Housing Affordability in New Zealand: Methodology

Methodology of HAM version 1.0
10 May 2017

Glossary

CPI	consumers price index
ERI	equivalised residual income
FHB	first home buyer
HAM	Housing Affordability Measure
HAM Buy	first home buyer HAM indicator
HAM Own	owner-occupier HAM indicator
HAM Rent	renter HAM indicator
HEF	household equivalisation factor
HES	Household Economic Survey
IDI	Integrated Data Infrastructure
IRD	Inland Revenue Department
MBIE	Ministry of Business, Innovation and Employment
MSD	Ministry of Social Development
OECD	Organisation for Economic Co-operation and Development

Contents

1   Introduction

This paper presents detail of the methodology used to calculate the Ministry of Business, Innovation and Employment's (MBIE's) Housing Affordability Measure (HAM), preliminary results of which are available in the paper *Housing Affordability in New Zealand: Results*. The HAM comprises two indicators:

1. **HAM Buy**: housing affordability for first home buyers. This indicator addresses whether a household that is currently renting can feasibly afford to own a home.
2. **HAM Rent**: housing affordability for renters. This indicator addresses whether a household that rents can feasibly afford to live in its current accommodation.

The HAM indicators calculate housing affordability based on the proportion of households that fall below the 2013 National Affordability Benchmark, calculated as the median equivalised residual income in June 2013[1]:

1. **HAM Buy** measures the proportion of renting households who would have below-median housing affordability if they bought a lower quartile-valued dwelling in their territorial authority,[2] based on their income in that quarter and an estimate of what their housing costs would be on purchasing this dwelling.
2. **HAM Rent** measures the proportion of renting households who have below-median affordability, based on their income and rent in their current home that quarter.

For users interested in other points in the residual income distribution, we have also released two alternate HAM series. These series are based around the 30th and 10th percentiles of equivalised residual income, but are otherwise calculated the same way as the primary HAM measure. Further details of the data and methods used to construct the HAM follow.

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[1] The source of the income data used to calculate the benchmark is the equivalised household income from the June 2013 Household Economic Survey.
[2] Or ward area, within Auckland.

2   The data used to construct the HAM

2.1   Data sources

The majority of the data used to create the HAM is sourced from Statistics New Zealand's Integrated Data Infrastructure (IDI). The IDI contains anonymised microdata about people and households. This data is supplied by a range of government agencies and non-governmental organisations, and also comprises data from Statistics New Zealand surveys, including the most recent census.[3]

The IDI's data on New Zealanders is extremely comprehensive, making it possible to examine the state of housing affordability in New Zealand in fine detail, without the sampling errors that come from using survey data or the jumps in a time series caused by the low frequency of censuses.

In addition to the IDI the following data was used to create the HAM:

- consumers price index (CPI)
- lower quartile rateable value and E-valuer data supplied by CoreLogic New Zealand
- effective interest rate data from the Reserve Bank of New Zealand.

2.2   Frequency of data updates

The HAM is presented as a quarterly series starting in March 2003. At the time of writing the latest quarter of data available is June 2015. The reason for the lag is that it takes time for all the data required to produce the HAM to be reported to Statistics New Zealand and incorporated into the IDI.

2.3   The reference date

Every quarter of data is produced relative to a reference date. This date is the last day of that quarter. For example, the reference date for the HAM values for March 2013 is 31 March 2013. The ways in which the reference dates are used are explained in subsequent sections.

2.4   Data used to calculate incomes

The HAM calculates individual personal income using the following sources in the IDI:

- Inland Revenue Department (IRD): employee monthly schedule (EMS) incomes. These are monthly income reports from employers about their employees. EMS incomes include taxable benefits supplied by the Ministry of Social Development (MSD) to the IRD.
- IRD: self-employment income (annual returns based on the IR4S, IR3 and IR20 income tax returns).
- MSD: non-taxable benefit income.

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[3] http://www.stats.govt.nz/browse_for_stats/snapshots-of-nz/integrated-data-infrastructure/idi-data.aspx

All income from these sources is collected for the year ending on the relevant reference date (see section 2.3 above). Note that because data for tax payable on self-employment income is not available in the IDI, all incomes are calculated before tax.

On 31 March 2013 there were 3,359,553 individuals with some reported income during the year to that reference date (the closest to the date of the most recent census).

2.5   Data used to define the HAM population

The IDI's address data, in conjunction with its 'Personal details' dataset, is used to determine the number of people who are alive in New Zealand and have a known address on the reference date for each quarter. The 'Personal details' dataset is also used to calculate individuals' ages on the quarter's reference date: this data is used for equivalising household income (see section 3.4).

On 31 March 2013, this IDI data produced a total population of 6,112,008 people, relative to a census population of 4,353,198 on 5 March 2013. The variance between IDI and census populations suggests the IDI is over-counting people in New Zealand, presumably by treating one person as several people due to discrepancies between administrative data sources. To address this issue, we employ a filter developed by Gibb, Bycroft and Matheson-Dunning (2016)[4] as part of a project to reconcile the information in the IDI and that gathered by the census.

The filter used by Gibb et al. requires an individual to meet one of the following two criteria:
1) Have had an interaction with one of the following agencies in the past year:
  o   Inland Revenue Department
  o   Ministry of Social Development
  o   Ministry of Health
  o   Ministry of Education
  o   Accident Compensation Corporation

2) Be a child under five years old.

Using Gibb et al.'s filter reduced the IDI population to 4,762,008 people on 31 March 2013. This is still higher than the census, but reduces the variance considerably.

2.6   Data used to define households

Using the address data in the IDI, all individuals in the filtered HAM population are assigned into households based on their address on the quarter's reference date. To improve data quality, the following 'households' are excluded:

- Households composed of more than 15 residents, to account for addresses that are not truly residences. For example, some people register their accountant's office with the IRD and this can make the accountant's office appear to be a residence with a large number of people living at it.
- Households with no residents aged 15 years or older. This is because a household without a resident 15 years or older is unlikely to be a real household; more plausibly,

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[4] Gibb, S., Bycroft, C., & Matheson-Dunning, N. (2016). *Identifying the New Zealand resident population in the Integrated Data Infrastructure (IDI)*. Retrieved from http://www.stats.govt.nz/methods/research-papers/topss/identifying-nz-resident-pop-in-idi.aspx

the household has moved elsewhere, but some of the address information for individuals in the household has not been fully updated.

Note that this approach to household construction, while necessary due to the nature of the data, relies on the assumption that the household will retain its composition for the near future. This presents an issue for some households in the potential first home buying population, as there are certain cases where this will not hold true, such as:

- the household would split up or lose members if it became owner-occupying (e.g., a group of flatmates)
- the household would add members if it became owner-occupying (e.g., buying a dwelling to make room for relatives).

In these cases, HAM Buy will not correctly identify the level of housing affordability that the household would experience in purchasing a dwelling.

2.7 Data used to define the renting population

The HAM population is composed of renting households. To gather data on these, we use the tenancy bond database, which MBIE permits to be incorporated into the IDI. Under the *Residential Tenancies Act 1986*, all landlords who require a bond of their tenants must register this bond with MBIE. The bond form provides information on the address and weekly rent of the tenancy, as well as indicating when a property became tenanted.

