PGR) less the proportion of losses realised (PLR) to quantify the effect. More recent research focuses more on neuroeconomic explanations, examining the foundational biases of the disposition effect for gender, ethnicity or cultural differences. Prior literature using transaction based empirical evidence suggest that investors regularly deviate from rationality to avoid regret. The key advantage of using transactional based data is that I can observe how investors behaved in actual investment situations. Our transactional based paper contributes to the literature by providing a better understanding of the gap between situation (stated preference) and actual behaviour (revealed preference).

4.4 Methodology

Figure 4.1 below shows that the overall percentage of sales with a profit is moderately positively correlated with the number of sales across time. This chapter formally investigates the lead lag effect of this relationship. The optimum lag length of the prior percentage of sales with a profit in relation to the number of sales in the current quarter was determined using a combination of Akaike's information criterion (AIC), Schwarz's Bayesian information criterion (SBIC), and the Hannan and Quinn

information criterion (HQIC) lag-order selection statistics known as 'varsoc' in Stata to inspect the appropriate lag length. Our results indicated that a one period lag was optimal. Suburb investors are consolidated as QLD investors in this chapter to avoid complications. A data summary is provided in Table 4.1 below.

Table 4.1 *Summary Statistics of Buyer & Property Types*

Number of Purchases by Buyer and Property types

BUYER TYPE	NUMBER OF SALES FOR UNIT	NUMBER OF SALES FOR HOUSES
Owner Occupier	43,953	87,275
QLD Investor	34,908	40,474
Interstate Investor	25,239	14,808
Foreign Investor	3,031	1,653
All Transactions	**107,131**	**144,210**

4.4.1 Index Calculation

Prior to performing any modelling, I construct a market price index to determine whether the property owner sells for a profit. This index was created using the following steps:

The first step is to assign a quarterly value to the date in which the home or unit's price shows up in the database. For example, if the home or unit was sold on August 16, 2012, then the quarterly value of the sale would be Q3 of 2012. I then determine the market index for a home of the same type in Q3 2013.

The second step is to assign a quarterly index value for the next sale of the home. Suppose the same home was sold on December 13, 2015. The quarterly index value (Q4 2015) for a home of that type.

The third step is to calculate the percentage change in the market. In this case, from the first sale to the second sale, the market for three-bedroom homes grew by:

$$\frac{Market\ Index\ (Q4\ 2015)}{Market\ Index\ (Q3\ 2012)} - 1$$

The fourth step is to compare the market return over the period with the sale price of the home as follows:

$$\frac{Home\ or\ unit\ value\ (Q4\ 2015)}{Home\ or\ unit\ value\ (Q3\ 2012)} - 1$$

The fifth step is to calculate the difference between the two. If difference is positive the home is defined as selling at a profit. Formally, the difference value is as shown in the following equation:

$$Difference_{Home\ or\ unit\ value-market} = \left(\frac{Home\ or\ unit\ value_{Q4\ 2015}}{Home\ or\ unit\ value_{Q3\ 2012}} - 1\right) - \left(\frac{Market\ Index_{Q4\ 2015}}{Market\ Index_{Q3\ 2012}} - 1\right)$$

The sixth step is to calculate a theoretical profit figure relative to the market. Formally, the calculation is as shown in the following equation.

$$Profit_{relative\ to\ the\ market} = Home\ or\ unit\ value_{Q3\ 2012} \cdot (Difference_{Home\ or\ unit\ value-market\ index})$$

Percentage of profit (gains) realised (PGR) is calculated to measure the investors' tendency to realise either gains or losses (PLR). The PGR measure is calculated as follows:

$PGR = \frac{C_P}{(C_P + C_N)}$ where:

$C_P = |Count\ of\ all\ observations\ where\ Difference_{Home\ or\ unit\ value-market}| > 0$

$C_N = |Count\ of\ all\ observations\ where\ Difference_{Home\ or\ unit\ value-market}| < 0$

4.4.2 Empirical Modelling

I develop an empirical model to determine whether people are more likely to sell when there are a significant number of transactions occurring in the market with a high percentage of sales with a profit. Equation 4.1 below is an autoregressive model designed to capture these effects.

$$N_{sales,t} = \beta_0 + \beta_1 N_{sales,t-1} + \beta_2 PGR_{t-1} \quad \text{(Eq. 4.1)}$$

where $N_{sales,t}$ is the number of sales in period *t*, $N_{sales,t-1}$ is the number of sales in period *t-1*, and PGR_{t-1} is the percentage of sales with a profit in period *t-1*. A significant value for β_1 would suggest that the number of sales in the prior period provides insight into the number of sales in the following quarter. A significant value for β_2 would suggest that the percentage of sales with a profit in the prior period provides insight into the number of sales in the following quarter. Hence, β_1 captures a momentum effect whereas β_2 captures the disposition effect.

Several robustness tests are performed in Equations 4.2, 4.3 and 4.4 below to ensure that the results are not sensitive to the measurement of profit.

$$N_{sales,t} = \beta_0 + \beta_1 N_{sales,t-1} + \beta_2 Avg\_Profit_{t-1} \quad \text{(Eq. 4.2)}$$

where $N_{sales,t}$ is the number of sales in period *t*, $N_{sales,t-1}$ is the number of sales in period *t-1*, and Avg_Profit_{t-1} is the average profit for period *t-1*.

$$N_{sales,t} = \beta_0 + \beta_1 N_{sales,t-1} + \beta_2 Median\_profit_{t-1} \quad \text{(Eq. 4.3)}$$

where $N_{sales,t}$ is the number of sales in period *t*, $N_{sales,t-1}$ is the number of sales in period *t-1*, and $Median\_profit_{t-1}$ is the median profit for period *t-1*.

$$N_{sales,t} = \beta_0 + \beta_1 N_{sales,t-1} + \beta_2 Profit\_\min\ \_inf_{t-1} \quad \text{(Eq. 4.4)}$$

where $Profit\_\min\ \_inf_{t-1}$ is the average profit less inflation for the prior quarter. Owing to the unique nature of the data, this is the first study to determine whether investor type contributes to the disposition effect in the residential real estate market. Equations 4.5, 4.6, 4.7 and 4.8 below allow us to capture the impact of investor type indicating any differences in the disposition effects found in different buyer types.

$$N_{sales\_For\_Inv,t} = \beta_0 + \beta_1 N_{sales\_For\_Inv,t-1} + \beta_2 For\_InvPGR_{t-1} \quad \text{(Eq. 4.5)}$$

where $N_{sales\_For\_Inv,t}$ is the number of sales by foreign investors, $N_{sales\_For\_Inv,t-1}$ is

the lag number of sales by foreign investors and For_InvPGR_{t-1} is the percentage of sales by foreign investors for the prior quarter that were profitable

$$N_{sales\_Int\_Inv,t} = \beta_0 + \beta_1 N_{sales\_Int\_Inv,t-1} + \beta_2 Int\_InvPGR_{t-1} \quad \text{(Eq. 4.6)}$$

where $N_{sales\_Int\_Inv,t}$ is the number of sales by interstate investors, $N_{sales\_Int\_Inv,t-1}$ is the lag number of sales by interstate investors and Int_InvPGR_{t-1} is the percentage of sales by interstate investors for the prior quarter that were profitable

$$N_{sales\_Owner,t} = \beta_0 + \beta_1 N_{sales\_Owner,t-1} + \beta_2 OwnerPGR_{t-1} \quad \text{(Eq. 4.7)}$$

where $N_{sales\_Owner,t}$ is the number of sales by owner occupiers, $N_{sales\_Owner,t-1}$ is the lag number of sales by owner occupiers and $OwnerPGR_{t-1}$ is the percentage of sales by owner occupiers for the prior quarter that were profitable

$$N_{sales\_QLD\_Inv,t} = \beta_0 + \beta_1 N_{sales\_QLD\_Inv,t-1} + \beta_2 QLD\_InvPGR_{t-1} \quad \text{(Eq. 4.8)}$$

where $N_{sales\_QLD\_Inv,t}$ is the number of sales by Queensland investors, $N_{sales\_QLD\_Inv,t-1}$ is the lag number of sales by Queensland investors and QLD_InvPGR_{t-1} is the percentage of sales by Queensland investors for the prior quarter that were profitable

In Equation 4.9,. I test the influence of three investor types as a group on the total number of sales. If there is a common shock to certain type of buyers, ie: a drop-in exchange rate, influencing foreign investors to sell, I can measure the corresponding impact on the total number of sales.

$$N_{sales,t} = \beta_0 + \beta_1 Pctg\ N\ IntInv_t + \beta_2 Pctg\ N\ ForInv_t + \beta_3 Pctg\ N\ QLDInv_t$$

(Eq. 4.9)

where $Pctg\ N\ IntInv_t$ is the percentage of all sales in a given quarter that involved interstate investors, $Pctg\ N\ ForInv_t$ is the percentage of all sales in a given

quarter that involved foreign investors, and $Pctg\ N\ QLDInv_t$ is the percentage of all sales in a given quarter that involved Queensland investors.

