

Five Key Assumptions for the NAHC Shared Equity Finance Model

Sub-Project Leaders: Dr Benjamin Liu, Professor George Earl and Dr Akihiro Omura

12 September 2017

Members from Griffith

Professor Eduardo Roca, Dr Benjamin Liu, Dr Akihiro Omura, Dr Nirodha Jayawardena



Table of Contents

Griffith university foreword	i
Executive summary.....	ii
Preface.....	iv
1. Price of houses and associated variables.....	1
1.1. Introduction	1
1.2. Identifying the driving factors.....	1
1.3. Our view on the real estate market	5
2. Delinquency and default rates	10
2.1. Introduction	9
2.2. Our view on delinquency rate.....	9
2.3. Our view on default rate.....	11
3. Churn rate assumption (exit rate of the program participants).....	17
3.1. Introduction	17
3.2. Our view on churn rate	17
4. Conclusion	21
References.....	23
Appendix	24

List of Tables

Table 1: Review summary	iii
Table 2: Effect of the Macro-Economic Factors on the House Price	8
Table 3: Simulation of the average annual house price growth rate over 30 years using data period between 1970 – 2014	8

List of Figures

Figure 1: Melbourne house price forecast	6
Figure 2: Forecasts of key Victorian macroeconomic variables	7
Figure 3: Housing stock, population growth and real wage growth forecasts (Victoria)	7
Figure 4: The proportion of households with overdue loans	10
Figure 5: Factors leading to delinquency and default using Melbourne data	14
Figure 6: Factors leading to delinquency and default using Victoria data	15
Figure 7: Years before home owners refinance their loans	18
Figure 8: Expected time to pay off loans	19

GRIFFITH UNIVERSITY Foreword

Introduction of innovative funding and financing schemes are crucial to cope up with the rising demand of current Australian housing affordability crisis.

“Funding is the ultimate source of payment for infrastructure. Put simply, the option for funding public infrastructure are user charges, such as tolls on roads or fares on public transport, or government revenue, raised via taxation or asset sales. Most funding for transport infrastructure comes from the community through general taxation.

Financing is the method of obtaining the money to pay the upfront investment costs of the infrastructure. Investments in public infrastructure can be financed from existing government revenues, government borrowing, or public finance. There is an enormous variety of financial instruments that make use of debt, equity and hybrids of the two.

Obtaining financing does not preclude the need for funding. That is, money can only be borrowed if there will be some way to pay it back in the future (Terrill, 2007).”

National Affordable Housing Consortium (NAHC) together with BuyAssist developed a financial model to examine feasibility of the shared equity housing project in the State of Victoria.

Extending from the previously prepared work named “Review and Audit of NAHC Financial Models”, this report examines fairness of assumptions for some key variables used in the financial model of NAHC. Those are;

- I. Change in the price of houses and some variables including household income which influence such a price
- II. Mortgage default and delinquency rates
- III. Churn rate

Executive Summary

The Griffith University team has prepared this report to document the results of its review of five key assumptions made in the financial model on the shared equity affordable housing project prepared by the National Affordable Housing Consortium.

Scope

This project reviews assumptions of the four key variables used in the spreadsheet model, titled “SEHO Finance Model 1000 - Griffith University.xlsx”, prepared by the National Affordable Housing Consortium. The key variables are the churn rate, the default rate, the household income and the house price.

The model currently assumes that:

- (1) no owner exits from the scheme for the first five years and during the subsequent twenty years, the equal number of owners who purchased the property in the same year exit from the scheme (churn rate = 5%).
- (2) the default rate of the project is equal to 0.6%.
- (3) no assumption is made on the delinquency rate.
- (4) no assumption is made on the household income.
- (5) no change in the property price.

To validate the assumptions related to prices and household income, the Griffith team has surveyed the contemporary macroeconomic projections prepared by highly regarded research institutes and implemented statistical techniques (bootstrapping) to simulate possible future outcomes. For other tasks, the Griffith team surveyed scholarly articles, and analysed the publicly available information and the data obtained from the Household Income and Labour Demographics in Australia (HILDA).

Summary of findings

From our view, the assumptions used in the finance model are relatively conservative. For example, in relation to the house prices in the region, while there may be some short-term correction in a near-future, projected macroeconomic conditions support upside potential in a longer-term. This includes projected trend of the average household income. This is a similar case for both default and churn rates. The expected default rate determined by the frequency of the private mortgage insurance being claimed appears to be well below 0.6 per cent and it also appears that the project participants would start exiting from the scheme earlier than the project assumes. The summary of the analysis is presented in Table 1 below.

Table 1: Review summary

Variables	Assumptions	Methods used to validate assumption	Findings and Comments
House price	Zero change	Survey contemporaneous market view on the property market and the key variables identified through reviewing literature. Conduct simulations using Bootstrapping technique.	The assumption appears conservative (the house price growth can be positive over long-term).
Household income	No assumption is made	Survey contemporaneous view on the variable by the state of Victoria.	Household income is expected to take an upward trend in a foreseeable future. This would support our findings about the house price.
Default rate	0.60%	Analysed the data obtained from HILDA. Conduct survey on the key variables affecting the default rate and on a proxy which represents such a rate.	The assumption appears conservative (the project may be able to allocate a smaller default rate).
Delinquency rate	No assumption is made	Analysed the data obtained from HILDA. Conduct survey on the key variables affecting the default rate.	The proportion of households with overdue loans can be up to 3 per cent; however, the value changes depending on remaining length of repayment.
Churn rate	Zero for first 5 years, then 5% per year	Analysed the data obtained from HILDA. Conduct survey on the key variables affecting the default rate.	The assumption of the project (especially for the first 5 years) appears relatively low.

Preface

The Griffith University team has prepared this report to document the results of its review of some key assumptions used in the financial model on the shared equity affordable housing project prepared by the National Affordable Housing Consortium. We acknowledge that the NAHC is interested in separating the analysis outcomes into first home buyers and non-first home buyers. However, as a limitation of the information, the analysis is conducted on the overall home owners. According to a survey conducted by the Australian Bureau of Statistics, the age group of 25 – 34 is the largest group of home buyers whereas 35 – 44 for changeover buyers.¹ This demographic factor may have influence on our results such as on the examination outcome of the churn rate. To be more specific, another ABS survey indicates that younger people are more mobile than the older generations.² For this reason, the churn rate may be higher in the early years of the program when the first home owners are isolated.

This report is structured as follows. **Section 1** presents the results on the examination of assumptions with regards to house prices and other associated variables. **Section 2** examines the delinquency and default rates assumptions used in the finance model. **Section 3** examines the pace of project participants leaving the scheme. **Section 4** concludes.

¹ The housing occupancy and costs survey (the ABS): Retrieved on 11th of September 2017.
<http://www.abs.gov.au/ausstats/abs@.nsf/Lookup/by%20Subject/4130.0~2013-14~Main%20Features~First%20Home%20Buyers~7>

²The housing occupancy and costs survey (the ABS): Retrieved on 11th of September 2017.
<http://www.abs.gov.au/ausstats/abs@.nsf/Lookup/by%20Subject/4130.0~2013-14~Main%20Features~Housing%20Mobility~10003>

1. Price of houses and associated variables

1.1. Introduction:

This section explores possible drivers of housing price through surveying both industrial and academic literature. In addition, for the target area of the shared equity affordable housing project of NAHC, we survey the housing price forecast made by reputable research institutes as well as obtain our own forecasts using bootstrapping. We validated the projected figures by analysing the projected trend of the important macroeconomic variables. We have identified six macroeconomic variables, namely, the gross production growth (GDP and GSP), inflation rate, population growth, unemployment rate, interest rate and income level. All in all, it appears that the assumption of zero growth in the house prices during the current shared equity program appears conservative.