The tenancy bond data identifies 365,469 tenanted properties on 31 March 2013, which compares with a 2013 census count of 453,132 renting households. The census number is larger in part because:

- Some registered tenancies lack data on the rent paid in the tenancy: these tenancies are excluded as HAM Rent cannot be calculated without rental data.
- Quality issues with the tenancy bond database addresses mean that 29 percent of addresses could not be coded by Statistics New Zealand, and could therefore not be linked with the other IDI data. These tenancies are therefore excluded. The effect of these excluded addresses is discussed in Annex 3.

Properties with no registered tenancy are treated as not being rentals and are excluded from the population. While we have no direct data on the excluded households, our validation of HAM data against Household Economic Survey (HES) data in Annex 4 suggests the potential bias in HAM Rent and HAM Buy is quite small.

More discussion on the limitations and validation of the rental data can be found in Annex 3.

2.8 Data used to calculate housing costs for HAM Buy

Data from CoreLogic New Zealand, as well as Statistics New Zealand's HES, is used to calculate the housing costs of the 'modest dwelling' (a one- or two-bedroom dwelling at the lower quartile value price) used in constructing HAM Buy. CoreLogic New Zealand provides information on the rateable value of residences in addition to their own E-valuer estimate of market values.[5]

CoreLogic collects data on rateable values and sales prices through a relationship with territorial authorities, and uses secondary sources to fill in the gaps in their primary data sources. Each address is assigned to a geographical area (either a territorial authority, or in Auckland, a ward area) to act as the basis for estimating the cost of a modest dwelling.

For HAM Buy, housing cost data is estimated by linking CoreLogic's E-valuer data to HES data. This data is used to calculate the average expenditure on rates per dollar of capital value, and insurance expenditure per dollar of E-valuer market value.

Data on mortgage interest rates is sourced from the Reserve Bank of New Zealand.[6]

2.9 Households with negative residual income

Households with negative residual income (representing 4 percent of the population) are excluded from the HAM population. In practice, it is not possible for a household to sustainably spend more than their income on housing, implying that households in this state have income sources not visible to the IDI or cases where the household suffered some temporary setback such as suffering a business loss that year. In either case, these households represent cases where a household's actual ability to afford housing is not properly being represented by the data.

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[5] CoreLogic's E-valuer uses the sales prices of similar dwellings sold in a given time period to estimate a market value for all dwellings. The result is similar to a sales price series, but without the variation caused by the specific characteristics of the dwellings sold in each period. For example, if a number of expensive houses get sold in a given quarter, this would bias prices up for that quarter. Using E-valuer data removes this effect.

[6] Effective interest rates from series hb3 – Retail interest rates on lending and deposits.

3 Calculating affordability: the methodology of the HAM

3.1 Primary differences between the two HAM indicators

The HAM Buy and HAM Rent indicators are both residual-income-based indicators. Each indicator takes a household's income after housing costs (its residual income), adjusts for household size, and then determines whether is it above or below the 2013 National Affordability Benchmark.

Both indicators examine the same ultimate population: all households who are renting on the quarter's reference date, as measured by having an active bond lodged against the property in which the household lives (less those who are excluded for data quality reasons, as described in the previous section). The differences between the indicators reflect the fact that each indicator examines a different aspect of housing affordability. HAM Rent is concerned with a household's current housing circumstances, while HAM Buy is concerned with the effect a change in housing circumstances would have upon a household.

3.2 Calculating household incomes

All individual incomes at an address are combined to form household income.

Household income (*HI*) is calculated as follows:

$$HI_{p,t} = \sum_i I_{i,p,t}$$

Where:
I = the amount of individual income (before tax)
i = the source of individual income earned
t = time (income sources from the past 12 months are included)
p = address

3.3 Calculating housing costs

3.3.1 Calculating housing costs for first home buyers

The hypothetical housing costs for each household are calculated based on the following formula:

$$HC_{a,t} = Ins_{a,t} + LR_{a,t} + MP_{a,t}$$

Where:
Ins = insurance
LR = local body rates
MP = mortgage payments
a = area (ward for addresses in Auckland; territorial authority for other addresses).

Ins and *LR* are calculated as ratios of, respectively, the dwelling price and capital value of a modest dwelling:

$$Ins_{a,t} = IR \times LQ(P_{a,t})$$

$$LR_{a,t} = RR \times LQ(CV_{a,t})$$

Where:

IR = insurance ratio (average insurance cost as a fraction of dwelling price, based on CoreLogic E-valuer estimates)

RR = rates ratio (average rates cost as a fraction of capital value)

LQ(P) = lower quartile market value

LQ(CV) = lower quartile capital value (rateable value of land and building/s)

a = area (ward for addresses in Auckland; territorial authority for other addresses).

IR and *RR* are calculated by comparing the expenditures of households in the HES with the HES dwellings' sales prices and capital values of dwellings.

MP is calculated assuming a 30-year mortgage with no deposit.

We calculate the mortgage payment on the basis that there is no deposit. This is because the deposit is still a financial cost to the house-buyer, and treating the mortgage as zero-deposit accounts for this financial cost.

$$MP_{a,t} = \frac{LQ(P_{a,t}) * r_t}{1 - (1 + r_t)^{-30}}$$

Where:

LQ(P) = lower quartile dwelling price

r_t = the Reserve Bank's effective mortgage interest rate

a = area (ward for addresses in Auckland; territorial authority for other addresses).

Unlike the HAM Rent indicator, HAM Buy is considering the hypothetical housing costs of a household after it buys a dwelling. As such, it is necessary to estimate what type of dwelling the household would purchase. This is complicated by the fact that different-sized households will have different housing needs. For this reason, for HAM Buy we have equivalised household income before deducting housing costs, and then estimated the costs of a modest dwelling for a one-person household. For more information on the equivalisation process, see section 3.4 below.

Based on data from CoreLogic on the behaviour of first home buyers, the definition of a modest dwelling is set as the lower quartile of the housing market in the area (territorial authority, or ward for Auckland) in which the household resides.

Furthermore, as household incomes are equivalised to the equivalent of a one-person household, the modest dwelling calculations are based off one- and two-bedroom dwellings only, as these are the kinds of dwellings likely to be occupied by a one-person household.

3.3.2 Calculating housing costs for renters

The housing costs (*HC*) for each household in rental tenure are calculated as follows:

$$HC_{p,t} = R_{p,t} \times 52\tfrac{weeks}{Year}$$

Where:

R = weekly rent from the tenancy bond database (taken from the last bond lodged against that property (at time *t*) that is still active).

3.4 Calculating equivalised residual income

3.4.1 Equivalised residual income for renters

For the HAM Rent indicator, equivalised residual income (*ERI*) is calculated as follows:

$$ERI_{p,t} = \frac{HI_{p,t} - HC_{p,t}}{HEF_{p,t}}$$

Where:

HI = household income

HC = housing costs

HEF = the household equivalisation factor, which is calculated based on the modified OECD formula, as employed by Eurostat:[7]

$$HEF_{p,a,t} = 1 + 0.5\,(A_{p,t} - 1) + 0.3\,C_{p,t}$$

Where:

A = the number of people in the household aged 14 years and older

C = the number of people in the household aged under 14 years.