Equation 4.10 considers whether Australian government policy relating to foreign investment influences the total number of sales. I regress the model below to test the effects of change in mortgage rates and the effect of the introduction of FIRB (Policy 1) and AFAD (Policy 2).

$$N_{sales,t} = \beta_0 + \beta_1 N_{sales,t-1} + \beta_2 PGR_{t-1} + \beta_3 Policy1Dummy_t + \beta_4 Policy2Dummy_t + \beta_5 Mortgage\ Rate_t \quad \text{(Eq. 4.10)}$$

Equation 4.11 includes all variables in Equation 4.10 as well as the individual indicator variables for the percentage of sales for different investor types. This regression allows us to examine whether the total number of sales is influenced by the percentage of each investor type in addition to policy changes for foreign investors.

$$N_{sales,t} = \beta_0 + \beta_1 N_{sales,t-1} + \beta_2 PGR_{t-1} + \beta_3 Policy1Dummy_t + \beta_4 Policy2Dummy_t + \beta_5 Mortgage\ Rate_t + \beta_6 Pctg\ N\ IntInv_t + \beta_7 Pctg\ N\ ForInv_t + \beta_8 Pctg\ N\ QLDInv_t \quad \text{(Eq. 4.11)}$$

4.5 Empirical Results & Interpretation

The key motivation of this paper is to examine whether the disposition effect is prevalent in the Australian residential real estate market. The left axis in Figure 4.1 shows the percentage of sales with a profit from our full dataset between FY 2001 to 2018. The graph shows wide variation across time, with a high percentage of sales with a profit of around 90% until approximately FY 2009, at which point there was a significant decline in the percentage of homes sold with a profit, to around 50% in FY 2012 and 2013. If the disposition effect is evident, one would expect that the number of homes sold would be higher during periods when the percentage of profitable sales is higher. Figure 4.1 shows the percentage of sales with a profit (right vertical axis) and the number of sales (left vertical axis). The results show that these two time-series graphs are moderately correlated, with a correlation coefficient of 0.475. The chart

also shows what appears to be a lead lag effect whereby a rise (fall) in the percentage of sales with a profit leads to a rise (fall) in the number of sales in future periods. Further investigation of this effect suggests that the optimal lead lag length is one quarter.

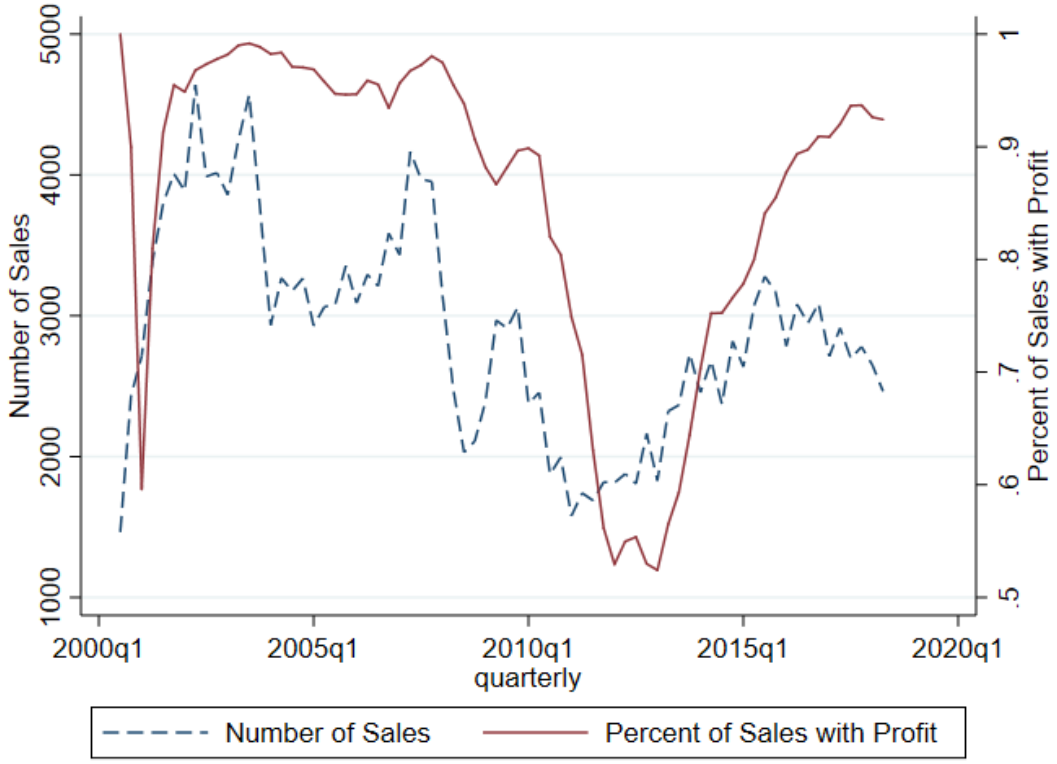

Figure 4.1. Percentage of Sales with Profit vs. Number of Sales across time

I estimate the regression for Equation 4.1 using quarterly data from Financial Year 2000 to 2018 and the results are presented in Column 1 of Table 4.1. The result suggests that the prior period number of sales is a strong predictor of future sales, highlighting the autocorrelation in the number of sales in Australian residential real estate markets. However, the lag percentage of profits (PGR) is not a statistically significant determinant of the number of sales over and above the number of sales in the previous quarter. This result strongly supports the hypothesis that momentum from sales in prior period affects the number of sales in the current period. However, it does not show statistically significant results for a relationship between the percentage of

profitable sales in prior period and the number of sales in the current period, which would represent the disposition effect.

Subsequent results however show some evidence of the disposition effect. Column 2 of Table 4.2 shows the statistically significant relationship at the 5% level between the average profit and the number of sales in addition to the correlation effect. The β coefficient for average profits indicates that for every 1 unit increase in average profit, there is an expected increase in the number of sales by 10.692. Column 3 of Table 4.2 shows the results when using the median profit measure, which again has a positive coefficient of 13.35, which is statistically significant at the 10% level. Column 4 of Table 4.2 shows the results when the value of profit after adjusting for inflation which does not show a significant relationship with the number of sales. In all specifications, there is a high R-squared value with consistent significance for the number of sales in the previous quarter being strongly related to the current quarter's number of sales. These results suggest that there is weak evidence of the disposition effect although results are sensitive to the measure of profits in the previous quarter.

Table 4.2 *No. of Sales compared with Prior Sales and Percentage of Profits*

	Eq. 4.1	**Eq. 4.2**	**Eq. 4.3**	**Eq. 4.4**
Lagged Number of Sales	0.84*** (8.84)	0.83*** (11.83)	0.84*** (12.07)	0.85*** (10.07)
Lagged Percentage of Gains Realised	93.59 (0.21)			
Lagged Average Profit		10.69** (2.01)		
Lagged Median Profit			13.35* (1.80)	
Lagged Profit Minus Inflation				1.58 (0.58)
Mean Number of Sales	1,881.78	2,922.31	2,922.31	2,922.31
SD Number of Sales	572.93	745.19	745.19	745.19
R-Squared	0.85	0.79	0.79	0.78
Number of Observations	69	68	68	68
****** p<.01, ** p<.05, * p<.1***				

Table 4.3 shows the results of the model specifications segregating the buyer type, as specified for Equations 4.5, 4.6, 4.7 and 4.8. In each case the independent variable is the percentage of profits and number of sales in the previous period for the specified buyer type, while the dependent variable is the number of sales for each buyer type for the current quarter. These results are consistent with the results for Model 1, whereby the positive coefficient for β1 suggests that the number of sales is strongly determined by the number of sales in the previous quarter for all buyer types. However, the insignificant coefficient for β2 suggests that the number of sales are not significantly related to the lagged percentage of profits for each buyer type. These results are consistent with momentum effects, but do not confirm behaviours that are consistent with disposition theory. This effect is consistent throughout each of the buyer types.

Table 4.3 *No. of Sales compared with Percentage of Sales with Profit for each Buyer Type*

Specific Buyer Type No. of Sales	**Eq. 4.5**	**Eq. 4.6**	**Eq. 4.7**	**Eq. 4.8**
Lagged Number of Sales for each buyer type (a)	0.839*** (8.62)	0.789*** (9.26)	0.822*** (9.28)	0.880*** (8.15)
Lagged Percentage of Sales with Profit for Foreign Investor	11.10 (0.11)			
Lagged Percentage of Sales with Profit for Interstate Investor		4.30 (0.13)		
Lagged Percentage of Sales with Profit for Owner Occupiers			11.47 (0.05)	
Lagged Percentage of Sales with Profit for QLD Investor				5.09 (0.06)
SD (a)	0.097	0.085	0.86	0.11
R-Squared	0.72	0.64	0.71	0.77
Number of Observations	70	70	70	70
****** p<.01, ** p<.05, * p<.1***				

To compare the influence of buyer type on the total number of sales, Table 4.4 presents the results for Equation 4.9 representing the percentage of sales in a given quarter by investor type. Foreign and QLD investors appear to have a different impact on the number of sales compared with owner occupiers and the results are significant at the 1% significance level. This indicates that as the percentage of foreign and QLD investors increases, the number of sales is positively affected. The percentage of

foreign investors appears to have the greatest impact on the number of sales with a coefficient of 17,666. This indicates that a 1% increase in the percentage of foreign investors increases the total number of sales by 17,666.

Table 4.4 *No. of Sales Compared with Percentage of Overall Sales for Different Investor Types*

	Eq. 4.9
Percentage Number of Overall Sales for Interstate Investors	2,304.64 (0.42)
Percentage Number of Overall Sales for Foreign Investors	17,666.44*** (6.25)
Percentage Number of Overall Sales for QLD Investors	9,145.58 *** (2.77)
SD Number of Sales	748.61
R-Squared	0.42
Number of Observations	72
****** p<.01, ** p<.05, * p<.1***	

Column 1 in Table 4.5 (Equation 4.10) shows the impact of foreign investment policies for foreign investors on the total number of sales, with monetary policy proxied by mortgage rates. The results show that the lagged number of sales has a statistically significant positive coefficient, again highlighting the momentum in the number of sales in the residential real estate market in Australia. Foreign Investment Policy 2 and mortgage rates have statistically significant negative relationships with the number of sales. Given that Foreign Investment Policy 2 imposes higher transaction costs to foreign buyers, it is not surprising that the coefficient is negative as the increased costs will decrease the total number of sales to foreign investors. In addition, when mortgage rates increase, the number of sales will decrease due to higher borrowing costs.