1.2. Identifying the driving factors

Based on the survey of scholarly literature we explore the plausible macro-economic factors which influence the residential property price growth in Australia especially the State of Victoria. Rahman (2010) analyse the Australian housing market, and investigate the causes and effects of rising house price from socio-economic point of view. These forces can be divided into three categories: short term/cyclical, institutional, and long term/ fundamental. The short-term factors include lower interest rates, high investment demand and positive economic climate. The institutional factors include financial deregulation and innovation, land supply and the land-use planning system, and government taxes, levies and charges. The long term/fundamental factors are population growth, economic growth and increased wealth effect.

Kohler and Van Der Merwe (2015) further showed that main drivers of housing price growth in Australia have been changing over time. The authors found that while the inflation rate and the debt-to-income ratio of households were the main drivers from 1980s to the mid-2000s, the recent hike in the housing price in Australia was primarily contributed by the strong population growth. The population level was also used as one of the key variables to determine the house prices in Sydney and Melbourne by the well-regarded research house namely KPMG Economics (2017).

Observing studies focusing on the real estate markets in other countries, after investigating the 1990s British housing market, Meen and Mark (1998) conclude that the main factors influencing the housing market are: income, interest rates, credit availability, tax structure, housing supply and demographic structure. Jud and Winkler (1999) find that the population, real income real construction fee and real interest rate have significant effects on housing price after analysing 130 American cities housing price from 1984 to 1998. Zhang and Li (2001) analyse the housing price of Beijing. They find that the real construction fee and real local GDP have the significant effects on housing price change. When the GDP growth rate slows down, housing price needs to be under control. The relationship between GDP, income and the housing market is also discussed in many studies (Davis and Heathcote, 2003; Goodhart and Hofmann, 2008). Mikhed and Zemcik (2009) state that in the USA, a decline in home prices affected negatively the consumption and GDP. Adams and Füss (2010) noticed that the GDP growth has an increasing impact on the housing market. However, Madsen (2012) indicates that in the long term this connection becomes weak.

Additionally, demographic factors such as net population growth (including migration), annual family income (including salaries, income via running business, property income like rent, dividends and interest income), and transferred payment from the government are likely to affect the residential property prices. Mankiw and Weil (1989) are

the first to study the relationship between demographics and the housing market. They state that a decrease in the number of births or an increase in the average age of population has a strong influence on demand and on the housing prices.

Xu (2007) state that the family disposal income will keep pace with the movement of housing price. The expected relationship between disposable income and house price is positive. But when the increasing rate of housing price is far beyond the rise of family income, there must be a capital bubble existed with this market. Moreover, in an economy when the wages are on the rise and unemployment levels are low, consumer confidence is at its peak and people are willing to spend their money. Often in this type of fruitful economic environment people are more willing to take on debt and make large financial commitments such as buying property. This in turn means an increase in demand that pushes property values up. The opposite to this argument is also true.³

Another important determinant is the government taxes. According to Leung (2004) there are two main reasons why government taxes residential property. Firstly, because of the high market value of the housing stock and secondly because of the immobility and durability of housing that makes it difficult to avoid taxation. However, the taxation policy in many countries used to be favourable for homeowners. Most Eurozone governments encourage housing investments either by subsidizing or through tax deductions (Andrews, 2010). In the long-term this course will end up with higher housing stock and increased price levels (Order Van, 2007).

In the Australian context, a great example of how government policy can change the supply/demand balance in housing markets is the First Home Owners' Grant. With the introduction of the grant at the beginning of this decade it can be seen as the start of one of the largest property booms in Australian history (the grant was not solely responsible for the

³ Wealth and Property blogs, "13 factors that influence property markets." Retrieved 5 September 2017, from <http://www.wealthandproperty.com.au/13-factors-that-influence-property-markets/>

boom of course). The enticement of ‘free’ money was too much for some people and many new homebuyers entered the market all at once, intensifying demand levels substantially. When the Federal Government doubled the incentive in 2008/09 (First Home Boost), the more affordable sectors of the Australian housing markets enjoy a mini-boom as thousands of young house hunters took advantage of the handout to live their own Great Australian Dream. It is worth noting that many people have a lot of their household wealth tied up in property. This is why the government involvement is important to help the property market with policy.

Residential loans also play an important role in determining residential property prices. According to Case et al (2000), any decrease in the house price level reduces the bank capital, limits lending and finally it confines the investments in the housing sector. Adams and Füss (2010) argue that any increase in the house prices raises the bank lending as high as greater is the ratio of loan to the value of the collateral (Loan to Value Ratio). Similarly, when the interest rate is rising, the cost of borrowing is also rising and the potential buyers are getting discouraged. As a result, housing demand is falling. On the contrary, when the interest rates decrease, e.g., because of money supply growth, then the user cost of housing is going down and the demand for housing increases. Andrews (2010) argues that the correlation between house prices and the loan interest rate is negative and depends on the degree of competition in the banking sector.

Inflation is another identified factor in determining residential property prices. Andrews (2010) detect upward trends of housing prices after change of inflation in both negative and positive directions. On the other hand, Nielsen and Sorensen (1994) find that an increasing inflation motivates housing investment because of the decreasing real user cost after taxes.

Employment and household income are important factors. Schnure (2005) concludes that a percentage increase of the unemployment rate by one unit leads to housing price decrease of 1 per cent. Blanchflower and Oswald (2013) connect the labour mobility and the home ownership rate and find evidence of negative externalities of the housing market on the labour market. They argue that a homeownership rate increase affects labour mobility and leads to an unemployment rise. Apart from the macroeconomic conditions discussed above, a given residential housing property price is also affected by various micro-economic conditions such as; location to amenities, council planning regulation, block orientation and views, architectural style and floor plan etc.

1.3. Our view on the real estate market

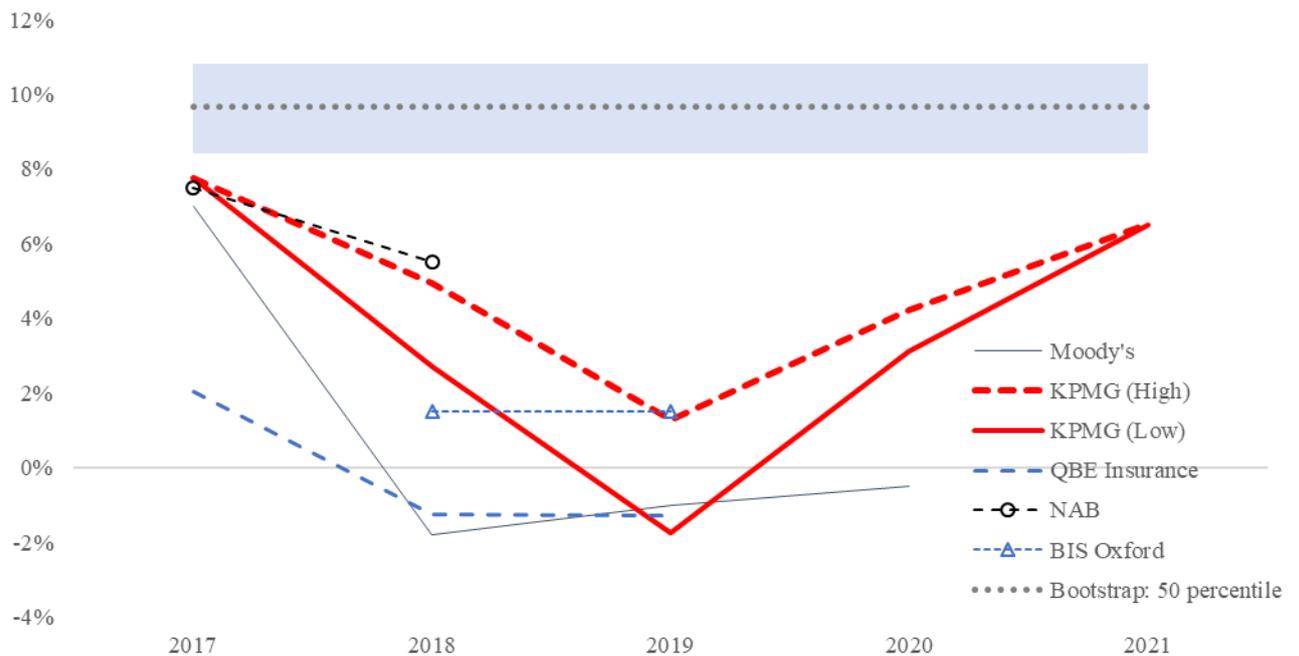
As shown in Figure 1, we have identified the house price forecasts for Melbourne. The projections are made by five well-regarded research houses. The projected growth rates over next four years are ranged from approximately -2 to + 6 per cent. In terms of the trend, it appears that most of the forecasts are expecting slowdown in the real estate market in 2018. This is consistent with the forecasts of a number of macroeconomic measures for Victoria presented in Figure 2 (projections for border macroeconomic variables are presented in Table 2). The Gross State Product and the population growth rates of Victoria are expected to decline in 2018. Nevertheless, as the wage level in the state is expected to rise even in the real term, this may offset some of the negative macroeconomic factors and for this reason, as 67 per cent of the predictions indicate, the house price may be able to maintain its growth in 2018 (e.g. 2 to 5 per cent).