3.4.2 Equivalised residual income for first home buyers

Before calculating the ERI for households belonging to the first home buying population, it is first necessary to calculate the households' equivalised income (*EI*).

EI is calculated as follows:

$$EI_{p,t} = \frac{HI_{p,t}}{HEF_{p,t}}$$

Where:

HI = household income

HEF = the household equivalisation factor, which is calculated based on the modified OECD formula as used by Eurostat:

$$HEF_{p,t} = 1 \,+\, 0.5\,(A_{p,t} - 1) + 0.3\,C_{p,t}$$

Where:

A = the number of people in the household aged 14 years and older

C = the number of people in the household aged under 14 years.

This is the same formula as used for HAM Rent, but involves equivalising income, rather than residual income.

The ERI for the first home buying population is therefore calculated using the following formula:

$$ERI_{p,t} = EI_{p,t} -\, HC_{a,t}$$

Since *EI* has already been equivalised, and *HC* has been constructed with a one-person household in mind, no further equivalisation is needed at this point.

Note that HAM Buy is based on cash flow considerations, including the mortgage payments associated with buying a home and the opportunity cost of the deposit. Without a detailed

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[7] http://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:Equivalised_disposable_income

source of net worth data for New Zealand households, HAM Buy cannot consider the effect that capital constraints (such as the requirement to save for a deposit) may have on the ability of a household to buy a dwelling.

3.5   Calculating the 2013 National Affordability Benchmark

For both HAM indicators, individual households are determined to be either above or below the 2013 National Affordability Benchmark based on their ERI. The benchmark is calculated using equivalised residual incomes from the 2013 HES[8]. The equivalisation formula used is the same modified OECD formula described in section 3.4.2. The housing cost share is the average share of household income spent on housing-related expenses (rent, mortgage payments, body corporate fees, rates and insurance), calculated from 2013 HES data.

The median affordability threshold is **$662 per week** (in 2013 dollars). Note that the benchmark is only directly applicable to one-person households. A larger household needs a correspondingly higher residual income to be considered as having above-median affordability.

This benchmark is inflation-adjusted using CPI data for each quarter in the HAM time series. This is necessary because the equivalised residual incomes are in nominal (face value) terms.

The median affordability threshold is intended to be rebased from time to time. This approach is used in a number of other statistical collections, such as the production measure of constant price gross domestic product and the CPI.

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[8] Including both home-owning and renting households.

3.6   Alternative HAM Series

One of the advantages of HAM's methodology is that it can be used to investigate any point along the residual income distribution. For this reason we have constructed two additional HAM series based on the 30th and 10th percentiles of equivalised residual income, representing households with progressively less income after housing costs. The affordability threshold for the 30th percentile measure is $421 per week, and the affordability threshold for the 10th percentile measure is $215 per week. The alternative HAM series are presented below; as you can see the overall trend is consistent no matter what threshold is used.
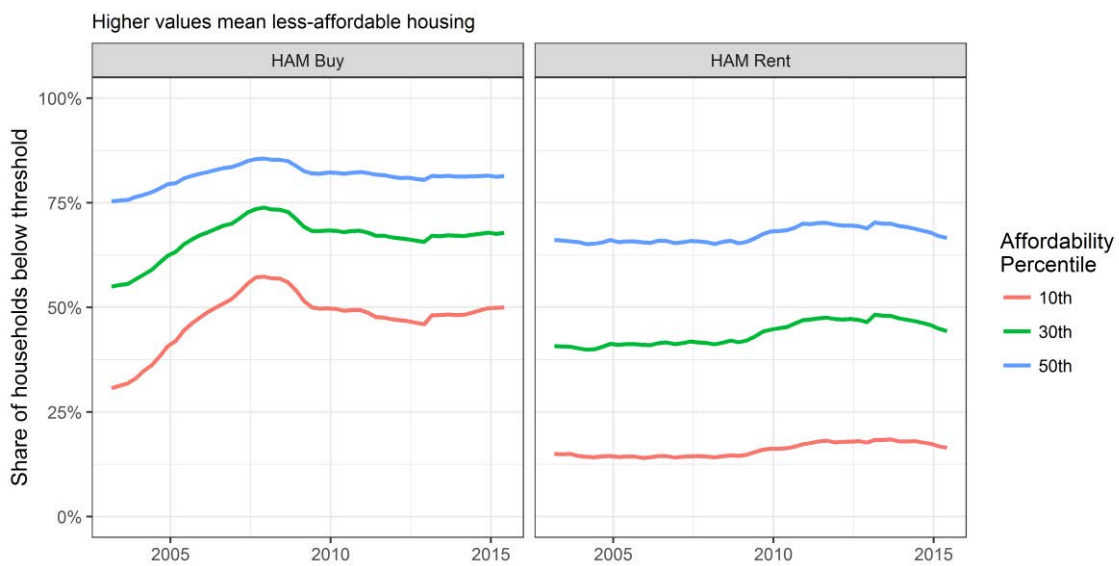

Figure 1: Comparison of Alternative HAM series, National Totals

The alternative HAM series are available on MBIE's website as a supplementary table.

4   Limitations of the HAM version 1.0

As it is presently constructed, the HAM has the following limitations:

- Due to data constraints, the HAM is calculated from pre-tax incomes where ideally after-tax income would be used instead.
- There is a considerable delay in the series – at present the latest data available is for June 2015.
- HAM Buy does not account for the effect of credit constraints (such as the need to have a deposit) on the ability of aspiring first home buyers to buy a home.

Annex 1: Pre-existing New Zealand housing affordability measures

Demographia

Description

The annual Demographia International Housing Affordability Survey measures the affordability of purchasing a home in nine international markets: Australia, Canada, China (Hong Kong), Ireland, Japan, New Zealand, Singapore, the United Kingdom, and the United States. It assesses affordability by metropolitan area, using a **median multiple** measure. This measure takes a location's median house price and divides it by the median household income in that area in order to calculate how many years' annual household income would be needed to buy a house. Results are organised into four housing affordability rating categories: 'affordable', 'moderately unaffordable', 'seriously unaffordable' and 'severely unaffordable'. A result of 3 or lower constitutes 'affordable' housing; 5.1 or higher is considered 'severely unaffordable'.

Data sources

The median house price information is drawn from "real estate industry time series that have become established as authoritative, national sales transaction registries and other government sources", and the median household income data is taken from the most recent census, although reports produced in years since the census have this income "adjusted to account for changes to produce an up-to-date estimate, using the best available indicators of income changes."[9]

Limitations

- Using the median house price and median income to calculate the measure only allows for a very broad-brush view of affordability, as these median amounts do not necessarily reflect the purchasing intentions or incomes of aspiring first home buyers.
- The measure does not capture differences in affordability for households of varying sizes.
- Census data becomes less reliable as time passes.
- The measure assesses only the affordability of purchasing a house, not the affordability of renting a home.