Again, the coefficient for the lagged percentage of sales with a profit is not statistically significant. The coefficient for foreign investment Policy 1 is also not statistically significant. This is consistent with industry discussions regarding the effectiveness of the FIRB policy in curtailing foreign investor participation, which

contributed to the implementation of the second foreign investment policy which further increased costs to foreign investors.

Table 4.5 *Impact of Mortgage Rate and Foreign Investment Policies with percentage number of overall sales for different investors on No. of Sales*

	Eq. 4.10	**Eq. 4.11**
Lagged Number of Sales	0.766*** (7.93)	0.693*** (6.55)
Lagged Percentage of Sales with Profit for all Buyer Types	438.33 (0.88)	366.32 (0.71)
Foreign Investment Policy 1	-0.289 (-1.20)	-0.217 (-0.84)
Foreign Investment Policy 2	-0.794** (-2.53)	-0.714** (-2.43)
Mortgage Rate	-152.86** (-2.55)	-206.31*** (-3.73)
Percentage Number of Overall Sales for Interstate Investors		6,882.77* (1.85)
Percentage Number of Overall Sales for Foreign Investors		7,368.40** (2.38)
Percentage Number of Overall Sales for QLD Investors		-2,488.22 (-1.04)
SD Number of Sales	733.92	733.92
R-Squared	0.78	0.80
Number of Observations	71	71
****** p<.01, ** p<.05, * p<.1***		

Column 2 of Table 4.5 shows the results of Equation 4.11, which includes the overall percentage sales for different investor types. The coefficient for the lagged percentage of sales with a profit is not statistically significant which again fails to confirm the disposition effect. The coefficients for the foreign investment policies show results that are consistent with Equation 4.10, where the coefficient for Foreign Investment Policy 1 is not statistically significant, while the coefficient for Foreign Investment Policy 2 is negative and statistically significant. Mortgage Rates again have a negative impact on the number of sales at 1% level. The percentage of foreign investors is again statistically significant at the 5% level and the percentage of interstate investors is statistically significant at the 10% level. These results indicate that as the percentage of foreign or interstate investors increases, the number of overall sales also increases. This essentially "crowds out" local investors and owner occupiers.

4.6 Conclusion

There are several reasons to expect that disposition effects would be found in the Australian residential real estate market, consistent with the findings of previous studies in the US and in equity markets. This chapter adds to the very scarce literature on the empirical investigations for the presence of disposition effect in the residential real estate market. The case setting focuses on the Gold Coast suburbs, which is a unique, small but open economy with foreign investor presence which substantially varied over time.

Based on the data for the period FY 2000-2018, the results show very little evidence of disposition effect, showing only a weak relationship between profit and number of sales which is sensitive to the measure of profit. Thus, the study concludes that Australian residential real estate buyers are not heavily influenced by this heuristic bias. For an advanced economy, residential real estate investment is a direct channel for foreign investment capital flow. This chapter confirms that disposition biases are not integral nor prominent in Australian property purchasing decisions, using the Gold Coast setting. This result is unlike those set in developing countries where loss aversion, mental accounting, overconfidence, and anchoring biases are commonly found (Das and Sharma, 2013).

The results did, however, show a strong momentum effect in the number of sales, with the number of sales in the current quarter being significantly related to the number of sales in the previous quarter. This finding is consistent with Case and Shiller (1989), who showed a positive relationship between lagged returns and current returns in the US housing markets; asserting that housing returns are forecastable due to long term stable transaction costs and nature of participants. The results found in this chapter confirm that the momentum effect in residential real estate sales is statistically significant and economically meaningful throughout all models, though the effect appears to be more pronounced in certain suburbs such as Broadbeach, Robina, Paradise Point and Surfers Paradise and more prominent before FY 2016.

The results also show that the number of sales increases with the percentage of foreign or interstate investors (crowding out local investors and owner occupiers). This happens in vast proportions with foreign investors having almost double the impact of local investors. While there are concerns about the impacts of Australia's tax settings

on domestic housing demand and price inflation (Yates, 2010), it is unclear whether global policies surrounding property investment in foreign countries or changes in international sources of finance have contributed to this finding. The chapter, however, demonstrates that as the Gold Coast residential real estate market becomes an emerging global attraction, properties are no longer fixed assets with demands solely determined by local demographic changes or domestic drivers. Council or State regulations and foreign policy makers need to be cognisant of these drivers and capture potential opportunities offered by foreign investors while addressing local needs and pressures.

Finally, this chapter finds that foreign investment policies implemented by the Australian government have robust significant negative effects on the number of sales. Ma et.al. (2021) asserted that significant global events such as political unrest and changing economies have reduced the number of individual Chinese investors in Australia from 2017, further adding to the pressure of the Additional Foreign Acquirer Duties policy implemented around the same time. In a small globalised market such as the Gold Coast, where foreign buyer share has a statistically significant impact, the key practical implication is that there are better buying opportunities in small residential market such as the Gold Coast in times when foreign investors are discouraged from investing. In practice, high capital market uncertainty and the lack of foreign participants may turn out benefit local investors (Oikarinen and Falkenbach, 2017).

This study is one of the first attempts to investigate whether disposition effects exist in the Australian residential real estate market. The lack of evidence of the disposition effect suggests that Australian residential real estate prices are not affected by slow price incorporation of news or a lack of diversification during a downturn in the market. The effect of momentum may, however, lead to greater over reaction to news which may add to the volatility of prices.

Chapter 5: General Conclusion

This thesis examines the details of transactions in the Gold Coast residential real estate market, to better understand the characteristics of foreign investors compared with Australian investors. Some conclusions and generalisations are highlighted below.

For period between FY 2000 and FY 2018, foreign investor paid a premium for units in the Gold Coast compared to owner occupiers. This trend is consistent through the whole period of study, though it is not apparent for houses. Following the implementation of FIRB and AFAD policies, foreign investors were found to reduce this premium. This resulted in foreign investor purchases moving into lower price brackets, such as 2 bedroom units. Mortgage rates were found to have a positive relationship with property prices, indicating that the government may have limited potential to dampening property prices, especially during the pre-GFC period.

Mispricing by foreign investors is erratic in the Gold Coast residential property market. Property investment has been profitable for foreign investment, especially before FY 2011. Profit margins continue for houses (not units) even after the implementation of FIRB fees in 2015. However, a dramatic reversal is apparent after the implementation of AFAD, as the additional transaction costs reduce profitability. All property types except 2 bedroom units were overvalued during the period of this study. This finding may explain why foreign investors changed their buying patterns relative to owner occupiers, specifically targeting 2 bedroom units.

During the GFC, the mispricing of residential real estate in the Gold Coast was particularly significant. Imputed to Actual Rent (IAR) values significantly increased during the GFC, and continued to increase after the GFC, especially for foreign investors, where they did not return to pre-GFC levels. This indicates that there are other price drivers in the residential real estate market.

Mispricing is apparent for all property types where borrowing is required between FY 2000 and 2018. At both 50% and 80% LVR, all properties were found to be over-valued as the historical average rate of price appreciation were less than

interest repayment rates. It is be concluded that renting would have been cheaper for buyers, local and foreign rather than buying properties in the Gold Coast.

There is little to no evidence of the disposition bias in both local and foreign buyers in the Gold Coast residential market. However, foreign investment policies such as the AFAD had a statistically significant impact on the overall number of sales. This supports the intuitive outcome that number of sales decreases as transaction costs for foreign investors increases, though this study shows that the FIRB policy had comparatively less impact in curtailing foreign investment. There is, however, a robust momentum effect in that the number of sales from the previous quarter significantly influences the number of sales in the current quarter.

5.1 Limitations and Extensions

To address the issue of limited data on property purchases by foreign investors, a case setting is used in this thesis of a small, open economy, the Gold Coast, Australia. This thesis demonstrates the importance of using granular data for investors, policy makers and urban planners. While much effort has been taken to match each property for different buyer types, the high variability and heterogeneity inherent within the residential market has been widely documented, demonstrating a deficit in our understanding around unquantifiable measures (Lieske et.al., 2021; Fox and Tulip, 2014). In addition, the number of properties listed for sale at the time of purpose would also be an interesting factor to consider. Unfortunately, data for this variable is unavailable. Chapter 2 of this thesis fills an empirical research gap that would have been useful during the Parliament Inquiry into the effect of foreign investment in real estate markets in Australia in 2014. An interesting extension for this chapter would be to further the study with the same model throughout other Australian cities. A thorough investigation of these variables using a wider scope of data will bring a more fitting model to measure the characteristics of foreign investment in Australian residential prices.

The results in Chapter 3 provide evidence that credit conditions and foreign investment policies do impact mispricing in the Australian residential market. While renting is typically cheaper than buying in the Gold Coast, the analysis presented in this thesis is limited to the demand side model, without considering the supply side.

Future work on the supply side of the residential real estate market should provide an interesting, policy-relevant, perspective as explored in studies such as Cuestas (2017) and Lyon (2018), where forecasted housing prices can be used as a determinant of credit conditions. Price ratio and user costs should also be used in future research, especially to inform the ongoing debate regarding young Australians being crowded out of the residential real estate market. Future analysis could also examine the correlation between tenancy choice and profitability in residential markets. As suggested by Kim (2008), understanding this balance is paramount, though collecting corresponding rental and purchasing prices for the same properties is challenging. Future spatial studies exploring these differences would add to a more robust measurement of mispricing.