In 2019 onwards, as KPMG Economics argues, there may be a short-term correction in the house price in Melbourne due to recent hike in the price. As 60 per cent of the predictions indicate, there may be a slight fall in the price in 2019. However, consistent with

the projection of KPMG Economics, as the housing stock growth rate is expected to remain slower than that of the population growth rate (Figure 3), it would be reasonable to expect the house price in the area to advance again in the subsequent years. As Figure 3 shows, the real wage after considering the inflation rate in the state is expected to continue increasing and increase in the nominal wage is expected to surpass the nominal interest rate, the affordability of houses may not substantially change in a foreseeable future.

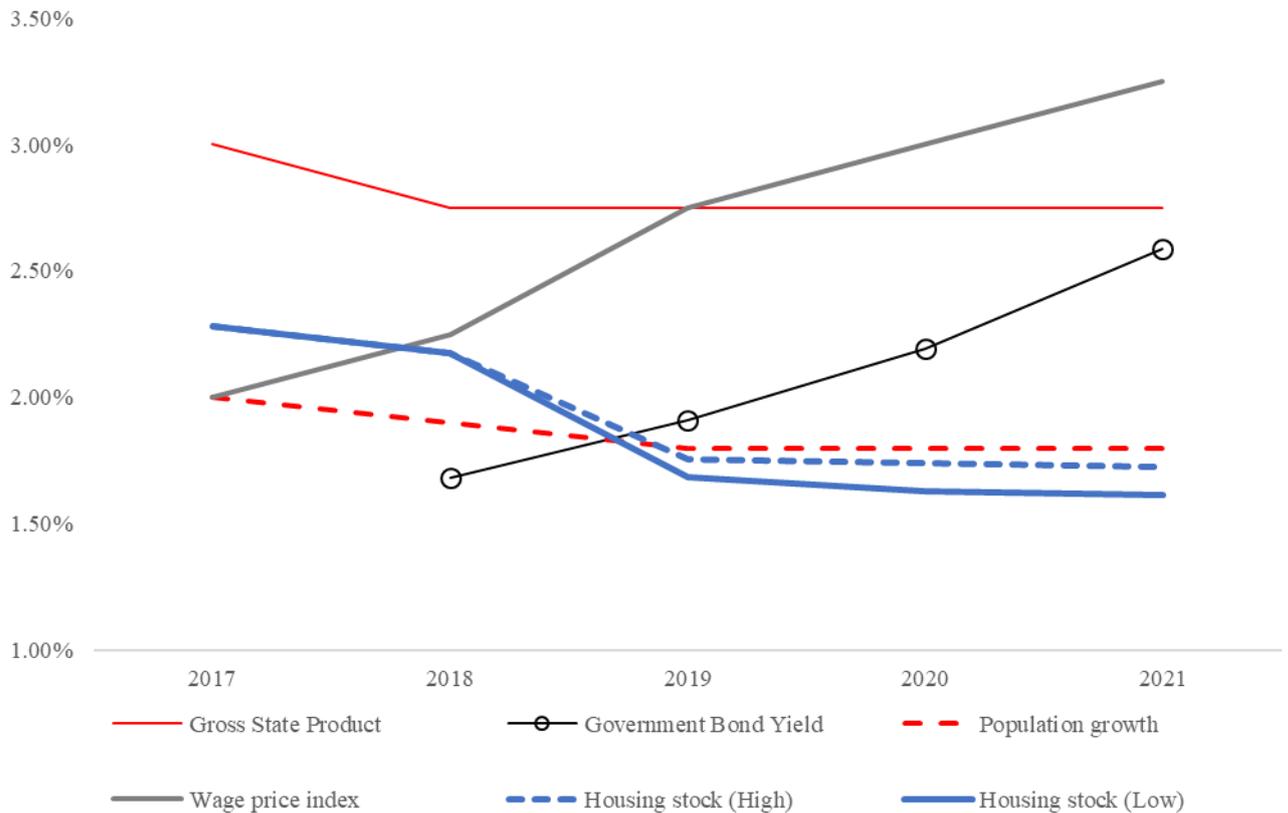
In addition, by using the historical year-on-year change in the median house price in the region between 1970 to 2014, we simulated possible outcome of the average change in the house prices in Melbourne and Victoria over next 30 years using the bootstrapping technique (Efron,1979, Lee and Ulla, 2001). Detail of bootstrapping technique is explained in Appendix. The results, shown in Table 3 also supports the projection made by KPMG Economics about recovery in the house price after some short-term corrections in the near future. All in all, the current assumption of zero growth in the house price over the life of the shared equity housing project may be conservative.

Figure 1: Melbourne house price forecast



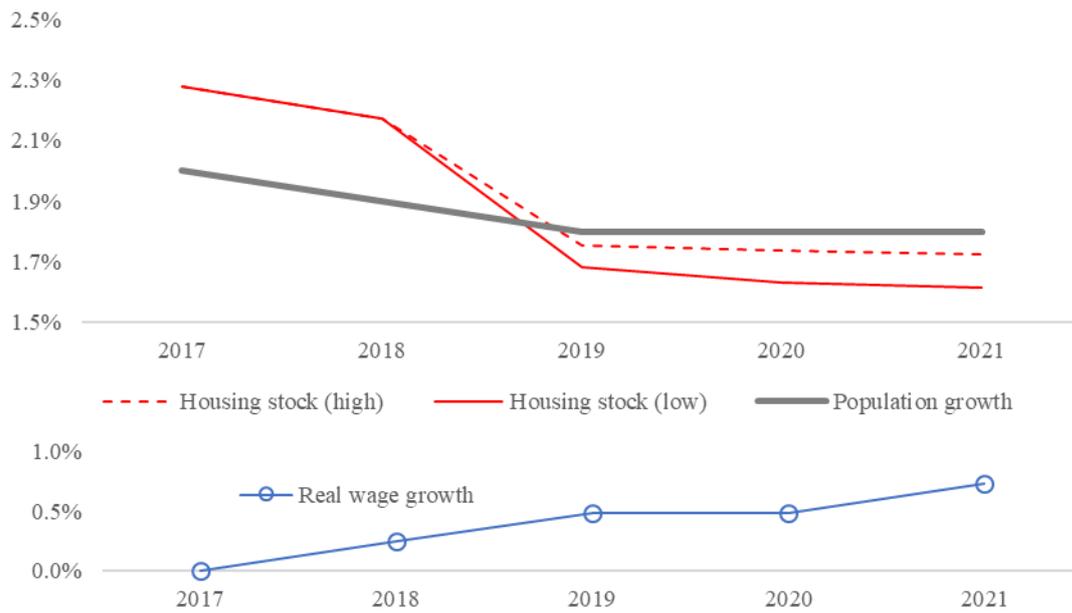
Note: Moody's forecast is as of April 2017, KPMG forecast is as of June 2017, QBE Insurance forecast is as of October 2016, NAB forecast is as of July 2017, BIS Oxford forecast is as of June 2017, Bootstrap: 50 percentile represents the median of the average returns over 30 years forecasted by the trimmed bootstrapping technique (based on 10,000 simulations). The shaded area represents 25 and 75 percentile of those average returns.