Interest.co.nz: Home Loan Affordability Index

Interest.co.nz provides two measures for calculating the affordability of purchasing a home in New Zealand: its **Home Loan Affordability Index** and its **house price-to-income multiple.**

Description

Interest's **Home Loan Affordability Index** considers the affordability of purchasing a home for three hypothetical populations: first home buyers, young family buyers, and second-rung buyers. Various assumptions are made about these populations; for example, first home buyers are assumed to be a childless couple in which both partners are aged 25–29 and work full time earning the median income for their age and region, who each year for four years

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[9] http://www.demographia.com/dhi.pdf

have saved 20 percent of their net pay towards a house deposit, and who intend to buy a first home at the lower quartile price.

The home loan affordability index measures the proportion a weekly mortgage payment (based on the assumed size of that household's deposit) would be of each household's weekly take-home pay. An index measure is generated for each region (some sub regions), and nationally: this index measure is represented as a percentage. A mortgage is considered 'affordable' when the mortgage payment is no greater than 40 percent of household weekly take-home pay.

Data sources

Estimates of median weekly income are calculated using data from Statistics New Zealand's Linked Employer–Employee Dataset. Take-home pay is calculated by applying the relevant income tax rate to this data.

A home loan is assumed to be the lower quartile or median house price (depending on population) less a 20 percent deposit. House prices are as reported by the Real Estate Institute of New Zealand.

Mortgage repayments are based on the value of the home loan, paid weekly for 30 years, using the two-year bank average interest rate. The home loan is assumed to be a standard table mortgage, where both interest and principal are repaid in a fixed weekly payment made in arrears. Average mortgage interest rates are sourced from www.interest.co.nz. These averages are for banks only, as banks have 90+ percent of the mortgage market.[10]

Limitations

- Numerous assumptions are made about the composition and purchasing power of first home buying households, meaning that affordability can only ever be roughly estimated.
- The measure assesses only the affordability of purchasing a house, not living in it.

Interest.co.nz: house price-to-income multiple

Description

This is another **median multiple measure**, similar to the Demographia measure. It also assumes that "a median multiple of 3.0 times or less is a very good marker for housing affordability".

It differs in these respects:

a) Interest's results are tracked monthly, whereas Demographia focuses solely on the September quarter each year.
b) Demographia uses a whole-of-population median when calculating income, whereas Interest calculates its measure using an estimate of median household income that is based on what it calls "a standardised house-buying household". It defines this household as "one full time male median income, 50% of one female median income, both in the 30–34 age range, plus the Working for Families income support they are entitled to receive under that program. This standardised household is assumed to have one 5 year old child." These are before-tax incomes taken from the Linked Employer–Employee Dataset income series, which is for primary wage and salary income, plus Working for Families benefits paid, whereas Demographia uses census

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[10] http://www.interest.co.nz/property/home-loan-affordability

income data, which includes income elements from all sources (wages, salaries, interest, dividends, benefits, self-employment, partnerships, foreign, etc).

c) The Interest measure covers a greater number of regions in New Zealand than the Demographia one does.[11]

Data sources

These are the same as for Interest's Home Loan Affordability Index.

Limitations

- The measure assesses only the affordability of purchasing a house, not living in it.
- Using the median house price and median income to calculate the measure only allows for a very broad-brush view of affordability, as these median amounts do not necessarily reflect the purchasing intentions or incomes of aspiring first home buyers.
- Assumptions made about the 'standardised house-buying household' are strongly heteronormative and not necessarily representative of actual households.

Massey Affordability Index

Description

This measure assesses how affordable it is to buy a house by multiplying the mortgage interest rate by the median house price and dividing the result by the average weekly income. The result is an index number; these numbers are produced for each region and for New Zealand as a whole. The lower the index number, the more affordable the housing. The index allows for comparisons of relative housing affordability over time and between regions.

Data sources

The income amount used in the calculation is the average weekly earnings of a household unit in the region under consideration. This data is provided directly by Statistics New Zealand.

House price data is released monthly by the Real Estate Institute of New Zealand.

Mortgage interest rates are published by the Reserve Bank. The Reserve Bank series selected for the affordability index is based on end-of-month floating and fixed rates for existing borrowers.[12]

Limitations

- The measure assesses only the affordability of purchasing a house, not living in it.
- Using the median house price and average income to calculate the measure only allows for a very broad-brush view of affordability, as these amounts do not necessarily reflect the purchasing intentions or incomes of aspiring first home buyers.
- The measure does not capture differences in affordability for households of varying sizes.

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[11] http://www.interest.co.nz/property/house-price-income-multiples
[12]

http://www.massey.ac.nz/massey/fms/Colleges/College%20of%20Business/School%20of%20Economics%20&%20Finance/research-outputs/mureau/home-affordability/188814%20Home%20Affordability%20Report%20Sept%202016%20v2[1].pdf?1A59E81314251462DA74652749CDEF03

Ministry of Social Development's outgoing-to-income ratio

Description

In an August 2016 report from the Ministry of Social Development (MSD), *Household incomes in New Zealand: Trends in indicators of inequality and hardship 1982 to 2015*, the author (Perry, 2016) [13] used a ratio measure to calculate housing affordability using data from Statistics New Zealand's Household Economic Survey (HES).

The HES data allows MSD to examine housing costs for both homeowners and renters in order to establish the number of households that have high 'outgoing-to-income ratios' (OTIs). Households that have high OTIs are defined as those that spend more than 30 percent of their unequivalised household disposable income on their gross unequivalised housing costs.

This measure captures the proportion of households that have OTIs greater than 30 percent in each income quintile. The measure also examines the proportion of households that have OTIs greater than 40 percent, and the proportion of lower quintile households that have OTIs greater than 50 percent.

For the lower two quintiles, the measure also provides a breakdown of trends by household type.

A particular feature of this measure is that it also examines housing costs using the unit of the individual rather than the household, which enables a comparison of different age brackets' OTIs.

Data sources

MSD's calculations use data from the most recent HES. This survey is run every three years by Statistics New Zealand and has a sample size of approximately 4700 households. [14]

Limitations

- The measure assesses only the affordability of living in a house, not purchasing it.
- It presents only national average figures, because the HES sample size is too small to capture regional differences.

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[13] Perry, B. (2016). *Household incomes in New Zealand: Trends in indicators of inequality and hardship 1982 to 2015*. Wellington: Ministry of Social Development, pp. 55–60.

[14] http://www.stats.govt.nz/survey-participants/survey-resources/hes-resource.aspx

Annex 2: Future developments for the HAM

This Annex is a list of future developments to the HAM that MBIE will look to implement in the future.

HAM Own: an indicator of housing affordability for home owner-occupiers

In developing the HAM, MBIE also developed an indicator of housing affordability for home owner-occupiers ('HAM Own').

HAM Own is intended to measure the affordability for home owner-occupiers living in their primary residence. Its design is similar to the other HAM indicators, with different housing costs. The housing costs for home owner-occupiers were estimated to include:

- mortgage payments, including principal repayments
- local body rates
- insurance
- body corporate fees (for property types that are typically part of a body corporate).