Chapter 4 of this thesis investigates one behavioural bias (the disposition effect) for foreign investors relative to local buyers. It is inferred in this chapter that this bias is weak in the Gold Coast residential real estate market. However, these results may differ in a bigger sample with more individual foreign investors such as Melbourne or Sydney. The research in this thesis also suggests some broader findings for foreign investment policymakers interested in reviewing the implementation of FIRB and AFAD policies. This pioneering research using granular data has provided a better understanding of the underlying relationship between foreign and local buying patterns. There is no evidence of the disposition effect in the Gold Coast residential real estate market, though it is a question worth exploring more widely throughout Australia.

5.2 Concluding Remarks

The pioneering work in this thesis includes the use of granular data to examine the relationship between foreign and local buying patterns in the Australian residential real estate market. This study adds to our understanding of the characteristics of foreign investment. It highlights some of the key purchasing characteristics over the period from FY 2011 to FY 2018. It is also the first research to examine mispricing in the Australian residential real estate market using the Imputed to Actual Rent (IAR) methodology. Finally, this thesis failed to confirm any evidence of a disposition effect by different buyer types in selling residential properties. It does, however, highlight

significant momentum effects whereby the number of sales in the current period is positively related to the number of sales in the previous quarter.

Bibliography

Abelson, P., & Joyeux, R. (2007). Price and Efficiency Effects of Taxes and Subsidies for Australian Housing. *Economic Papers: A journal of applied economics and policy, 26*(2), 147-169. https://doi:10.1111/j.1759-3441.2007.tb01013.x

ABS. (2015a). *Housing Occupancy and Costs 2013-2014.* Australian Bureau of Statistics Canberra Retrieved from www.abs.gov.au/ausstats/abs@.nsf/mf/4130.0 from www.abs.gov.au/AUSSTATS/abs@.nsf/Lookup/6523.0Main+Features312013-14?OpenDocument

ABS. (2015b). *Household Wealth & Wealth Distribution 2013-2014.* Australian Bureau of Statistics Canberra Retrieved from www.abs.gov.au/AUSSTATS/abs@.nsf/Lookup/6523.0Main+Features312013-14?OpenDocument

ABS. (2017). *Residential Property Price Indexes: Eight Capital Cities, Jun 2017*. Australian Bureau of Statistics Canberra Retrieved from http://www.abs.gov.au/AUSSTATS/abs@.nsf/Lookup/6416.0Main+Features1Jun%202017?OpenDocument

Adair, A., Nase, I. & Berry, J., (2016). Impact of quality-led design on real estate value: a spatiotemporal analysis of city centre apartments. *Journal of Property Research*, *33*(4), 309–331. https://doi.org/10.1080/09599916.2016.1258588

Adams, F.G. & Yang, J. (1994). The User Cost Estimation of Owner-Occupied Housing. *Journal of Policy Modelling, 16(3),* 327-333. https://doi.org/10.1016/0161-8938(94)90031-0

AIHW. (2017). The Changing Shape of Housing in Australia. Retrieved from https://www.aihw.gov.au/getmedia/54616413-166f-4048-b886-c901bf8afce1/aihw-australias-welfare-2017-chapter6-3.pdf.aspx

Alba, R. and Pereira, J. (2011). The Progress and Pitfalls of Diversity on Wall Street. Centre for Urban Research Report.

Alford, P. (2010). *Rent Ratio Tells You Whether Renting or Buying Is the Better Deal*. Forbes Online. Retrieved from: https://www.forbes.com/sites/greatspeculations/2010/11/02/rent-ratio-tells-you-whether-renting-or-buying-is-the-better-deal/#1791fa20e9d0

Allen, L. and Brown, G. (2013). Chinese Precise on Where to Buy. Retrieved from: https://www.theaustralian.com.au/news/nation/chinese-precise-on-where-to-buy/news-story/1cafa7d1434694b998643a0a5519a637?nk=385d4104e6730915dcc5e2c0f3c5aaf9-1548468251

Alonso, W. (1964). *Location and Land Use: Toward a General Theory of Land Rent.* Cambridge, MA: Harvard University Press.

Amarnani, N. (2010). The Disposition Effect: A Review of Literature. *Nirma University Journal of Business Management Studies. 4(3&4):*19-35. SSRN. Retrieved from: http://ssrn.com/abstract=1709225

Andrle, M. & Plasil, M. (2019). Assessing House Prices with Prudential and Valuation Measures. IMF Working Paper WP/19/59.

ANZ Research (2017). *Foreign buyers of Australian property – How many are there? ANZ Research*. Property Observer, 6 December, 2017. Retrieved online from: https://www.propertyobserver.com.au/forward-planning/advice-and-hot-topics/78975-foreign-buyers-of-australian-property-how-many-are-there-anz-research.html

Asal, M. (2018). Is There a Bubble in the Swedish Housing Market? *Journal of European Real Estate Research, 12(1)*, 32-61.

Australian Financial Business Review. (2019). Low rates not to Blame for Sky-high prices. Retrieved from: https://www.afr.com/markets/low-rates-not-to-blame-for-skyhigh-prices-20190306-h1c1q2

Badrinath, S. & Lewellen, W. (1991). Evidence on Tax-motivated Securities Trading Behaviour. *Journal of Finance. 46:*369-382.

Barberis, N. and Xiong, W. (2009). What Drives the Disposition Effect? An Analysis of a Longstanding Preference Based Explanation. *Journal of Finance. 64*:751-784.

Barham, G. (2004). *The Effects of Taxation Policy on the Cost of Capital in Housing – A Historical Profile. Financial Stability Report*. Central Bank of Ireland. Dublin 2, Ireland. 89-102.

Belkar, R., Cockerell, L. & Kent, C. (2007). *Current Account Deficits: The Australian Debate*. RBA Research Discussion Paper No. 2007-02.

Bender, B. and Hwang, H. (1985). Hedonic House Price Indices and Secondary Employment Centres. *Journal of Urban Economics, 17(1),* 90-107.

Bernanke, B.S. (2010). *Monetary Policy and the Housing Bubble.* Speech at the Annual Meeting of the American Economic Association, Atlanta, GA.

Birru, J. (2015). Confusion of Confusions: A Test of the Disposition Effect and Momentum. *Review of Financial Studies. 28:*1849-1873.

Bollard, A. & Smith, M. (2006). *Major Global Developments in the New Millennium*. Reserve Bank of New Zealand Bulletin 69, 26-39

Bourassa, S.C. (1995). The Impacts of Borrowing Constraints on Home-Ownership in Australia. *Urban Studies, 23*(7), 1163-1173

Braakmann, N. (2019). Immigration and the Property Market: Evidence from England and Wales. *Real Estate Economics*, 47, 509-533

Brown, P., Chappel, N., Da Silva Rosa R. & Walter, T. (2006). The reach of the disposition effect: Large sample evidence across investor classes. *International Review of Finance. 6*:43-78

Brown, R., Brown, R., O'Connor, I., Schwann, G. & Scott, C. (2011). The Other Side of Housing Affordability: The User Cost of Housing in Australia. *Economic Record, 87(279),* 558-574.

Brushko, I., & Hashimoto, Y. (2014). *The role of country concentration in the international portfolio investment positions for the European Union members* . International Monetary Fund.

Burks, S.V., Carpenter, J.P., Goette, L. and Rustichini, A. Overconfidence and Social Signalling. *Review of Economic Studies. 80:*949-983.

Casavecchia and Lee. (2014). Chinese Buyers' role in Australian Property Market not yet Clear. UTS Business School News. Retrieved online from: https://www.uts.edu.au/about/uts-business-school/news/chinese-buyers-role-australian-property-market-not-yet-clear

Case, K. & Shiller, R. (1988). The Behaviour of Home Buyers in Boom and Post-boom markets. *New England Economic Review* November/December. 29-46.

Case, K. & Shiller, R. (1989). The Efficiency of the Market for Single Family Homes. *American Economic Review*, 79(1), 125-137

Chao, C.C., & Yu, Eden. (2015). Housing Markets with Foreign Buyers. *Journal of Real Estate Finance & Economics, 50,* 207-218

Cheng, T.Y., Lee, C.I. & Lin, C. H. (2013). An Examination of the Relationship between the Disposition Effect and Gender Age, the Traded Security and Bull-bear market conditions. *Journal of Empirical Finance. 21*:195-213.

Chinco, A. & Mayer, C. (2015). *Misinformed Speculators and Mispricing in the Housing Market.* The Society for Financial Studies. Oxford University Press.

Chinco, A., & Mayer, C. (2016). Misinformed Speculators and Mispricing in the Housing Market. *The Review of Financial Studies, 29*(2), 486-522. doi:10.1093/rfs/hhv061

Cici, G. (2012). The Prevalence of the Disposition Effect in Mutual Funds' trades. *Journal of Finance and Quantitative Analysis. 47(4):*795-820.

Clausing, K. A. (2016). The Effect of Profit Shifting on the Corporate Tax base in the United States and Beyond. *National Tax Journal, 69*(4), 905–934. https://doi.org/10.17310/ntj.2016.4.09

Constantinides, G. (1984). Optimal Stock Trading with Personal Taxes: Implications for Prices and the Abnomal January Returns. *Journal of Financial Economics. 13*:65-69.