Figure 2: Forecasts of key Victorian macroeconomic variables



Note: Gross State Product, Wage index and Population growth forecasts are from the State of Victoria, the interest rate forecast is calculated from the Australian Government Bond yield curve obtained from Bloomberg, the housing stock forecasts are from KPMG Economics.

Figure 3: Housing stock, population growth and real wage growth forecasts (Victoria)



Note: Wage index and Population growth forecasts are from the State of Victoria, and the housing stock forecasts are from KPMG Economics.

Table 2: Effect of the Macro-Economic Factors on the House Price

	2017	2018	2019	2020	2021	2022
GDP growth (constant price)	3.12%	3.00%	2.95%	2.84%	2.83%	2.69%
Gross State Product (Victoria, real)	3.00%	2.75%	2.75%	2.75%	2.75%	-
Inflation rate	2.02%	2.60%	2.52%	2.52%	2.52%	2.42%
Inflation rate (CPI of Melbourne)	2.00%	2.00%	2.25%	2.50%	2.50%	-
Population growth	1.42%	1.42%	1.42%	1.42%	1.42%	1.42%
Population growth (Victoria)	2.00%	1.90%	1.80%	1.80%	1.80%	-
Unemployment rate (Victoria)	5.75%	5.50%	5.50%	5.50%	5.50%	-
Interest rate	-	1.68%	1.91%	2.19%	2.59%	2.62%
Wage price index (Victoria)	2.00%	2.25%	2.75%	3.00%	3.25%	-
Housing stock (Victoria): High	2.28%	2.17%	1.75%	1.74%	1.72%	-
Housing stock (Victoria): Low	2.28%	2.17%	1.68%	1.63%	1.61%	-

Note: GDP, inflation and population growth are from the IMF (2017 April), Gross State Product, Inflation rate for Melbourne and population growth, unemployment rate and wage price index for Victoria are from the Victorian Government. The forecasts of the Victorian Government are in the financial year basis and in the table, the values for each are inserted based on which year the financial year end falls. The interest rate forecast is calculated from the Australian Government Bond yield curve obtained from Bloomberg (retrieved on 7th of September 2017).

Table 3: Simulation of the average annual house price growth rate over 30 years using data period between 1970 - 2014

			Trimmed Bootstrap		Bootstrap		
			Melbourne	Victoria	Melbourne	Victoria	
Forecast	50 percentile			9.7%	9.5%	9.7%	9.6%
	25 percentiles	Lower		8.4%	8.2%	8.5%	8.5%
		Upper		10.8%	10.8%	10.8%	10.8%

Note: Figures are the median of the annual average figures estimated through 10,000 simulations. The simulations methods used in this analysis are Trimmed Bootstrap and the standard Bootstrap explained in Appendix. The simulations are conducted using the annual change in the median house price in the region over specified period.

2. Delinquency and default rates

2.1. Introduction:

This section examines the delinquency and default rates assumptions can be used in the finance model developed by NAHC. The current finance model does not have assumption about the delinquency rate. Based on the information obtained from the HILDA, it is found that the delinquency rate between 1985 and 2014 is on average 1.4 per cent and the curve takes an inversed U-shaped trend throughout the life of the loan.

In relation to the default rate, the finance model assumes 0.6 per cent. Based on the high loan-to-value ratio (LVR) borrowers' default rate, it is reasonable to say that the assumption has sufficiently taken possible credit risk into consideration.

2.2. Our view on delinquency rate:

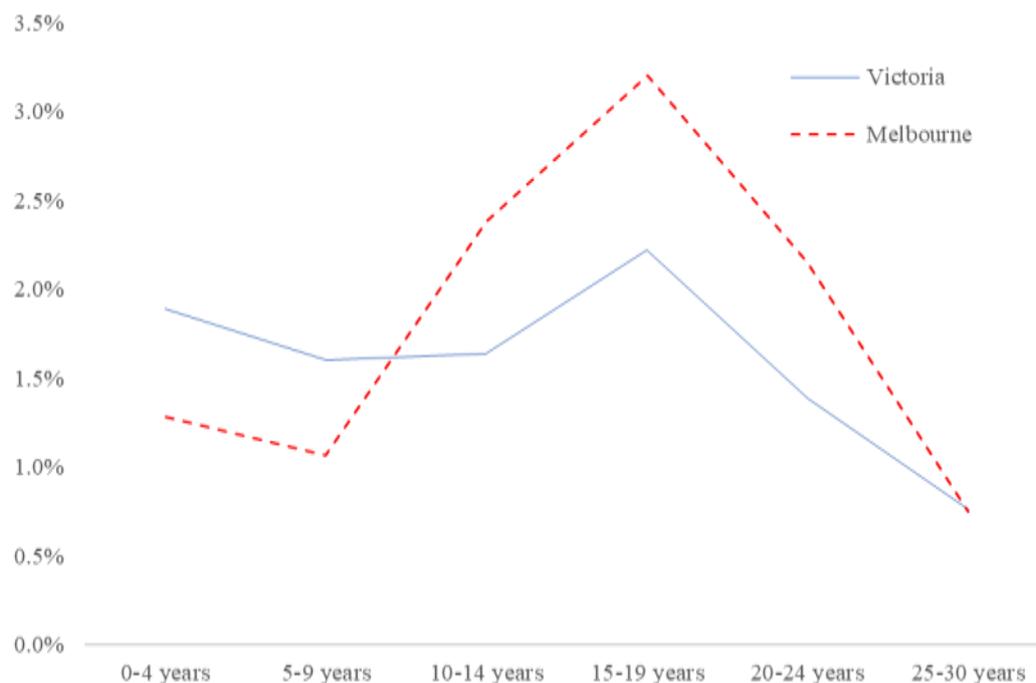
The delinquency rate is one of the important factor in the finance model of the shared equity as it is directly related to the default rate of home owners as well as it affects one of the fees earned by BuyAssist. This is supported by the fact that banks are required to allocate provision for loan losses based on the duration of arrears.⁴ This report obtains the relevant information from HILDA. To be more specific, the database surveys the households in Australia whether they are behind schedule in paying off the home loans. By dividing the number of households in Victoria with overdue home loans by the overall sample size, it is possible to estimate the delinquency rate in the state. According to the information gathered in 2014, one point four (1.4) per cent of the households in the State of Victoria who purchased a house in the period between 1985 and 2014 answered that they have overdue home loans.

⁴ 5 per cent of the loan value needs to be recognised as the provision for loan losses if a loan is 90 days past due and 20 per cent for 1 year or longer.

This is consistent with the information provided by Moody's⁵ where the 30 days plus delinquency rate between 2010 and 2016 is shown to be 1.3 per cent.