The HAM Own indicator was shown to be significantly different from the data that was used for its validation.[15] MBIE concluded that the HAM Own indicator was not yet of sufficient quality to be released with the other indicators (HAM Rent and HAM Buy).

More detailed geographical breakdowns

HAM Buy and HAM Rent are currently broken down by regional council area. MBIE considers this data to be an unbiased measure at that level. More detailed geographical breakdowns (such as territorial authority areas or census area units) may be possible, and would be extremely useful for many stakeholders. For example, the new National Policy Statement for Urban Development Capacity requires affected councils to monitor and report on several key indicators, including housing affordability for buyers, renters and home owner-occupiers. The HAM Buy and HAM Rent indicators would be ideal sources of data for this purpose.

To ensure that more detailed breakdowns are also unbiased measures of housing affordability, it is important that MBIE performs robustness checks on this data. These robustness checks are limited by the lack of similar data to check the HAM indicators against at that level of geographic breakdown. One possible check is to check the average household equivalisation factors (HEFs) for each area from the HAM indicators with the HEFs derived from 2006 and 2013 censuses for the same areas. This check would determine whether the level of the HEFs were about right at the time of those censuses, and a time-series consistency check would spot any stability issues with the household composition. Other checks may be required to determine whether or not these measures are unbiased at a lower level of geographical breakdown; MBIE will continue to work with Statistics New Zealand's Statistical Methods team on this issue.

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[15] As with the other HAM indicators, HAM Own was validated against an analogue measure constructed from the HES. This validation showed that HAM Own consistently showed housing was less affordable for home owner-occupiers than the analogue measure.

Improving the quality of household composition data in the IDI

The quality of household composition data is one of the key factors affecting the quality of the HAM indicators, because the HAM indicators are equivalised. Data on household composition comes from many administrative sources (based on peoples' interactions with government agencies), and is matched together in the IDI to create a reasonably complete estimate of the New Zealand resident population.

As part of their Census Transformation work programme, Statistics New Zealand compared data from the IDI on the New Zealand resident population with the most recent census in 2013 (Gibb et al, 2016). This comparison showed that at a national level, the IDI could estimate the New Zealand resident population to within about 1 percent (when compared to the similar data from the 2013 Census). This comparison exercise did not consider the composition of households: further work to determine the quality of household composition data in the IDI will be important to prioritising quality improvements in this data. Any improvements to the quality of household composition data in the IDI will result in improvements to the quality of the HAM indicators.

Annex 3: Quality of tenancy bond data

Like any administrative data source, the tenancy bond data used in the construction of the HAM trades off quality for completeness. The amount of data available in the tenancy bond data exceeds that available from any survey apart from the census. However, there are some quality issues that could have affected the HAM.

Data losses

Section 2.7 outlines the issue of missing data – including uncodeable addresses and tenancies that are not captured by the tenancy bond data.

The missing tenancies cannot be effectively adjusted for, as their characteristics are unknown – all we can do is compare the HAM results with an equivalent measure created from alternate data sources (see Annex 4).

The implications of the uncodeable addresses can be examined by calibrating the HAM data – weighting each household so the final HAM population more closely resembles the initial population of rental bonds.

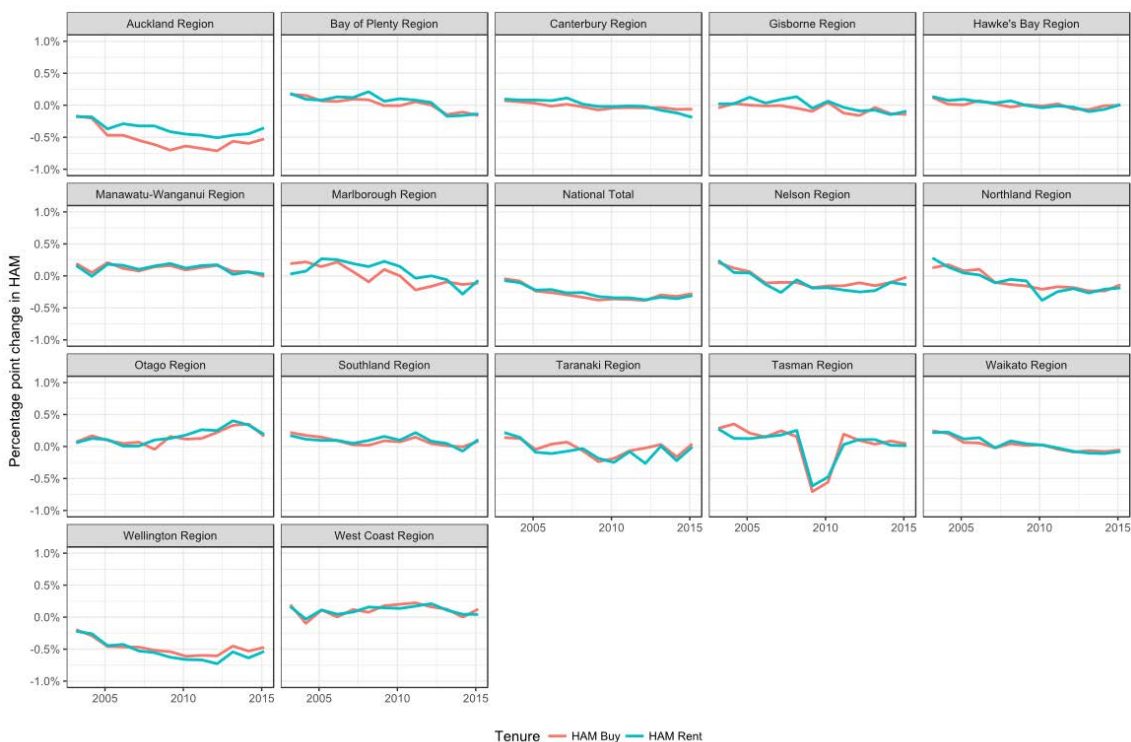The difference between the calibrated and uncalibrated HAM is presented below.

Figure 2: Variation in HAM with the introduction of calibration

While the calibration has an effect, especially in Auckland, the overall impact is very small – less than 1 percentage point in all cases and less than 0.5 percentage points in most cases. This suggests that the uncodeable addresses are having little to no impact on the HAM results.

Out-of-date data

One issue with the tenancy bond data is that it is often not updated when the rent changes. Under the *Residential Tenancies Act*, a landlord would only need to provide new information to MBIE if the bond itself was changed, and that rarely occurs.

To understand the likely effects of older bonds on rents, we have compared rent increases for active bonds of different ages to the growth in the 'Actual Rentals for Housing' component of the CPI. As the CPI uses a survey to capture rents, it is not be subject to the same potential bias as the Tenancy Bond Data. If older bonds were biasing the tenancy bond rent data, the growth of CPI rents would be higher than the tenancy bond rents, as the inaccurate older bonds acted as a drag on the tenancy bond rental series.

Figure 3: Annual rental growth: tenancy bond vs CPI

The tenancy bond rent series that most closely approximates the growth in CPI rents is the series without a cut-off, implying that the inclusion of older bonds in the tenancy bond data is not biasing the rental data used to construct the HAM.