Corelogic (2018). National Dwelling Values Continue to Trend Lower, Falling by Half a Percent in October. Retrieved from https://www.corelogic.com.au/sites/default/files/201811/CoreLogic%20Home%20Value%20Index%20Nov%201%202018.pdf

Coricelli, G. Critchley, H.D., Joffily, M. O'Doherty, J.D., Sirigu, A. and Dolan, R.J. (2005). *Regret and its Avoidance: A Neuroimaging Study of Choice Behaviour. Natural Neuroscience 8:*1255-1262.

Coulson, N.E. (1991). Really Useful Tests of the Monocentric Model. *Land Economics, 67(3),* 299-307.

Cronqvist, H. & Siegel, S. (2014). The genetics of investment biases. *Journal of Finance and Economics*. 113:215-234.

Cuestas, J.C. (2017). House Prices and Capital Inflows in Spain during the Boom Evidence from a Cointegrated VAR and a Structural Bayesian VAR. *Journal of Housing Economics*. 37, 22-28.

Da Costa, N., Goulart, M. Cupertino, C. Macedo, J. & Da Silva, S. (2013). The Disposition Effect and Investor Experience. *Journal of Banking and Finance. 37(5):*1669-1675.

Da Costa, N., Mineto, C. & Da Silva, S. (2008). Disposition Effect and Gender. *Applied Economics Letter. 15(6)*:411-416.

Das, P. & Sharma, D. (2013). *Real Estate Finance in India.* SAGE Publications.

Diewert, W. E. (2004). *The Treatment of Owner Occupied Housing and Other Durables in a Consumer Price Index*. Centre for Applied Economic Research Working Paper No. 2004/3. University of New South Wales, Sydney.

Dougherty, A. & Van Order, R. (1982). Inflation, Housing Costs and the Consumer Price Index. *The American Economic Review, 72(1),* 154

ECB. (2011). Box 3: Tools for Detecting a Possible Misalignment of Residential Property Prices from Fundamentals. *Financial Stability Review.* European Central Bank Frankfurt.

Einio, M., Kaustia, M., & Puttonen, V., (2008). Price setting and the reluctance to realise losses in apartment markets. *Journal of Economics and Psychology. 29(1)*: 19-34.

Ellis, L. (2013). Housing and Mortgage Markets: The Long Run, the Short Run and the Uncertainty in Between. Address to the Citibank Property Conference, Sydney 23rd April

Elster, J. Social Norms and the Explanation of Behaviour. The Oxford Handbook of Analytical Sociology. Oxford (Eds).

Fane, G. & Richardson, M. (2005). Negative Gearing and the Taxation of Capital Gains in Australia. *Economic Record*, 81(254), 249-261, Retrieved online: https://ssrn.com/abstract=783241

FIRB. (2018). Retrieved from https://cdn.tspace.gov.au/uploads/sites/79/2019/02/FIRB-2017-18-Annual-Report-final.pdf

Fischbacher, U. Hoffmann, G., & Schudy, S. (2017). The Causal Effect of Stop-Loss and Take-Gain Orders on the Disposition Effect. *The Review of Financial Studies. 31(9):*2110-2129.

Flatau, P., Watson, R. & Wood, G. (2006). Microsimulation Modelling of Tenure Choice and Grants to Promote Home Ownership. *Australian Economic Review, 39*(1), 14-34

Fox, R. & Finlay, R. (2012). *Dwelling Prices and Household Income.* RBA Bulletin March, 45-54.

Fox, R. & Tulip, P. (2014). *Is Housing Overvalued?* RBA Research Discussion Paper.

Franklin, J. P. & Waddell, P. (2003). *A Hedonic Regression of Home Prices in King County, Washington, Using Activity-Specific Accessibility Measures*. Retrieved from https://www.researchgate.net/publication/228695852_A_hedonic_regression_of_home_prices_in_King_County_Washington_using_activity-specific_accessibility_measures

Fraser, P., Hoesli, M & McAlevey, L. (2008). House Prices and Bubbles in New Zealand. *Journal of Real Estate & Finance Economics,37*, 71-91

Frost, L. & O'Hanlon, S. (2009). Urban History and the Future of Australian Cities. *Australian Economic History Review, 49*, 1-18

Frydman, C., Barberis, N. Camerer, C., Bossaerts, P. & Rangel, A. (2014). Using neural data to test a theory of investor behaviour: an application to realisation utility. *Journal of Finance*. 69:907-946.

Fu, Y., & Qian, W. (2014). Speculators and Price Overreaction in the Housing Market. *Real Estate Economics, 42*(4), 977-1007. doi:10.1111/1540-6229.12071

Garner, T. I. & Verbrugge, R. (2009). *The Puzzling Divergence of U.S. Rents and User Costs, 1980-2004: Summary and Extensions* in WE Diewert, BM Balk, D Fixler, KJ Fox and AO Nakamura (eds), *Price and Productivity Measurement: Volume 1 – Housing*, Trafford Press, Victoria, Canada, pp 125–146

Gauder, M., Houssard, C., & Orsmond, D. (2014). Foreign Investment in Residential Real Estate. *RBA Bulletin June Quarter*, 11-18

Ge, J.X. (2014). *Australian Migration and Dwelling Prices*. 19th Annual Asian Real Estate Society Conference Gold Coast.

Genesove, D. & Mayer, C.J., (1997). Equity and Time to sale in the Real Estate Market. *The American Economic Review. 87(3)*, 255-269.

Genesove, D. & Mayer, C.J., (2001). Loss Aversion and Seller Behaviour: Evidence from the Housing Market. *The Quarterly Journal of Economics. 116 (4)*, 1233-1260.

Gholipour. H.F., Lean, H.H., Tajaddini, R., & Pham, A. K. (2019). Foreign investment in Australian residential properties. *International Journal of Housing Markets and Analysis, 12*(2), 166–180. https://doi.org/10.1108/IJHMA-05-2018-0030

Gillingham, R. (1980). Estimating the User Cost of Owner Occupied Housing. *Monthly Labor Review-pre 1986 Washington, 103(00002)*, 31.

Glaeser, E.L. & Gyourko, J. (2018). The Economic Implications of Housing Supply. *Journal of Economic Perspectives, 21*(1), 3-30

Glaeser, E.L., Gyourko, J. & Gottlieb, J. (2010). *Can cheap credit explain the housing boom?* NBER Working Paper No. 16230. National Bureau of Economics Research, Cambridge, MA

Glaeser, E.L., Gyourko, J. & Saiz, A. (2008). Housing Supply and Housing Bubbles. *Journal of Urban Economics, 64*, 198-217

Goetzmann, W.N. & Kumar, A. (2008). Equity Portfolio Diversification. *Review of Finance. 12*:433-463.

Goodhart, C. & Hofmann, B. (2008). House Prices, Money, Credit and the Macroeconomy. *Oxford Review of Economic Policy, 24*(1), 180-205

Grimes, A. & Aitken, A. (2010). Housing supply, land costs and price adjustment. *Real Estate Economics, 38*(2), 325-353

Grinblatt, M. and Han, B. (2005). Prospect Theory, Mental Accounting and Momentum. *Journal of Financial Economics. 78*:311-339.

Guest, R., & Rohde, N. (2017). The Contribution of Foreign Real Estate Investment to Housing Price Growth in Australian Capital Cities. *Abacus, 53*(3), 304-318. doi:10.1111/abac.12110

Harbour, J. & Houghton, J. (2016). *Gold Coast the 15th least affordable housing market in the world – ahead of New York, Tokyo and Singapore*. Gold Coast Bulleting Real Estate. Retrieved online: https://www.goldcoastbulletin.com.au/realestate/gold-coast-the-15th-least-affordable-housing-market-in-world--ahead-of-new-york-tokyo-and-singapore/news-story/8a004946bfbb02fad7fbd5ed9af398d8

Hatzvi, E. & Otto, G. (2008). Prices, Rents and Rational Speculative Bubbles in the Sydney Housing Market. *The Economic Record, 84(267)*, 405-420.

He, C. & Cava, G.L. (2020). The Distributional Effects of Monetary Policy: Evidence from Local Housing Markets. RBA Research Discussion Paper

Heimer, R.Z. (2016). Peer Pressure: Social Interaction and the Disposition Effect. The *Review of Financial Studies Journal. 29*:3177-3209.

Hens.T, and Vlcek, M. (2011). Does Prospect Theory Explain the Disposition Effect? *Journal of Behavioural Finance. 12(3):*141-157.

Herath, S. and Maier, G. (2010). The Hedonic Price Method in Real Estate and Housing Market Research: A Review of the Literature. Institute for Regional Development and Environment (pp.1-21). Vienna, Australia

Hermann, D., Musshoff, O. and Rau, H.A. (2017). *The Disposition Effect When Deciding on Behalf of Others*. Centre for European, Governance and Economic Development Research. Cege Working Paper No. 332.

HILDA. (2017). *The Household, Income and Labour Dynamics in Australia Survey: Selected Findings from Waves 1 to 15*. Retrieved from https://melbourneinstitute.unimelb.edu.au/__data/assets/pdf_file/0010/2437426/HILDA-SR-med-res.pdf

Hill, R. J. & Syed, I.A. (2012). *Hedonic Price-Rent Ratios, User Cost and Departures from Equilibrium in the Housing Market.* University of New South Wales. Australian School of Business Research Paper No 2012 ECON 45.

Hill, R.J. (2012). Hedonic Prices Indexes for Residential Housing: A Survey, Evaluation and Taxonomy. *Journal of Economic Surveys*, 27, 879-914

Himmelberg, C., Mayer, C. & Sinai, T. (2005). Assessing High House Prices: Bubbles, Fundamentals and Misperceptions. *Journal of Economic Perspectives, 19(4),* 67-92.

