

# Controlling house price affordability: Look to the rental market

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House price affordability has plummeted in many economies in spite of the belief in and use of monetary policies to control house price growth. This article examines quarterly data for New Zealand from Jan 2000 to April 2018 and illustrates that changes in mortgage rates had no recognisable effect on house price affordability. Instead, we reveal an inter-temporal and bi-directional relationship between affordability in the house rental market and affordability in the house ownership market. Increases in rental affordability do subsequently affect house price affordability but the relationship appears to be stronger the other way around, where house price affordability subsequently affects rental affordability. When we control for seasonality to allow for the socio-habit of moving at a particular time of year, we find that house price affordability subsequently affects rental affordability albeit after a 1-year delay and the reverse causality weakens significantly. Policies to control house price inflation should look at influencing rental prices in the housing market in order to reduce this rental hike pass through effect rather than to alter mortgage rates.

**Keywords:** Housing Affordability; Rental Affordability; Mortgage Rates; Affordable Housing

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## Introduction

Affordability is explored in this paper from the lens of both house price affordability and rental affordability. By house price affordability we mean how the ratio of house prices to wages have changed over time, and with rental affordability how rents to wage ratios have changed over time. Affordability variables interacting with mortgage Interest rates are of particular attention in this paper, in order to state with some strong assertion whether controlling interest rates has some strong correlation with house price affordability. Further, the relationship between house price affordability and rental affordability is explored, where we analyse the ratio relationships both forward and back in time as lags and leads. With house price affordability becoming out of reach for many, alternative tenure ‘choice’ into the rented sector means that decisions to rent are intertwined with the decisions to owner-occupy or owner-invest. Hence, the determination by a particular tenure on affordability is both novel and of policy interest, particularly if some rational argument for causality by a particular tenure’s affordability can be claimed. Geographical analysis is at national level for New Zealand which has arguably had, and is still experiencing, high unaffordability levels. To this aim, we seek a better understanding the interrelationship of house price affordability, rental affordability, and mortgage rates. We put forward 2 central research questions:

1. What affect has mortgage rates had on house price affordability over time?
2. What temporal bi-directional relationship is there between house price affordability and rental affordability?

This study makes an important contribution to the literature, because despite various and many academic discussions of house prices, there is not much in-depth analysis of house price affordability. Allied to this is a lack of analysis of rental affordability, especially in a contemporary setting where the option for many middle income earners is to rent rather than own. Further, the policy levers to deal with house price affordability is rather imprecise and/or analytical. There is a need to include or exclude the importance of mortgage rates when many other policy instruments could be more effective. An effective policy depends on what could be best used to what is being diagnosed as ‘the problem’ and if the problem wants to be ‘solved’ from an agency-institutional perspective. Work on causality assertions when looking at different types of tenure affordability is also a new, and can build on the more general discussion in the literature of affordability across the globe.

The results are particularly significant because in relation to mortgage rates, this determinant is often perceived as a strong instrument in controlling variables such as house prices. As low interest rates would mean the ability to purchase housing increases and those drives house prices up *vice versa*. The results in the relationship of house price affordability and rental affordability are significant when considering a significant time period of 18 years, but also in that time relationships of the ratios are tested at quarterly intervals both with lead and lag effects of up to 1 whole year. This layering of lag-lead analysis in multiple computations mean that any bi-temporal strengths picked up are significant, and especially worthy of attention if statistically significant. In doing so the results can also pick up weaker and stronger time directional relationships and this infer some degree of causality of house price affordability effecting rental affordability and *vice versa*. Bringing in even more significance is the use of

seasonality of rental affordability. Particularly if the quarterly lags and leads still hold the same strength of relationship when controlling for relative seasonal sales and rents, the overall general claims can be further confirmed or denied.

The paper has the following structure. First, we set the context and themes for the focus of study on affordability when looking at house prices, rents, wages and mortgage rates. Literature study is set both more in theory and concepts, as well as when applied to the New Zealand case. Second, there is an overview of the data and some visual trends of what the data is often describing as isolated variables. Third is the methodology that sets the overarching methodological framework, as well as explaining the particular methods and techniques that have been used. Limitations and explanation of why certain techniques were or were not used are also put forward. Fifth is the findings and analysis that provide evidence of affordability and mortgage rate connection, as well as findings in the bi-temporal affordability ration comparisons. These findings are set as both non-seasonal and seasonal to contribute in confirmation and significance of findings – both statistically and economically. Sixth is a discussion section that draws together the findings and contribution to the literature. The paper is then finalised by bringing conclusions, both as summary, and as overarching commentary to begin answering the central research question(s). Some implications for policy recommendations and further research are also concluded.