Annex 4: Validation of HAM data against HES data

The method for producing the HAM, as well as much of the data, is novel. Furthermore, as noted in sections 2 and 3, there are several assumptions required for the HAM to be properly representative. Some of these assumptions, such as the assumption that our missing data does not bias the HAM results, are effectively impossible to test directly.

For this reason, we created an alternate version of the HAM using HES data. While the low sample size and annual frequency make the HES unsuitable for generating the main HAM series, the HES HAM can act as a useful test of the assumptions employed to construct the HAM, in particular that:

- the IDI addresses are sufficiently robust to allow us to assign people to households
- the tenancy bond data captures a representative sample of renting people

The following graph compares HAM Rent to HES HAM Rent and HAM Buy to HES HAM Buy. The HAM values are in blue, and the HES HAM values and 95 percent confidence intervals are marked in red. Red points represent HES HAM values with high sample error, and should be interpreted with care. Note that the regional breakdowns used here are different from the other presentations of the HAM. This is because we needed to use consistent regional definitions between the HES HAM and the HAM.
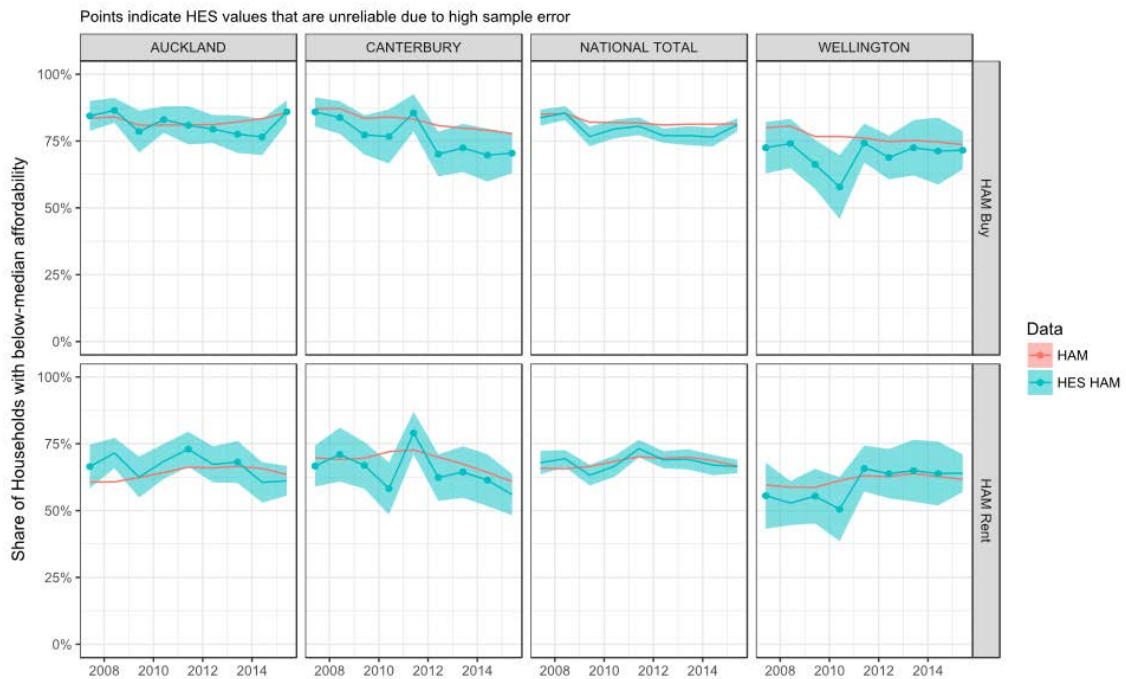

Figure 4: HES validation of HAM

In general, the values of HAM Rent fall within the sample errors for HES HAM Rent. There are some noteworthy variances for the national total, but even here the results are still broadly consistent.

The results for HAM Buy are similar, although HAM Buy does not fit quite as well as HAM Rent

Overall, these results suggest that, while we should continue to refine the HAM to identify possible biases, the indicators fall broadly within the parameters of the HES data.

Distribution of incomes and household size: HES vs IDI

To further compare HES and the IDI, the following tables summarise the differences between the household count and income for the HES and IDI for the year ending June 2013. These values are for the renting population only, as they are the households used to calculate HAM Buy and HAM Rent.

Table 1: Proportions of people in household

Household size	IDI	HES
1	14%	22%
2	20%	34%
3	19%	18%
4	16%	16%
5	11%	6%
6	7%	2%
7	5%	1%
8+	7%	1%

The HES identifies a higher proportion of 1- and 2-person households, while the IDI finds a higher proportion of larger households (those with 5+ people).

Table 2: Household income by decile

Percentile	IDI	HES	% difference
10	$22,660	$22,769	0.5%
20	$32,694	$32,136	−1.7%
30	$42,215	$42,473	0.6%
40	$52,746	$55,456	5.1%
50	$64,443	$68,597	6.4%
60	$77,564	$82,534	6.4%
70	$93,496	$100,114	7.1%
80	$115,052	$123,893	7.7%
90	$152,553	$165,859	8.7%

IDI and HES income are more similar at lower income levels, particularly at the 30th percentile and below. The variances at high income percentiles (60th and above) are less relevant, as almost every household with an income that high would be assigned to affordability category Band A in any case.

While these results do identify differences between the IDI and HES results, the similarity between the HAM and the HES HAM suggests these differences are not causing a substantial bias in the HAM.

Annex 5: At what price point do first home buyers normally buy?

This note draws together some information of the position of the market that first home buyers (FHBs) purchase at, and tests MBIE's assumption that the lower quartile house value in each territorial authority is an appropriate assumption to use in a measure of housing asset affordability for FHBs. The analysis draws on data on FHB sales from CoreLogic New Zealand Ltd.

Data summary

The data used for inform this analysis includes:

- the number of FHB sales, and share of total sales for selected areas,[16] and by year (2003–15)
- the number of FHB sales (and share of total FHB sales) in each quartile,[17] by area and by year (2003–15)
- the lower, median and upper quartile house prices by area, by year (2003–15).

FHBs as a share of total sales

On average, FHB sales make up 17.5 percent of all sales. A breakdown of the share of FHB sales by area is shown in Figure . Across the Auckland wards, the share of FHBs in total sales varied substantially. FHBs made up a larger share of the market in wards such as Manukau, Whau, Waitakere, Maungakiekie-Tamaki, and Manurewa-Papakura, and comparatively lower share in the Franklin, Rodney, Waitemata and Gulf, and Whangamarino wards. Outside Auckland, Hamilton, Wellington and Christchurch city had above-average prevalence of FHBs, whereas Tauranga and the rest of New Zealand had below-average FHB shares.

In some areas, the share of FHBs was decreasing over time, mostly in Auckland city, whereas the share of sales to FHBs was increasing over time elsewhere in New Zealand.

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[16] Selected areas are: Albany Ward; Albert-Eden-Roskill Ward; Awaroa ki Tuakau Ward; Franklin Ward; Howick Ward; Manukau Ward; Manurewa-Papakura Ward; Maungakiekie-Tamaki Ward; North Shore Ward; Orakei Ward; Otamatea Ward; Rodney Ward; Waitakere Ward; Waitemata and Gulf Ward; Whangamarino Ward; Whau Ward; Hamilton City; Tauranga City; Wellington City; Christchurch City; rest of New Zealand.