By sorting the households by the year of purchase of the house, it is possible to obtain information regarding the change in the delinquency rate throughout the life of the mortgage loans (assuming that mortgage loans are obtained at the time houses being purchased). The results are presented in Figure 4. This analysis shows that for both overall Victoria and the city of Melbourne, the proportion of households with overdue loans takes a reversed U-shaped curve through the life of the loans. In particular, the figures for Victoria (Melbourne) are 1.6 to 1.9 per cent (1.1 to 2.4 per cent) for up to 14 years after the purchase on the house but the figure increases to 2.2 per cent (3.2 per cent) for the period of 15 to 20 years. Then the proportion decreases to less than 1 per cent for both the State of Victoria and the city of Melbourne.

Figure 4: The proportion of households with overdue loans



⁵ Moody's Investor Services, "Mortgage Delinquency Map: Home Loan Arrears Rising in All Australian States." Retrieved 7 September 2017, from <https://www.macrobusiness.com.au/wp-content/uploads/2017/04/Report-Mortgage-delinquency-map-home-loan-arrears-rising-in-all-Australian-states-Apr2017-1.pdf>

Note: the years for the X-axis indicate how long ago the house was purchased at the time the survey was conducted by HILDA in 2014.

2.3. Our view on default rate:

The default rate of mortgage loan can be estimated by observing the frequency of PMI (Private Mortgage Insurance) or LMI (Lenders' Mortgage Insurance) being claimed. Lenders usually request home loan borrowers to acquire a PMI or LMI when the loan-to-value ratio (LVR) is higher than 80 per cent as it is known that the default risk increases exponentially as the LVR goes beyond such a level. The PMI or LMI policy is claimable when the borrower default and for this reason, the claim frequency of the PMI or LMI can be used as a proxy for the default rate. In addition, the shared equity housing project of NAHC is designed to inject NAHC's fund of around 25 per cent of the house value to support the participating households to purchase a house. Under the scheme, the remaining fund is expected to be borrowed by the owners. Considering this, the LVR of the participants from banks perspective exceeds 80 per cent, and therefore the demographics of the participants are expected to be similar to that of the home owners who are required to acquire a PMI or LMI. According to the QBE insurance, the LMI claim frequency in Victoria between 2008 and 2012 ranged between approximately 0.025 and 0.1 per cent.⁶ Since the NAHC allocates 0.6 per cent for the provision of default, such assumption is relatively conservative.

The actual default rate; however, is affected by various factors, the remainder of this report explores possible factors, based on the scholarly literature, which cause mortgage loan borrowers to default. Berry, Dalton, and Nelson (2010) conduct a survey on mortgage stress during October 2008 in Melbourne. They identified the survey cohort generally had a high initial LVRs, varying positively with income, paid relatively high mortgage interest rates,

⁶ QBE Lenders' Mortgage Insurance (QBE LMI), Retrieved 7 September 2017, from <https://www.qbelmi.com/Uploads/Documents/22548007-4424-45f9-b6d8-85d97061c0ac.pdf>

began experiencing difficulties more than 1 year after taking on their mortgages (more than a third of respondents fell into arrears less than a year into their loans), and are more likely that home owners borrow from sources other than the banks (more than a third of the sample). By 2003, 80% of defaulters had borrowed from non-bank institutions (Berry et al.,2010).

Furthermore, Berry et al. (2010) highlight several triggers for these repayment difficulties, out of the triggers, the ‘loss of work and income’, closely followed by ‘too much debt’ and ‘interest rates too high’ stand out. However, ‘illness or accident in the household’, ‘relationship breakdown’ and ‘underestimated costs of repayments and other housing costs’ are also significant. In many of the cases, particularly those interviewed, the descent into mortgage default was triggered by a mutually reinforcing combination of factors. The main initial actions and impacts of failing to meet these mortgage repayments, were identified as:

- Households took on more expensive debt by using their credit cards
- Households took on more debt by borrowing from family and/or friends
- Household members increased their level of labour market participation, thereby earning more income
- Households refinanced their dwellings with new loans as they sought to strike a new affordable balance between income and repayments
- Households took a number of ‘other’ actions, including significant use of superannuation⁷ hardship provisions (allowing the use of superannuation savings to prevent the contributor’s home from being sold by the lender who holds the mortgage) and bankruptcy (this can be a consequence of mortgage default and can also be a way of avoiding having to access superannuation savings).

⁷ Under the Superannuation Industry (Supervision) Regulations 1994 the Australian Prudential Regulation Authority (APRA) can approve the early release of superannuation benefits on specified compassionate grounds. One of these grounds is where a person with superannuation savings is faced with ‘a forced sale of an applicant’s principal place of residence by their mortgagor’ (APRA, 2008: p. 20 cited in Berry et al., 2010).

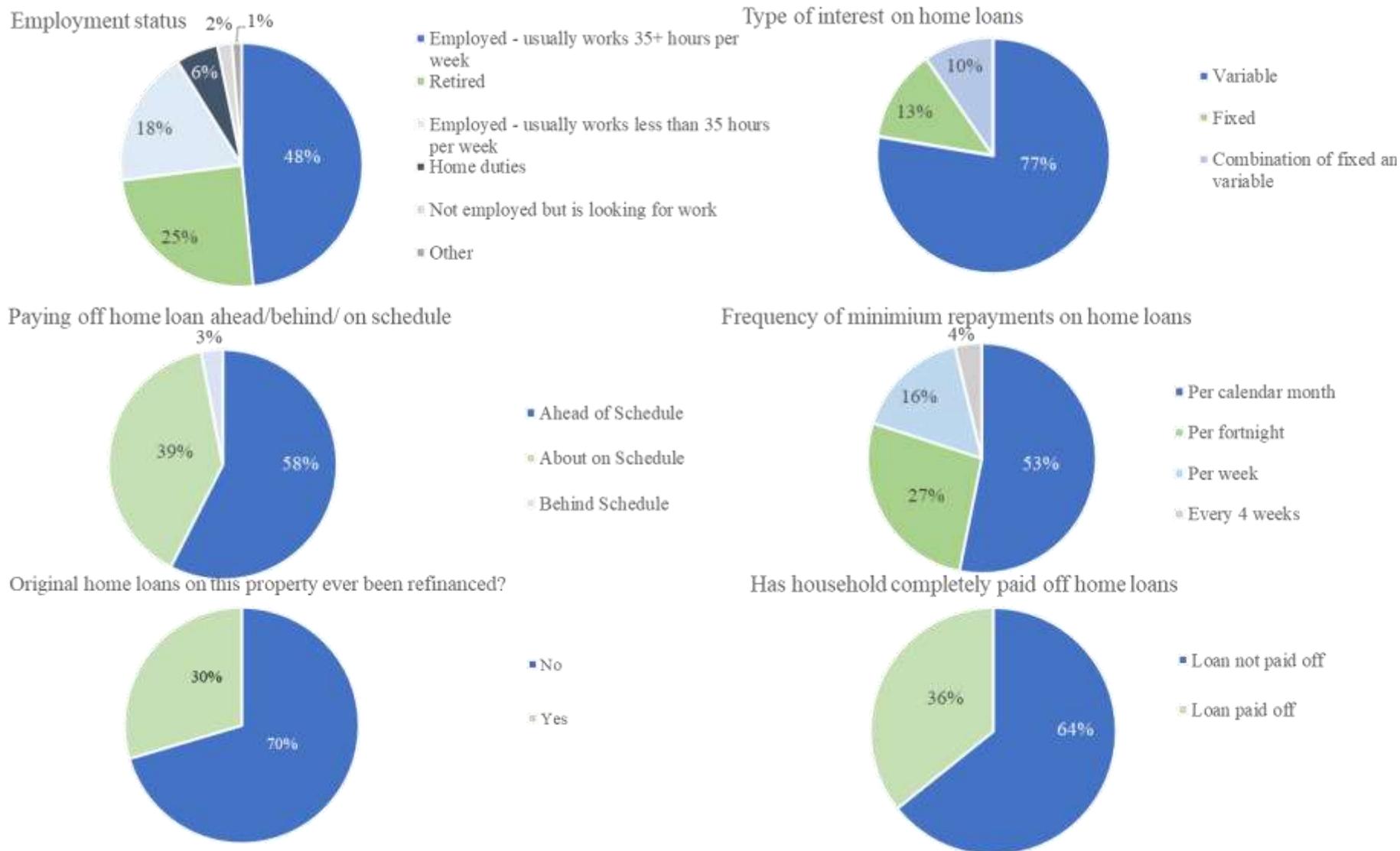
Additionally, household composition for Australia for the 2006 census (ABS, 2007) shows that household formation also has an impact towards the delinquency rate. ABS data indicate that single-person and couple-without-children households are less likely to default compared to the couple-with-children households.