Hirshleifer, D. and Teoh, S.H. (2003). Limited Attention, Information Disclosure and Financial Reporting. *Journal of Accounting and Economics 36:*337-386.

Hseih, C. T. and Moretti, E. (2015). Housing Constraints and Spatial Misallocation. NBER Working Paper No. 21154. National Bureau of Economic Research, Cambridge MA

Hui, C.M.E., Seabrooke, W. & Wong, T. Y. J. (2003). The impact of interest rates upon house prices: an empirical study of Hong Kong's market. *Journal of Property Management, 21* (2), 153-170 https://doi.org/10.1108/02637470310478891

Huizinga, H. & Nicodème, G. 2006. Foreign ownership and corporate income taxation: An empirical evaluation. *European Economic Review*, 50 (5), 1223-1244.

Hull, R. (1997). The complexity fad. *Futures: The Journal of Policy, Planning and Futures Studies, 29*(7), 689–691. https://doi.org/10.1016/S0016-3287(97)00041-4

Hung, M.W. & Yu, H.Y. (2006). A heterogeneous model of disposition effect. *Applied Economics 38(18):*2147-2157.

IMF. (2018). Fundamental Drivers of House Prices in Advanced Economies. WP/18/164.

Javorcik, B., Ozden, C., Spatareanu, M. & Neagu, C. (2011) Migrant networks and foreign direct investment, *Journal of Development Economics, 94*(2), 231–241

Jegadeesh, N. and Titman, S. (1993). Returns to buying Winners and selling Losers: Implications for Stock Market Efficiency. *Journal of Finance. 48(1):*65-91.

Jorgenson, D.W. (1963). Capital Theory and Investment Behaviour. *American Economic Review, 53,* 247-259.

Jou, J.B., Shi, S. & Tripe, D. (2014). Can interest rates really control house prices? Effectiveness and implications for macroprudential policy. *Journal of Banking & Finance, 47*, 15-28

Kahneman, D. and Tversky, A. (1979). Prospect Theory: An Analysis of Decision Under Risk. *Econometrica 47(2):*263-291.

Kain, J.F. & Quigley, J.M., (1970). Measuring the Value of House Quality. *Journal of the American Statistical Association, 65*(330), 532-548.

Kaustia, M. (2010). Prospect Theory and the Disposition Effect. *Journal of Finance & Quantitative Analysis. 45(3):*791-812.

Khan, V. (2019). *Real Assets and How They can Help Investors*. What Investment Online. Retrieved from: https://www.whatinvestment.co.uk/real-assets-and-how-they-can-help-investors-charu-lahiri-explains-2617072/

Lai, H.W., Chen, H.W. & Huang, C.S., (2010). Technical Analysis, investment psychology & liquidity provision: evidence from the Taiwan stock market. *Emerging Market Finance and Trade. 46(5):*18-38.

Larkins, D. (2019). *Is the Gold Coast less affordable and family friendly than 30 years ago*? ABC Gold Coast News. Retrieved from:

https://www.abc.net.au/news/2019-06-13/curious-is-gold-coast-more-expensive-less-family-friendly/11075928

Law, J. (2014). Housing Affordability: Are Foreign Investors to blame for Australia's high property prices? Retrieved from: https://www.news.com.au/finance/real-estate/buying/housing-affordability-are-foreign-investors-to-blame-for-australias-high-property-prices/news-story/710ba2cff1932f0fb3f81ce83a07946b

Lee, C. L. & Reed, R. (2014). Volatility Decomposition of Australian Housing Prices. *Journal of Housing Research*, 23(1), 21-44

Lee, C. L. (2017). An examination of the risk-return relation in the Australian housing market. *International Journal of Housing Markets and Analysis, 10*(3), 431-449. doi:10.1108/IJHMA-07-2016-0052

Lee, C.L., Rogers, D. & Yan, D. (2015). The Politics of Foreign Investment in Australian Housing: Chinese Investors, Translocal Sales Agents and Local Resistance, *Housing Studies, 30*(5), 730-748, DOI:10.1080/02673037.2015.1006185. Retrieved from https://doi.org/10.1080/02673037.2015.1006185

Ley, D. (2010). *Millionaire Migrants – Trans Pacific Life Lines*. Wiley Online Library. DOI:10.1002/9781444319262. Retrieved from https://onlinelibrary.wiley.com/doi/book/10.1002/9781444319262

Lieske, S. N., van den Nouwelant, R., Han, J. H., & Pettit, C. (2021). A novel hedonic price modelling approach for estimating the impact of transportation infrastructure on property prices. *Urban Studies (Edinburgh, Scotland)*, *58*(1), 182–202. https://doi.org/10.1177/0042098019879382

Lim, G.C. & Tsiaplias, S. (2018). Interest Rates, Local Housing Markets and House Price Over-reactions. *Economic Record June Issue, 49,* 33-48 Retrieved from https://onlinelibrary-wiley-com.ezp01.library.qut.edu.au/doi/epdf/10.1111/1475-4932.12402

Liow, K. H., Zhou, X., Li, Q., & Huang, Y. (2019). Co-movement between the US and the securitised real estate markets of the Asian-Pacific economies. *Journal of Property Research*, *36*(1), 27–58. https://doi.org/10.1080/09599916.2019.1568283

Locke, P. and Mann, S. (2005). Professional Trader Discipline and Trade Disposition. *Journal of Financial Economics. 76:*401-444.

Lucchesi, E.P., Yoshinaga, C.E. and De Castro, F.H.F. (2015). Disposition Effect Among Brazilian Equity Fund Managers. Retrieved from: https://doi.org/10.1590/S0034-759020150104

Lyon, C. R. (2018). Credit Conditions and the Housing Price Ratio: Evidence from Ireland's boom and bust. *Journal of Housing Economics*. 42, 84-96.

Ma, X., Rogers, D., & Troy, L. (2021). Chinese property developers after the decline in foreign real estate investment in Sydney, Australia. *Housing Studies*, 1–20. https://doi.org/10.1080/02673037.2021.1935764

Malpezzi, S. (2002). *Hedonic Pricing Models: A Selective and Applied Review*. In K.Gibb & A. O'Sullivan. Housing Economics and Public Policy. Oxford, UK: Blackwell Science Ltd.

Marzuki, M. J., & Newell, G. (2018). The emergence of Spanish REITs. *Journal of Property Investment & Finance*, *36*(5), 495–508. https://doi.org/10.1108/JPIF-05-2018-0032

McDonald, J.F. & Stokes, H.H. (2013). Monetary Policy and the Housing Bubble. *Journal of Real Estate Finance and Economics, 46*, 437-451

Mehrhoff, J. (2016). *How Should We Measure Residential Property Prices to Inform Policy Makers?* Deutsche Bundesbank for Irving Fisher Committee on Central Bank Statistics Bank of International Settlements BIS Retrieved from: https://www.bis.org/ifc/publ/ifcb43_z.pdf

Mills, E.S. (1972). *Studies in the Structure of the Urban Economic*. Baltimore: Johns Hopkins Press for Resources for the Future.

Mishkin, F.S. (2007). *Housing and the Monetary Transmission Mechanism*. NBER Working Paper 13518. National Bureau of Economic Research, Cambridge MA

Miziołek, T., Feder-Sempach, E., & Zaremba, A. (2020). *International equity exchange-traded funds : navigating global ETF market opportunities and risks* (1st ed. 2020.). Palgrave Macmillan. https://doi.org/10.1007/978-3-030-53864-4

Niklewski, J., Rodgers, T. & Tse, C. (2014). The 2007 Financial Crisis and the UK Residential Housing Market: Did the Relationship between Interest Rates and House Price Change? *Economic Modelling, 37*, 518-530

Odean, T. (1998). Are investors reluctant to realise their losses? *Journal of Finance. 53(5):* 1775-1798.

OECD. (2012). *Economic Outlook, Analysis and Forecasts: Focus on House Prices*. Retrieved from http://www.oecd.org/eco/outlook/focusonhouseprices..htm

Oikarinen, E., & Falkenbach, H. (2017). Foreign investors' influence on the real estate market capitalization rate - evidence from a small open economy. *Applied Economics*, *49*(32), 3141–3155. https://doi.org/10.1080/00036846.2016.1254343

Parliament of Australia. (2014). *Report on Foreign Investment in Residential Real Estate*. Canberra.

Parliament of Australia (2015). *Report of the Inquiry into the Business Innovation and Investment Programme.* Canberra.

Philiponnet, N. & Turrini, A. (2017). *Assessing House Price Developments in the EU*. Discussion Paper 048/2017, European Commission, Brussels.

Piazzesi, M. & Schneider, M. (2016). *Housing and Macroeconomics*. NBER Working Paper No. 22354. National Bureau of Economic Research, Cambridge MA

Pleßner, M. (2017). The disposition effect: A survey. *Management Review Quarterly. 67*:1-30

Poterba, J. M. (1984). Tax Subsidies to Owner-Occupied Housing: An Asset-Market Approach. *Quarterly Journal of Economics, 99,* 729-752.

Property Council of Australia. (2017). *New Report Demonstrates Value to the Australian Economy from Foreign Investment in Real Estate.* Property Council of Australia Research. Retrieved from https://www.propertycouncil.com.au/Web/Content/Media_Release/National/2017/New_report_demonstrates_value_to_the_Australian_economy_from_foreign_investment_in_real_estate.aspx

Prosad, J.M., Kapoor, S. & Sengupta, J. (2017). Overconfidence and Disposition Effect in Indian Equity Market: An Empirical Evidence. *Global Business Review. 19(5):*1303-1321.