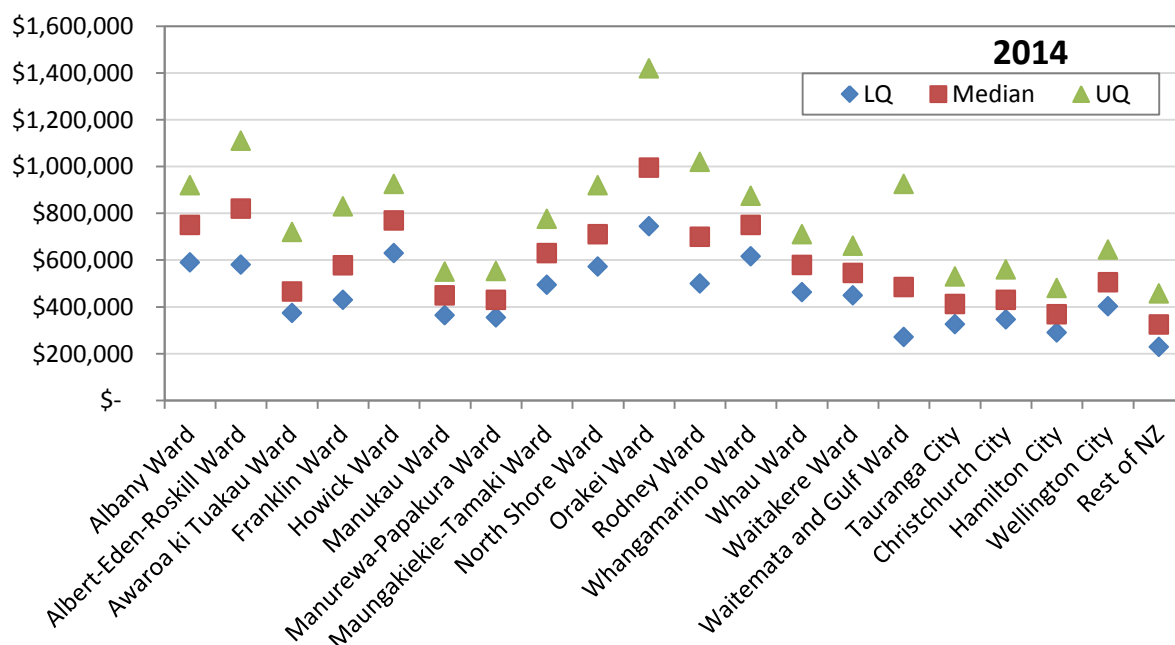[17] Up to lower quartile; from lower quartile to median; from median to upper quartile; over upper quartile.
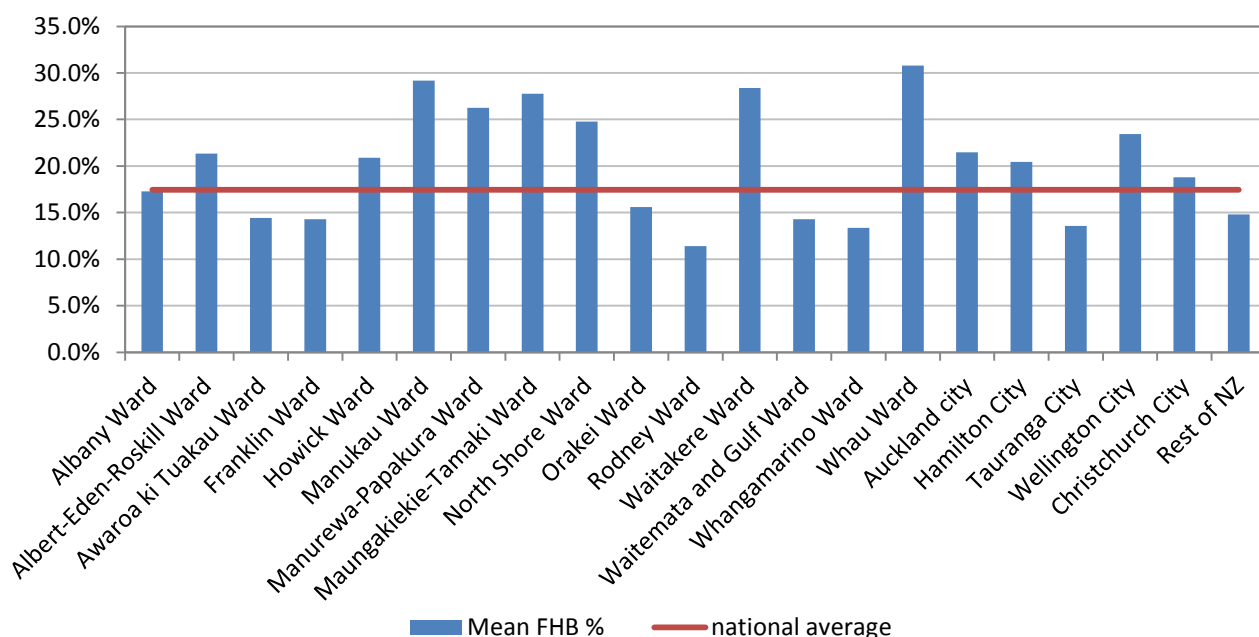
Source: CoreLogic NZ Ltd (2015)

Figure 5: Share of first home buyers in total property sales by area

Distribution of house prices by area

Figure shows the distribution of house prices in selected areas of New Zealand.

Source: CoreLogic NZ Ltd (2015)