This section uses HILDA survey data, to examine the income and expenditure on housing of different types of Australian households, including the levels of financial stress and wellbeing. The important distinguishing feature of the HILDA survey is that it has interviewed substantially the same households (9,835) and individuals (25,391) every year since 2001, thereby allowing researchers to see how their social, economic, and financial circumstances have changed over time.⁸ The HILDA survey is population weighted to be representative of the Australian population.

After identifying plausible factors from the above literature survey, this section summarises the key variables associated with mortgage distress in the Melbourne (1037 respondents) and Victoria (9538 respondents). The descriptive statistics are presented in Figure 5 (for Melbourne) and Figure 6 (Victoria).

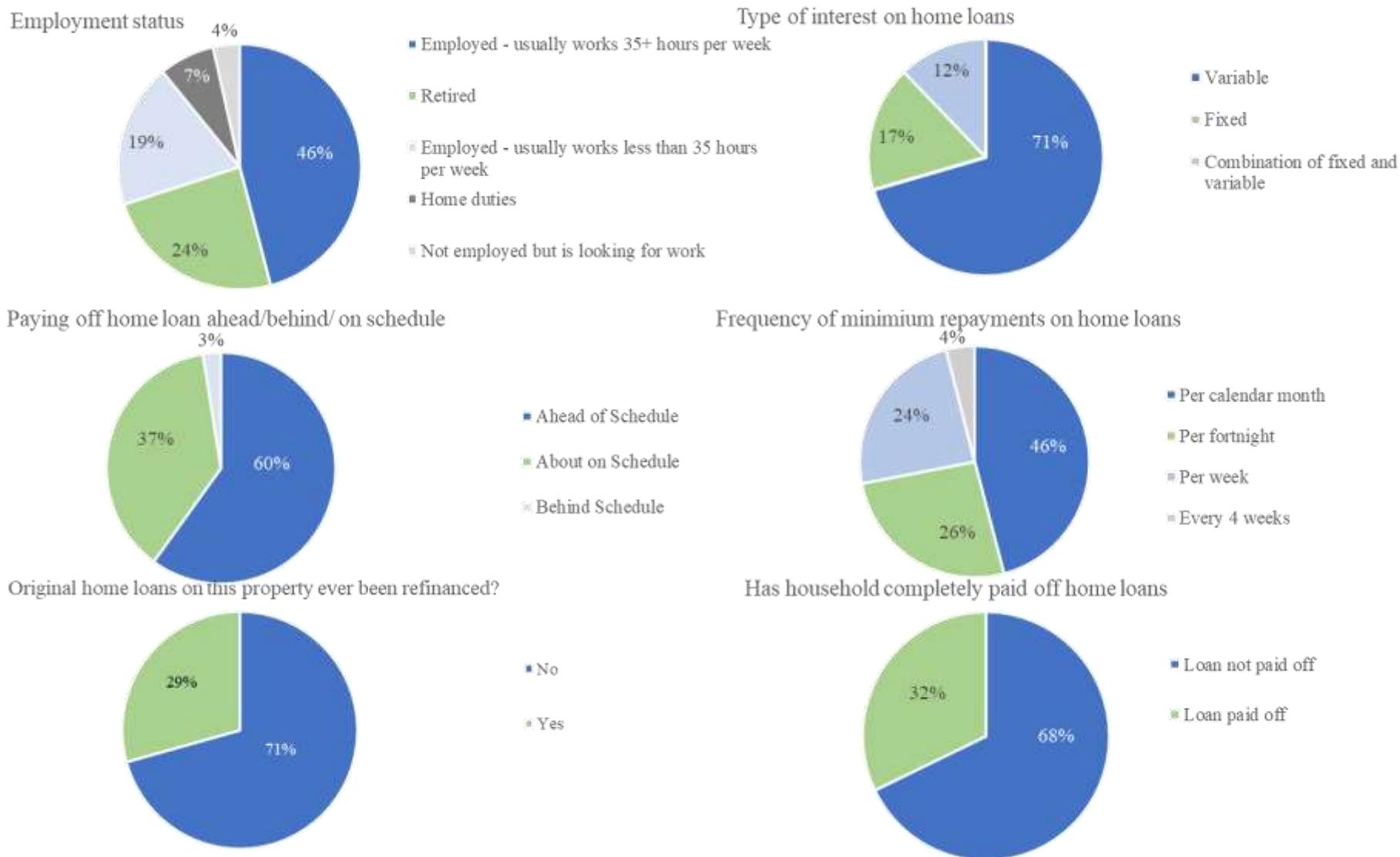
⁸ Wilkins, R. (2015) *The Household, Income and Labour Dynamics in Australia Survey: Selected Findings from Waves 1 to 12*, Melbourne Institute of Applied Economic and Social Research, Melbourne.

Figure 5: Factors leading to delinquency and default using Melbourne data



Note: Data are for Melbourne and obtained from HILDA.

Figure 6: Factors leading to delinquency and default using Victoria data



Note: Data are for Melbourne and obtained from HILDA.

3. Churn Rate Assumption (Exit rate of the program participants)

3.1. Introduction:

This section examines the assumption made on the churn rate (pace of the program participants exiting from the scheme). The current model is expecting that for the first 5 years since house being purchased, no home owners would exit from the scheme and over the following 20 years, 5 per cent of the participants would exit each year. Based on the survey results and analysing the data obtained from HILDA, the above-mentioned assumption appears somewhat low especially for early years of the program.

3.2. Our view on the churn rate:

In the shared equity project, we assume that the participants are considered exiting from the scheme once they refinance the original home loan they acquired, pay off the original mortgage loan or sold the house they purchased.

Based on the post-1985 data obtained from HILDA, Figure 7 presents the proportion of home owners who refinanced their loan after a certain number of years since the purchase of the property. The figure indicates that for both the city of Melbourne and the overall state of Victoria, almost 10 per cent of the households have refinanced the loan within 5 years of purchasing the house. If we restrict the survey to post 2010, then the figure increases to 16 to 18 per cent. Figure 8 presents the results of analysing HILDA data on the expected time of paying off the loan. The examination of the post-2010 data indicates that 4 to 5 per cent of the households are expecting to repay the home loans within 5 years of acquiring the house. As the denominators used to estimate the timing of refinancing and the expected time to repay the home loans are different, it is not appropriate to simply add the two figures; however, it provides valuable information on validating the assumptions used by the current shared equity

housing program. In particular, the current assumption of zero exiting rate in the first 5 years appears relatively low.