Queensland Productivity Commission. (2018). *Housing in Queensland: Affordability and Preferences*. Staff Research Paper. Retrieved from: https://apo.org.au/sites/default/files/resource-files/2018-04/apo-nid140056.pdf

Rau, H.A. (2014). The Disposition Effect and Loss Aversion: Do Gender Differences Matter? *Economic Letters. 123(1):* 33-36.

RBA (Reserve Bank of Australia). (2015). Submission to the Inquiry into Home Ownership. *Submission to the House of Representatives Standing Committee on Economics Inquiry in to Home Ownership*, June

RBA (Reserve Bank of Australia). (2017). *Household Debt, Housing Prices and Resilience*. Speech by Governor Philip Lowe. Economic Society of Australia (QLD) Business Lunch Brisbane 4th May 2017. Retrieved from: https://www.rba.gov.au/speeches/2017/sp-gov-2017-05-04.html

RBA (Reserve Bank of Australia). (2019). Bulletin 2019. Retrieved from: https://www.rba.gov.au/publications/bulletin/2019/dec/pdf/bulletin-2019-12.pdf

Ricardo, D. (1821). *The Principals of Political Economy and Taxation*. Retrieved from: https://socialsciences.mcmaster.ca/econ/ugcm/3ll3/ricardo/Principles.pdf

Rodríguez, C., & Bustillo, R. (2010). Modelling Foreign Real Estate Investment: The Spanish Case. *The Journal of Real Estate Finance and Economics, 41*(3), 354-367. https://doi:10.1007/s11146-008-9164-9

Rogers, D., & Koh, S. Y. (2017). The globalisation of real estate: the politics and practice of foreign real estate investment. *International Journal of Housing Policy, 17*(1), 1-14. doi:10.1080/19491247.2016.1270618

Rogers, D., Lee, C.L., & Yan, D. (2015). The politics of foreign investment in Australian Housing: Chinese Investors, Translocal Sales Agents and Local Resistance. *Housing Studies*, *30*(5), 730–748. https://doi.org/10.1080/02673037.2015.1006185

Salt, B. (2020). *Will less Immigration help or hinder nation*? Retrieved from: https://www.theaustralian.com.au/inquirer/shape-of-things-to-come/news-story/89be4d764bddbd014567c0c0f876f081

Saiz, A. (2010). The Geographic Determinants of Housing Supply. *Quarterly Journal of Economics, 125*(3), 1253-96

Samuelson, W. & Zeckhauser, R. (1988). Status Quo Bias in Decision Making. *Journal of Risk and Uncertainties. 1*:7-59.

Saunders, T. & Tulip, P. (2019). *A Model of the Australian Housing Market*. RBA Research Discussion Paper 2019-01 Retrieved from: https://www.rba.gov.au/publications/rdp/2019/pdf/rdp2019-01.pdf

Seiler, M. and Seiler, V. (2010). Mitigating Investor Risk Seeking Behaviour in a Down Real Estate Market. *Journal of Behavioural Finance. 11(3):*161-167.

Seiler, M., Seiler, V. and Lane, M. (2012). Mental Accounting and False Reference Points in Real Estate Investment Decision Making. *Journal of Behavioural Finance, 13(1):*17-26.

Seiler, M., Seiler, V., Traub, S. and Harrison, D. (2008). Regret Aversion and False Reference Points in Residential Real Estate. *Journal of Real Estate Research, 30*:461-474.

Shefrin, H. & Statman, M., (1985). The Disposition to Sell Winners too early and ride losers too long: theory and evidence. *Journal of Finance. 40(3):* 777-790.

Shiller, R. (2006). *Long-term perspective on the current boom in home prices*. The Economist's Voice 3

Shiller, R. (2008). Historical Turning Points in Real Estate. *Eastern Economic Journal, 34*, 1-13

Short, J.R. (2010). *Attracting Wealth: Crafting Immigration Policy to Attract the Rich*. Handbook on Wealth and the Super Rich. Edward Elgar Publishing.

Shumway, T. & Wu, G. (2006). Does Disposition drive momentum? Working paper, University of Michigan.

Simon, J. & Stone, T. (2017). *The Property Ladder after the Financial Crisis: The First Step is a Stretch but Those Who Make it are Doing OK*. RBA Research Discussion Paper Retrieved from: https://www.rba.gov.au/publications/rdp/2017/2017-05/introduction.html

Song, S. (1994). Modelling Worker Residence Distribution in the Los Angeles Region. *Urban Studies, 31*(9), 1533-1544.

Stapledon, N. (2016). The Inexorable Rise in House Prices in Australia since 1970: Unique or Not? *The Australian Economic Review, 49*(3), 317-327

Stapledon, N. D. (2007). *Long Term Housing Prices in Australia and Some Economic Perspectives.* PhD Dissertation. University of New South Wales. Australian School of Business School of Economics.

Stapledon, N.D. (2012). Trends and Cycles in Sydney and Melbourne House Prices from 1880 to 2011. *Australian Economic History Review, 52(3),* 293-317.

Stevenson, S. (2008). Modeling Housing Market Fundamentals: Empirical Evidence of Extreme Market Conditions. *Real Estate Economics, 36(1),* 1-29.

Stevenson, S. (2008). Modelling Housing Market Fundamentals: Empirical Evidence of Extreme Market Conditions, *Real Estate Economics, 26*(1), 1-29

Swieringa, J., & Wokker, C. (2016). *Foreign Investment and Residential Property Price Growth*. Retrieved from https://www.rse.anu.edu.au/media/1845323/Swieringa-Paper-2017.pdf.

Talpsell, T. (2010). *Does Gender and Age Affect Investor Performance and the Disposition Effect?* Research in Economics and Business: Central and Eastern Europe. 2(1):76-93.

Talpsepp, T. (2011). Reverse Disposition Effect of Foreign Investors. *Journal of Behavioural Finance. 12(4*): 183-200.

Taylor, J.B. (2007). *Housing and Monetary Policy*. NBER Working Paper No. 13682. National Bureau of Economic Research, Cambridge MA

Taylor, J.B. (2009). *The Financial Crisis and the Policy Responses: An Empirical Analysis of What Went Wrong*. NBER Working Paper No. 14631. National Bureau of Economic Research, Cambridge, MA

Thaler, R. H. (1980). Toward a Positive Theory of Consumer Choice. *Journal of Economic Behaviour and Organisation. 1:*39-60.

Thaler, R.H. and Johnson, E.J. (1990). Gambling with the House Money and Trying to Break Even: The Effects of Prior Outcomes on Risky Choice. *Management Science. 36(6):*643-660.

Tobin, J. (1969). A General Equilibrium Approach to Monetary Theory. *Journal of Money, Credit and Banking, 1,* 15-29.

Tversky, A. and Kahneman, D. (1992). Advances in Prospect Theory: Cumulative Representation of Uncertainty. *Journal of Risk and Uncertainty. 5(4*): 297-323.

U.S. Census. (2018). *Quarterly Residential Vacancies and Homeownership CB18-161*. Retrieved from https://www.census.gov/housing/hvs/files/currenthvspress.pdf

UNCTAD. (2017). Retrieved from https://unctad.org/Sections/dite_dir/docs/WIR2018/WIR2018_FDI_Developed_Economies_en.pdf

United Nations. (2018). *Revision of World Urbanization Prospects*. Retrieved from https://population.un.org/wup/

Uren, D. (2015). *Takeover: Foreign Investment and the Australian Psyche*. Black Inc. Books.

Visaltanachoti, N., Luo, H. & Lu, L. (2007). Holding Periods, illiquidity and disposition effect in the Chinese stock markets. *Applied Finance and Economics. 17(15):*1265-1274.

Wang, L.-R., & Shen, C.-H. (1999). Do foreign investments affect foreign exchange and stock markets - the case of Taiwan. *Applied Economics*, *31*(11), 1303–1314. https://doi.org/10.1080/000368499323184

Weber, M. and Camerer, C, (1998). The Disposition Effect in Securities Trading: An Experimental Analysis. *Journal of Economic Behaviour and Organisation. 33*:197-184.

Weber, M., & Welfens, F., (2006). An individual level analysis of the disposition effect: empirical and experimental evidence. Working paper, University of Mannheim.