Figure 6: Distribution of house prices by area

Share of first home buyers buying at positions within the housing market

Figure shows the share of FHBs buying at or below the lower quartile (LQ) of the market and the LQ of house prices in each area (in 2014). The share of FHBs shown in this figure is the mean over time. The error bars on the graph represent the standard deviation of this share over time. Areas with very few FHB sales (and therefore very large standard deviations) are shown as unfilled bars.
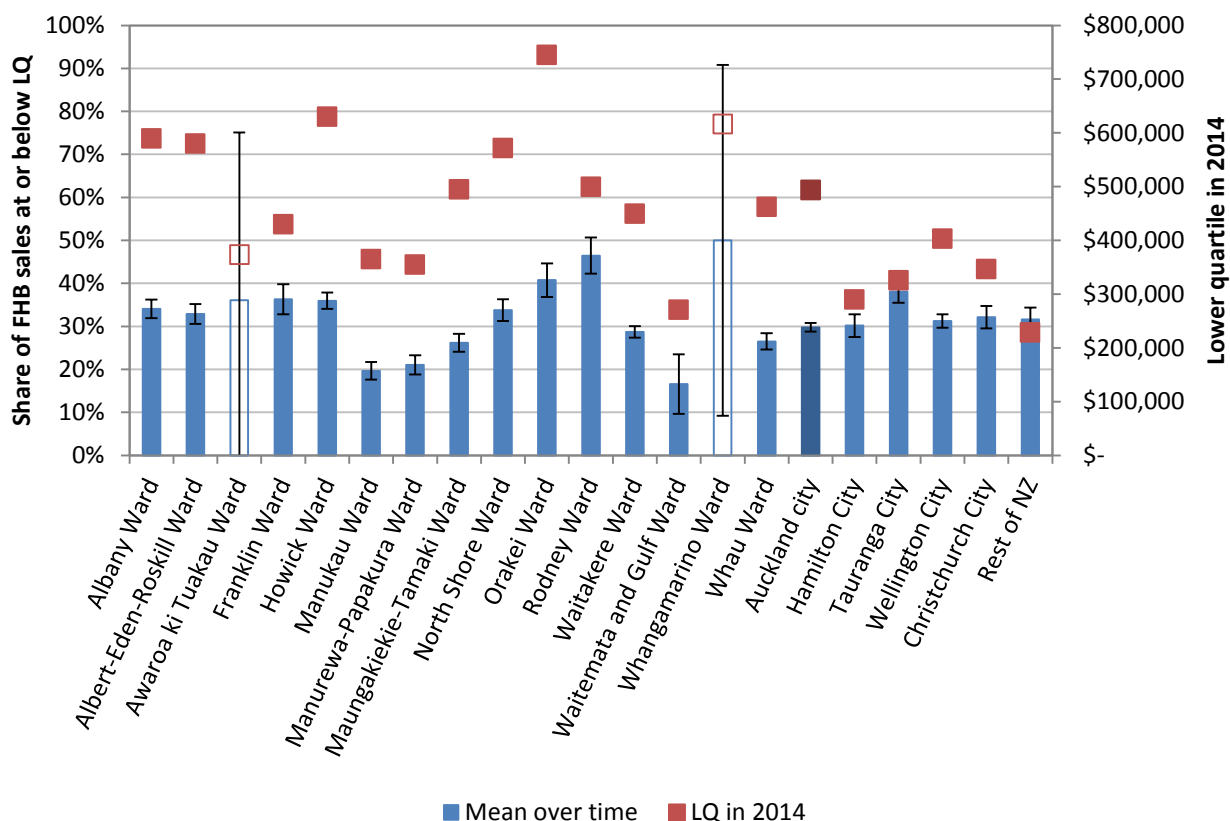

Figure 7: Share of first home buyers buying at or below the lower quartile, and lower quartile house prices

Although there is a great deal of variability within Auckland, the average share of FHBs buying at or below the LQ of the housing market is 29.8 percent. Within Auckland, there is a positive relationship between the share of FHBs buying at or below the LQ and the level of the LQ itself. This is because the higher the LQ is, the harder it is for an FHB to afford a more expensive property. Elsewhere in New Zealand, this relationship was less clear, with the share of FHBs that buy at or below the LQ being around 32 percent, and only Tauranga having a significantly higher share (38 percent).

Extending this analysis somewhat, Figure shows the share of FHBs buying below (and above) the median house price in Auckland and other cities. On average in New Zealand, 64.7 percent of FHBs buy below the median, and 35.3 percent buy above the median house price. The share of FHBs buying below the median is largely similar across New Zealand, except for Tauranga city, where 70.7 percent of FHBs buy properties below the median house price.
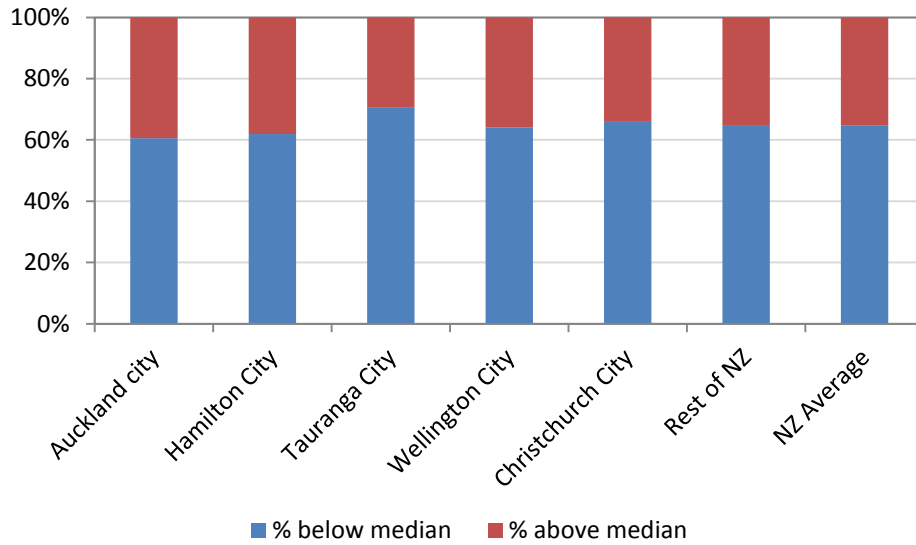
Figure 8: Share of FHBs buying below and above the median by area

Conclusions

From this data, we can conclude the following:

1. On average, FHBs make up about 18 percent of all house sales in New Zealand. This number varies from region to region, but is generally higher in the larger cities (Auckland, Hamilton, Wellington, and Christchurch) and is lower in rural areas and large cities (Tauranga and the rest of New Zealand).
2. Most FHBs (about 65 percent) buy below the median house price, and an appreciable fraction of FHBs (about 32 percent) buy at or below the LQ. These figures are fairly consistent across the areas shown, with the exception of Tauranga, where they are higher (71 percent and 38 percent respectively).
3. Because most FHBs buy at or below the median house price, we see no evidence from this analysis that would contradict our assumption that the LQ valued property in each territorial authority is an appropriate benchmark to use to assess housing asset affordability for FHBs.

Annex 6: Disclaimers

The results in this paper are an experimental series produced by the Ministry of Business Innovation and Employment. They are not a Tier One Official Statistic, nor have they been endorsed by Statistics New Zealand. They have been created for research purposes from the Integrated Data Infrastructure (IDI), managed by Statistics New Zealand.

The opinions, findings, recommendations, and conclusions expressed in this paper are those of the author(s), not Statistics NZ.

Access to the anonymised data used in this study was provided by Statistics NZ in accordance with security and confidentiality provisions of the Statistics Act 1975. Only people authorised by the Statistics Act 1975 are allowed to see data about a particular person, household, business, or organisation, and the results in this paper have been confidentialised to protect these groups from identification.

Careful consideration has been given to the privacy, security, and confidentiality issues associated with using administrative and survey data in the IDI. Further detail can be found in the Privacy impact assessment for the Integrated Data Infrastructure available from www.stats.govt.nz.

The results are based in part on tax data supplied by Inland Revenue to Statistics NZ under the Tax Administration Act 1994. This tax data must be used only for statistical purposes, and no individual information may be published or disclosed in any other form, or provided to Inland Revenue for administrative or regulatory purposes.

Any person who has had access to the unit record data has certified that they have been shown, have read, and have understood section 81 of the Tax Administration Act 1994, which relates to secrecy. Any discussion of data limitations or weaknesses is in the context of using the IDI for statistical purposes, and is not related to the data's ability to support Inland Revenue's core operational requirements.