## **Literature review**

### *House price affordability, Rental Affordability and Mortgage Interest Rates*

Housing affordability issues have become a concern a greater number of people in society around the globe over the last decade (Voith and Wachter, 2009). With strong arguments supporting that affordability is contributing to inequality at various levels spatially, as well as individually and collectively (Baker et al., 2016). Housing Affordability more broadly can be seen normatively as that individuals and households all ought to be able to afford the purchase or rental of a house (Kuang and Li, 2012). From a positive economics approach to affordability, we see empirical ‘facts’ as to what affordability looks like, which could be for example through statistical analysis or spatial visualisation of affordability data (Meen and Andrew, 2008). House price statistical spatial analysis at sub-national scale is available over time-series (Gray 2012). Although what is in focus for this paper is new and comparable compound affordability ratios that are in a time-series. Further, this ratio (house price-wage; rent price-wage) approach builds on the discussion of measured typologies of affordability (Stone, 2006). Other affordability measures include residuals (such as residual disposable income, after housing costs have been subtracted from gross incomes) and costs (such as total housing costs) (Bourassa et al., 2006; Gan and Hill, 2009).

Some of the wider determinants of housing affordability include an exponential house price growth and capital accumulation in housing since the turn of the century (Harvey, 2012). Further determinants include the financialisation of housing where the mechanisms of growing interdependence of finance and housing occur (Aalbers, 2016). Mechanisms of interdependence are seen to be driven by globalization, neoliberalism, privatisation and ‘regulated deregulation’; and it is these financialisation drivers that are enabled through more technical financial mechanisms (Aalbers, 2016). For instance, mechanisms include larger

reliance on credit rating/scoring, the creation of new financial markets, securitisation of mortgage loans, greater subprime and predatory lending, rising mortgage debt, entry of private equity firms and hedge funds, and the emergence of social housing bonds and other financial derivatives used by public/social housing and housing associations.

Further determinants of house price affordability is seen (at least in the UK) due to changes *inter-alia* from demography, income distribution, housing supply, tenure, and an important long history of financial deregulation (Bramley, 1994). More recently the draw of investors purchasing multiple properties has added further reassurance on house price appreciations and as a substitute for wage income via rents and/or sale profits (Jordà et al., 2017). Positive stigma in owning rather than renting property also plays a part in the drift of owner-occupation as the tenure of choice (Foye et al., 2017). Drift from housing need via public or social housing has also shifted in language and economic resource, to a more market orientated policy focus of housing affordability (Whitehead, 1991; Hulchanski, 1995). Housing affordability is also distinct but not mutually exclusive from affordable housing, that is often provided at less than market rate due to subsidies on the demand or supply side (Galster, 1997). Although taking 'sides' in any subsidisation needs to consider what construes housing to be affordable in terms of structure, process, and context (Whitehead and Yates, 1998).

Wages as income also are important to research on affordability. With some studies indicating that inequality of income play an important role in determining different measures and levels of affordability (Matlack and Vigdor, 2008). More recent research develops new Gini measures of housing affordability inequality, that construct wage derived consumption bases, and in particular generate assertions that a consumption-adjusted measure suggests more pronounced affordability burdens among minority and underprivileged groups recently (Ben-Shahar et al, 2018). Wage incomes are a useful starting point in gauging affordability, however it is held with caution as more of an approximation. Particularly , as some authors highlight that there are affordability differences in renting affordability and purchasing affordability, as there are asymmetries but connections in what a household can afford and the loan amount for which a household qualifies (Jewkes and Delgagillo, 2010). Useful reflective studies of the past also remind us that wage data may be complex in that single households may have multiple earners and that this multiple household composition is changing over time (Gyourko and Linneman, 1993).

We can also contribute to thinking on housing choice as to whether households operate in separate or intertwined markets of home-ownership and rented accommodation (Dieleman, 2017). Market risk is seen as playing a part in these choices of tenure, and in doing so generates interdependence of both house price affordability and rental affordability (Sinai and Souleles, 2005). Research has professed that those with low incomes tend to be affected most by the problems of affordability (Bogdon and Can, 1997). Therefore, if a majority of low income earners are renters, then rental affordability is of interest, as is its connection to house price affordability. Rental housing affordability dynamics are seen as the typical tenure choice (at least in the short term) for the young, the elderly, the disabled, people in highly mobile professional sectors, and low-wage working families. With further attention drawn to trends that have put (in the United States case) rent burdens in 2009 to all-time high (Collinson, 2011). Of interest in this paper is private rent affordability that recently reports the rising importance of the private rental activity in the broader housing market, and that

the current architecture of public policy does not facilitate consideration of changes in the private rental sector (Hulse et al, 2015). We draw attention in this paper to the role of interest rate setting in public policy, and interrelation of rental and purchase affordability in dealing with the complex dynamics of shaping housing markets and their affordability.

In this paper we link with mortgage and interest rate housing literature to see whether claims of mortgage interest rate adjustment affect house price growth and thus affordability growth (Iacoviello, 2005). Particularly as research implies that interest rate fluctuations must figure prominently in any explanation of movements in price/rent ratios, alongside policy recommendations that government should play a leading role in dealing with falling house prices by helping to reduce interest rates on new mortgages (Hubbard and Mayer, 2009). As such the work in this paper may highlight the different policy responses required via mortgage interest depending on whether the housing market is rapidly heating or cooling. The theory being that higher rates will have a dampening effect on the housing market, and subsequent impact on house price affordability (Zhu et al., 2017).