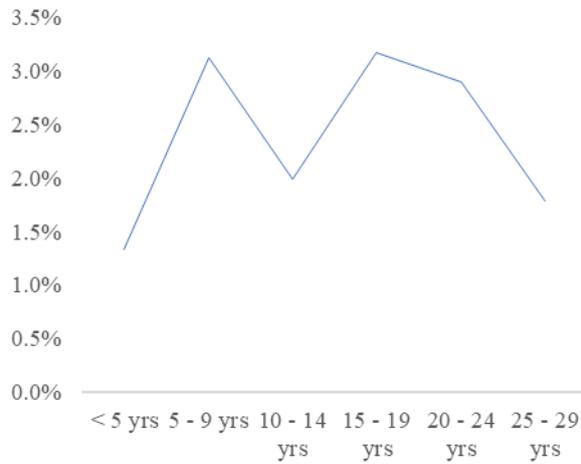
In addition, according to a news article reported in 2011, the average length of time that the owners staying in a house is 7.5 years across Australia and 9.6 years for Melbourne's CBD area.⁹ This indicates that the churn rate over the first 10 years of purchasing houses would be at least 50 per cent. Considering this and if we assume that the exiting rate is constant over the first 10 years, the exit rate would be 5 per cent each year from the time the house is purchased.

⁹ Switzer Daily, "How long do Australians stay put." Retrieved 7 September 2017, from <http://www.switzer.com.au/the-experts/john-mcgrath-property-expert/how-long-do-australians-stay-put/>

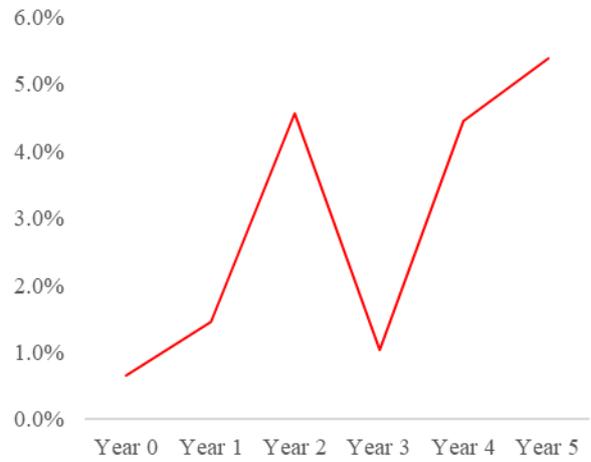
Figure 7: Years before home owners refinance their loans

Melbourne:

Annual average of the proportion of household refinanced loans after certain years (post 1985)

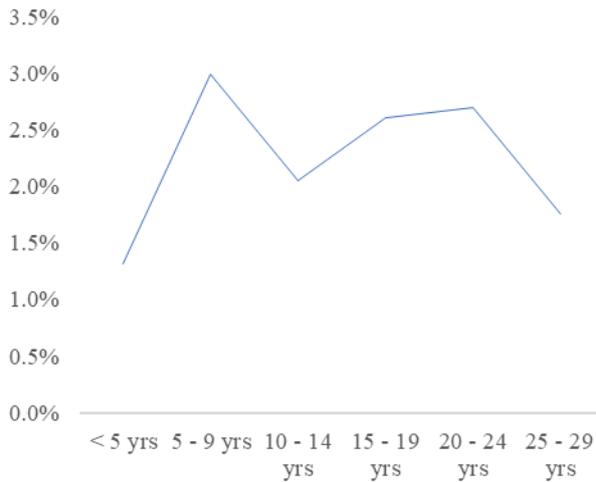


The proportion of household refinanced loans after certain year (post 2010)

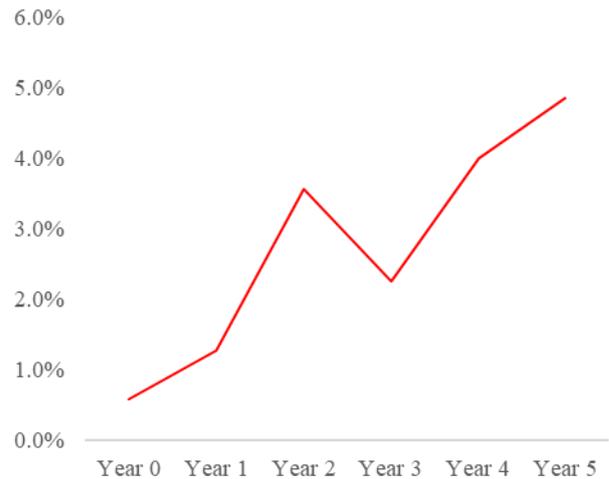


Victoria:

Annual average of the proportion of household refinanced loans after certain years (post 1985)

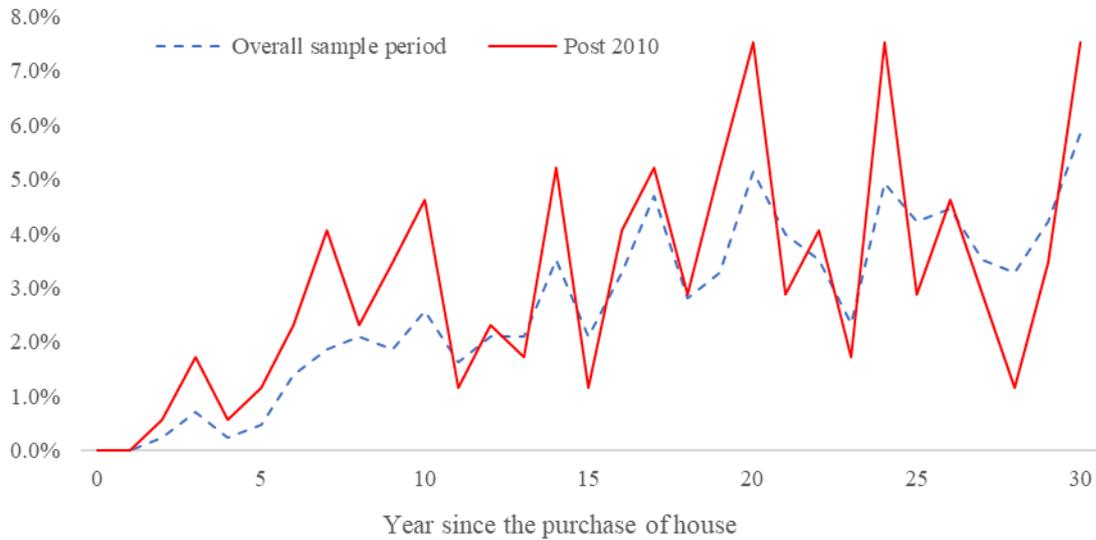


The proportion of household refinanced loans after certain year (post 2010)

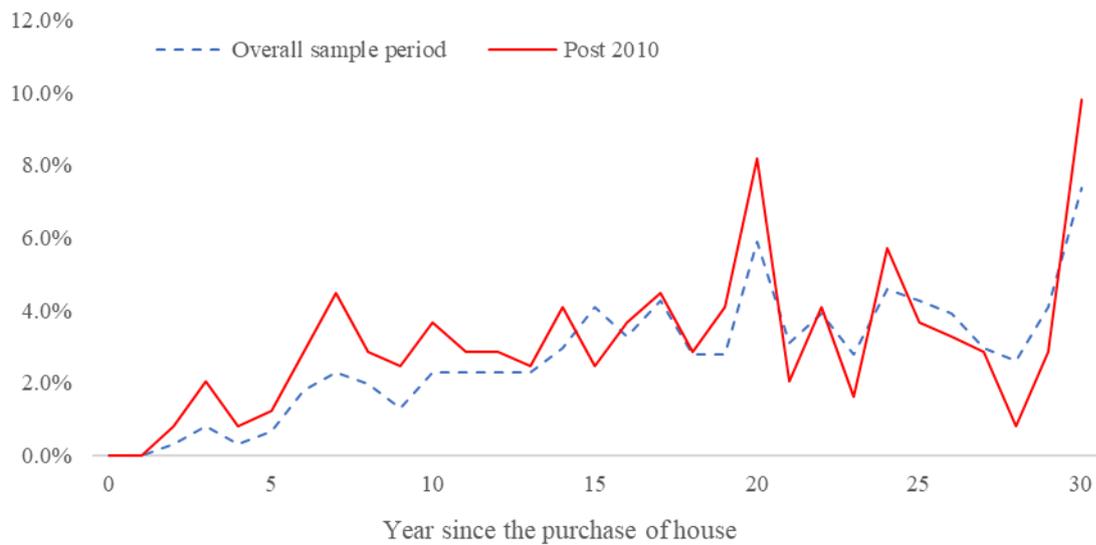


Note: Data are obtained from HILDA

**Figure 8: Expected time to pay off loans
Melbourne:**



Victoria:



Note: Data are obtained from HILDA

Nevertheless, as various factors would affect the churn rate of the shared equity housing program, the remainder of this section explores those possible factors based on a survey of the scholarly literature. Coulton, Theodos, and Turner (2012) review possible factors associated with residential mobility, which can be termed as the churn rate. They state that demographic variables consist of proxies for life-cycle events that may trigger a move or that capture stages in the life cycle that are associated with the chances of moving. For example, although households with children are generally more stable, gaining or losing

children may trigger the need for more or less space. Similarly, the addition or departure of a spouse or partner may influence the desire or ability to relocate. Employment, income, and distress variables relate to employment and income. Change in employment status may trigger a move, either due to location of the job or its effect on income. Financial hardships may bring on a housing crisis, but financial improvements may make a move to a better situation possible. Homeownership and housing subsidy (public housing or voucher) variables used in the analysis show that homeowners and households with subsidies are expected to move less often, but changing tenure is a possible reason for a move.

Neighbourhood services and future variables measure perceived neighbourhood quality. Dissatisfaction with neighbourhood quality could serve as a push factor for movers, but a positive view of the neighbourhood might be a pull factor for newcomers and stayers.

Hence, in this report, “churn rate” may take three forms:

- I. Refinancing the existing loan (Keep the same house and changing the financing provider)
- II. Voluntary exit (Sell the house due to demographic factors)
- III. Pay off the home loan

4. Conclusion

To validate the assumptions related to prices and household income, the Griffith team has surveyed the contemporary macroeconomic projections prepared by highly regarded research institutes and implemented statistical techniques (bootstrapping) to simulate possible future outcomes. For other tasks, the Griffith team surveyed scholarly articles, and analysed the publicly available information and the data obtained from the Household Income and Labour Demographics in Australia (HILDA).

From our view, the assumption used in the model in relation to the house price is relatively conservative. For example, in relation to the house prices in the region, while there may be some short-term correction in a near-future, projected macroeconomic conditions support upside potential in a longer-term. This includes projected trend of the average household income.

This is a similar case in relation to the default rate. The expected default rate determined by the frequency of the private mortgage insurance being claimed appears to be well below 0.6 per cent. In relation to the churn rate, which was assumed to be zero for the first five years and five percent in the subsequent years, appears to be relatively low most specially during the first five years.

References

- Adams, Z., & Füss, R. (2010). Macroeconomic determinants of international housing markets. *Journal of Housing Economics*, 19(1), 38-50.
- Andrews, D. (2010). Real house prices in OECD countries: the role of demand shocks and structural and policy factors. *OECD Economic Department Working Papers*, (831).
- Berry, M. R., Dalton, T. R., & Nelson, A. R. (2010). *Mortgage default in Australia: nature, causes and social and*. Australian Housing and Urban Research Institute Melbourne, Australia.
- Blanchflower, D. G., & Oswald, A. J. (2013). *Does high home-ownership impair the labour market?* (No. w19079). National Bureau of Economic Research.
- Coulton, C., Theodos, B., & Turner, M. A. (2012). Residential mobility and neighbourhood change: Real neighbourhoods under the microscope. *Cityscape*, 55-89.
- Efron, B., 1992. Bootstrap Methods: Another Look at the Jackknife. In: *Breakthroughs in Statistics*. Springer, pp. 569-593.
- Glaeser, E. L., & Parker, J. A. (2000). Comments and discussion. *Brookings Papers on Economic Activity*, 2000(2), 146-159.
- Goodhart, C., & Hofmann, B. (2008). House prices, money, credit, and the macro economy. *Oxford Review of Economic Policy*, 24(1), 180-205.
- Jud, D., & Winkler, D. (1999). Price indexes for commercial and office properties: an application of the assessed value method. *Journal of Real Estate Portfolio Management*, 5(1), 71-81.
- Kohler, M., & Van Der Merwe, M. (2015). Long-run trends in housing price growth. *Reserve Bank Bulletin*, 21-30.
- KPMG Economics. (2017). Housing affordability: What is driving house price in Sydney and Melbourne? Retrieved 7 September 2017, from <https://assets.kpmg.com/content/dam/kpmg/au/pdf/2017/housing-affordability-sydney-melbourne-june-2017.pdf>.
- Lee, T. H., & Ullah, A. (2001). Nonparametric bootstrap tests for neglected nonlinearity in time series regression models*. *Journal of Nonparametric Statistics*, 13(3), 425-451.
- Leung, C. (2004). Macroeconomics and housing: a review of the literature. *Journal of Housing Economics*, 13(4), 249-267.
- Ma, D., & Heathcote, J. (2003). Housing and the business cycle. *SSRN Electronic Journal* URL <http://www.ssrn.com/abstract,528102>.
- Madsen, J. B. (2012). A behavioral model of house prices. *Journal of Economic Behaviour & Organization*, 82(1), 21-38.
- Mankiw NG, Weil DN (1989) The baby boom, the baby bust, and the housing market. *Regional science and urban economics* 19(2):235-58.
- Meen, G., & Andrew, M. (1998). On the aggregate housing market implications of labour market change. *Scottish Journal of Political Economy*, 45(4), 393-419.
- Mikhed, V., & Zemčík, P. (2009). Do house prices reflect fundamentals? Aggregate and panel data evidence. *Journal of Housing Economics*, 18(2), 140-149.
- Nielsen, S. B., & Sørensen, P. B. (1994). Inflation, capital taxation, and housing: the long run in a small open economy. *Canadian Journal of Economics*, 198-217.

- Rahman, M. M. (2010). The Australian housing market—understanding the causes and effects of rising prices. *Policy studies*, 31(5), 577-590.
- Schnure, C. (2005). Boom-bust cycles in housing: The changing role of financial structure.
- Van Order, R. (2007). *Housing and the Economy: After the Short Run*.
- Wilkins, R. (2015) *The Household, Income and Labour Dynamics in Australia Survey: Selected Findings from Waves 1 to 12*, Melbourne Institute of Applied Economic and Social Research, Melbourne.
- Xu, D.,Q. (2007). *Housing Price and Capital Bubble*, China Machine Press, Beijing. Yearbook, 2000-2010, Hangzhou.
- Zhang, H., & Li, W.,T. (2001).The Empirical Research on Change of Housing Price in Beijing“, *China Real Estate Financing*, 12(3), 3-7.

Appendix: Bootstrapping Technique

A bootstrap is one of the nonparametric techniques to resample and recreate datasets by randomly shuffling the original sample dataset. The standard bootstrap was first introduced by Efron (1979). This is a very powerful technique to predict future outcomes based on historical data. It allows us to make predictions without assuming statistical probability distributions and specially in the case of limited available data. Since the first introduction, there has been a number of researchers such as Lee and Ulla, 2001 extending the method by taking some important factors in shuffling the dataset. This includes the nature of serial correlation in the timeseries data of prices and returns of financial assets.