Wit, de I. (2010). International Diversification Strategies for Direct Real Estate. *The Journal of Real Estate Finance and Economics*, *41*(4), 433–457. https://doi.org/10.1007/s11146-009-9173-3

Wong, P. (2017). Foreign Real Estate Investment and the Australian Residential Property Market: A Study on Chinese Investors. *International Journal of Economics and Management Engineering, 11(6),* 1561-1570

Wong, P. Y. (2016). *The Drivers of Overseas Investment in the Australian Residential Property Market*. 22nd Annual Pacific-Rim Real Estate Society Conference Sunshine Coast Retrieved from: http://www.prres.net/Proceedings/..%5CPapers%5CWong_Drivers_of_oversears_investment.pdf

World Wealth Report. (2018). Capgemini. Retrieved from: https://www.capgemini.com/ch-de/wp-content/uploads/sites/26/2018/06/Capgemini-World-Wealth-Report-19.pdf

Yates, J. (2010). Protecting Housing and Mortgage Markets in Times of Crisis: What Can Be Learned from the Australian Expreience. *Paper na konferenci Housing, The next,* 29(2), 361-382. https://doi:10.1007/s10901-013-9385-y

Yates, J. (2015). Trends in Home Ownership: Causes, Consequences and Solutions. *Submission to the House of Rep Standing Committee on Economics Inquiry into Home Ownership*, June

Ziegler, M. (2012). Why Wall Street Needs More Women Traders – a Conversation with Hedge Fund Boss Lex van Dam. Forbes Magazine. Retrieved from http://www.forbes.com

Appendices

5.3 Appendix A Appreciation Rates for All Property Types

Table A0.1 *Appreciation Rates for All Property Types*

QTR	2B Units	3B Units	3B Houses	4B Houses
Quarter 2-2001	3.51%	4.68%	0.58%	-1.06%
Quarter 3-2001	3.78%	6.95%	2.19%	-1.69%
Quarter 4-2001	3.06%	2.89%	4.65%	-5.03%
Quarter 1-2002	6.22%	4.63%	5.69%	2.87%
Quarter 2-2002	5.29%	3.59%	6.06%	8.81%
Quarter 3-2002	6.24%	0.90%	7.47%	9.50%
Quarter 4-2002	7.52%	4.01%	5.88%	18.71%
Quarter 1-2003	4.61%	4.70%	8.59%	12.73%
Quarter 2-2003	7.60%	4.51%	11.16%	5.92%
Quarter 3-2003	7.62%	9.37%	8.45%	10.31%
Quarter 4-2003	5.79%	7.00%	8.23%	0.47%
Quarter 1-2004	6.90%	7.23%	6.24%	0.46%
Quarter 2-2004	4.57%	8.44%	0.85%	3.01%
Quarter 3-2004	3.02%	6.47%	3.40%	-1.77%
Quarter 4-2004	3.03%	6.09%	0.75%	2.65%
Quarter 1-2005	1.07%	3.47%	-0.28%	2.26%
Quarter 2-2005	0.69%	5.27%	2.40%	4.60%
Quarter 3-2005	1.62%	0.54%	0.42%	4.01%
Quarter 4-2005	1.36%	0.47%	-2.37%	1.34%
Quarter 1-2006	0.66%	7.34%	0.73%	2.16%
Quarter 2-2006	1.79%	3.27%	2.56%	-0.78%
Quarter 3-2006	0.31%	3.60%	4.17%	0.57%
Quarter 4-2006	3.81%	13.89%	2.09%	0.95%
Quarter 1-2007	4.48%	5.22%	6.48%	3.05%
Quarter 2-2007	1.71%	9.86%	5.62%	4.81%
Quarter 3-2007	3.42%	12.26%	7.00%	8.27%
Quarter 4-2007	0.66%	1.36%	7.77%	11.62%
Quarter 1-2008	0.95%	5.03%	2.99%	17.11%
Quarter 2-2008	4.00%	-1.22%	1.69%	15.94%
Quarter 3-2008	2.38%	-0.74%	-1.39%	10.78%
Quarter 4-2008	0.14%	-2.27%	-0.78%	6.68%
Quarter 1-2009	0.26%	8.30%	0.27%	-1.65%
Quarter 2-2009	-2.54%	8.94%	1.29%	-6.03%
Quarter 3-2009	-1.01%	8.12%	3.00%	1.45%

Quarter 4-2009	1.24%	14.09%	1.36%	0.26%
Quarter 1-2010	-0.22%	-0.70%	0.07%	14.68%
Quarter 2-2010	1.40%	2.09%	4.56%	14.29%
Quarter 3-2010	0.14%	2.81%	1.60%	25.48%
Quarter 4-2010	-0.85%	0.88%	2.40%	30.02%
Quarter 1-2011	-0.18%	1.54%	6.35%	12.74%
Quarter 2-2011	-2.62%	-0.91%	3.24%	13.09%
Quarter 3-2011	-1.50%	-1.81%	3.53%	-3.36%
Quarter 4-2011	-1.50%	-1.72%	0.71%	-0.85%
Quarter 1-2012	1.37%	-1.12%	2.84%	-2.00%
Quarter 2-2012	1.24%	-0.19%	-0.96%	6.65%
Quarter 3-2012	-0.55%	3.06%	3.13%	5.93%
Quarter 4-2012	1.16%	1.15%	4.79%	5.21%
Quarter 1-2013	-1.95%	2.64%	-0.95%	7.17%
Quarter 2-2013	-0.13%	3.68%	3.45%	1.15%
Quarter 3-2013	0.36%	-0.85%	-0.11%	2.86%
Quarter 4-2013	-0.67%	0.44%	0.71%	-1.03%
Quarter 1-2014	0.43%	-0.80%	1.07%	4.22%
Quarter 2-2014	0.98%	-0.06%	1.57%	7.17%
Quarter 3-2014	-0.22%	1.95%	1.64%	3.51%
Quarter 4-2014	0.56%	-0.23%	3.41%	4.00%
Quarter 1-2015	0.83%	-0.94%	3.41%	1.95%
Quarter 2-2015	0.25%	2.83%	0.18%	2.69%
Quarter 3-2015	2.42%	0.98%	1.52%	2.65%
Quarter 4-2015	2.12%	3.27%	1.78%	5.35%
Quarter 1-2016	1.11%	5.15%	0.65%	2.79%
Quarter 2-2016	2.25%	1.07%	2.88%	-1.12%
Quarter 3-2016	1.56%	1.58%	2.49%	9.70%
Quarter 4-2016	0.95%	2.67%	7.18%	8.07%
Quarter 1-2017	2.65%	2.79%	4.89%	6.33%
Quarter 2-2017	0.48%	0.39%	5.35%	6.84%
Quarter 3-2017	1.34%	0.50%	4.30%	-0.69%
Quarter 4-2017	3.25%	-0.46%	-0.01%	0.68%
Quarter 1-2018	1.73%	0.17%	1.14%	4.18%
Quarter 2-2018	2.49%	0.77%	2.65%	1.95%

5.4 Appendix B Examples of Measuring IAR

Table B6.2 shows an example estimate of parameters as a percentage of dwelling price used to calculate the IAR for an *owner occupier* who purchased a property in March 2005 for $500,000 and holding it for 12 months. The annual rent for a similar property is $26,000.

Table B0.2 *UC parameters for IAR calculation of a 4 Bedroom House Owners*

Real Interest Rate **Monthly variable mortgage rate *less* annual housing inflation rate,** $(\boldsymbol{h - cpi})$	**r**	**3.21%**
Running Costs **Annual capital works maintenance and other running costs *plus* opportunity cost,** $\boldsymbol{(m + O)}$	c	1.47%
Purchase & Sale Transaction Costs **Conveyance *plus* Stamp duty *plus* Sales Commission divide average of ten years** $\boldsymbol{(c + SD + SC)}$ **/ 10**	t	0.77%
Depreciation $\boldsymbol{(d)}$	d	1.06%
Expected Appreciation (a)	a	0.74%
Total UC (r + c + t + d - a)		5.77%
Imputed-to-Actual Rent Ratio (P*UC) / Rent = (500,000*5.77%) / 26,000 = 1.1 ***This indicates a slight overvaluation of the property, where the owner occupier would be paying $28,850 to own and live in it for 12 months, which it could have been rented for $26,000.***		

Table B2 shows an example estimate of parameters as a percentage of dwelling price used to calculate the IAR for a QLD investor who purchased a property in May 2016 for $350,000 and holding it for 12 months. The annual rent for a similar property is $19,240.

Table B0.3 *UC parameters for IAR calculation of a 4 Bedroom House Owner*

Real Interest Rate **Monthly variable mortgage rate *less* annual housing inflation rate, $(h - cpi)$**	**r**	**3.75%**
Running Costs **Annual capital works maintenance and other running costs *plus* opportunity cost, $(m + O)$**	c	1.20%
Purchase & Sale Transaction Costs **Conveyance *plus* Stamp duty *plus* Sales Commission *plus* Tax *divide* average of ten years $(c + SD + SC + Tax)$ / 10**	t	0.82%
Depreciation (d)	d	1.06%
Expected Appreciation (a)	a	1.75%
Total UC (r + c + t + d - a)		5.08%
Imputed-to-Actual Rent Ratio (P*UC) / Rent = (350,000*5.08%) / 19,240 = 0.92 ***This indicates an undervaluation of the property, where the investor paid $17,780 to own a property for 12 months, while earning some capital gains as it was being rented at $19,240.***		

Table B6.4 shows an example estimate of parameters as a percentage of dwelling price used to calculate the IAR for a foreign investor who purchased a property in January 2001 for $244,000 and holding it for 12 months. The annual rent for a similar property is $12,740.

Table B0.4 *UC parameters for IAR calculation of a 4 Bedroom House Owner*

Real Interest Rate **Monthly variable mortgage rate *less* annual housing inflation rate, ($h - cpi$)**	**r**	**6.84%**
Running Costs **Annual capital works maintenance and other running costs *plus* opportunity cost, ($m + O$)**	c	3.11%
Purchase & Sale Transaction Costs **Conveyance *plus* Stamp duty *plus* Sales Commission *plus* FIRB *plus* AFAD *plus* Tax *divide* average of ten years,** **($c + SD + SC + FIRB + AFAD + Tax$) / 10**	t	0.96%
Depreciation (d)	d	1.06%
Expected Appreciation (a)	a	11.92%
Total UC (r + c + t + d - a)		0.05%
Imputed-to-Actual Rent Ratio (P*UC) / Rent = (244,000*0.05) / 12,740 = 0.95 ***This indicates an undervaluation of the property, where the investor paid $12,200 to own a property for 12 months, while earning some capital gains as it was being rented at $12,740.***		

NB: All purchase and sale transaction costs in the calculations above are amortised over ten years, the median tenure of home ownership as per Fox and Tulip (2014).