### *New Zealand, Owner-Renter Affordability and Mortgage Interest*

For the national case of New Zealand its significance as a place of high housing unaffordability is considerable, with national high price to wage ratios being at 8.5 times in 2018 (REAU, 2018). At a regional scale, affordability in New Zealand is also asymmetric but for most regions considered highly unaffordable with house price to wage ratios in the regions of Auckland and Otago Central lakes both exceeding 13 times in 2018, with the most affordable region of Southland at the southern tip of the South Island still having a ratio above 4 (REAU, 2018). For the regions experiencing high unaffordability the urban centres of regional growth play a part. For instance, the city of Auckland often ranks highly in the Demographia global index of housing unaffordability (or low in affordability), and for the 2019 report ranked 7<sup>th</sup> as the most unaffordable city on the planet (Demographia, 2019).

Housing affordability more generally has been a rising social and political concern in New Zealand over the last 2 decades (Murphy, 2014; 2016). Although affordability concerns have become an issue for middle income earners, who can no longer purchase their own home without stable income and external capital support for deposits. The tenure of choice and majority is owner-occupation, and as such the affordability to purchase a home at recent high prices is now proving a cause of tension for households, and on alternative tenures that are unaffordable at a particular quality standard (Austin et al, 2014). Policy responses to housing affordability in New Zealand have focussed around for purchase properties and to spatially target areas that are problematic by designating housing accord and Special Housing Areas (MHUD, 2019a). Affordable housing supply approach includes a push for purchase affordable housing with a struggling flagship Kiwi-Build programme aimed at building 100,000 low(er) priced new build housing over 10 years (RadionNZ, 2019).

Renting in New Zealand is either public or private rented, although there is some traction in considering hybrid quasi-market models such as Housing Associations (Dykes, 2018). Public renting is ideologically and economically siloed as a public good and service for low income individuals and households in need (Johnson, 2017). Public housing is owned or leased

institutionally by the Housing New Zealand Corporation or registered Community Housing Providers (CHPs) (HNZC, 2018; MHUD, 2019b). A baseline stocktake of housing commissioned by a new Labour-led coalition government gave attention to public housing in New Zealand (Johnson et al., 2018). Financial help and a register for those needing to rent public housing is provided by the Ministry for Social Development (MSD, 2017). Plus the new lead for housing by the Ministry of Housing and Urban Development is taking on a greater coordinated interest in the planning, strategy, regulation, and commissioning of public and community needs based rented accommodation (MHUD, 2019b).

Private rented accommodation in New Zealand is becoming more prominent tenure to deal with affordability, and has its own affordability difficulties of cost-quality (NZPC, 2012; BRANZ, 2017; Squires and White, 2019). Affordability concerns in the private rented sector will be felt hardest and disproportionately by low income and vulnerable groups such as Maori and Pacific groups (Statistics New Zealand, 2016). No doubt the rising middle income groups unable to access purchased housing will find rental property prices increasing, particularly if the demand for private rentals increase and the supply of rental properties diminish. Significant seasonal effects of private rented tenures in New Zealand are also of importance if renting is to become a more prominent and permanent option (Johnson et al., 2018). This study contributes to these new and emerging trends of affordable rents, by integrating in the datasets that identify new private rental prices that accompany registered bond payments lodged to a regulated body (MBIE, 2019).

The setting of interest rates and mortgage interest rates is also of significance to the case of New Zealand. For instance, interest rate setting by the Reserve Bank of New Zealand is often perceived as a policy tool to dampen housing market demand (RBNZ, 2018). Furthermore, it is argued that falling interest rates has helped fuel price prices and potential house price bubbles in New Zealand (Fraser et al., 2008). It is noted that the RBNZ is not entrusted to try and maintain a level of affordability or level of purchase-rental house prices – in fact no institution is tasked with maintaining or enforcing an affordability measure. Also, if interest rate incentives are strong, the influence of Australasian banks in the New Zealand make setting interest rates with more local provision more difficult (Murphy, 2011). What is of less understanding, and of purpose in this research, is whether interest rates have some relationship with house price affordability, and whether interest rate setting as a way to dampen or accelerate house prices and their subsequent affordability is valid (Squires and Webber, 2018). For New Zealand and as applied elsewhere to other nations.

## Data

National level quarterly data from New Zealand for the period from 2000 to 2018 were extracted from several sources and merged into one dataset. Median house price data were taken from the Real Estate Institute of New Zealand (REINZ, 2019) where figures are released monthly and obtained from a survey of member agencies' sales during a specific month in the quarter. REINZ notes that there may be data irregularities due to errors in the returns or in processing, but when individual returns are combined with data from other agencies the distortion is likely to be small. The number of transactions also varies any may be very few in some months, and this can result in skewed median prices.

Average national weekly earnings data are provided directly by Statistics New Zealand. Mortgage interest rate data are based on the Reserve Bank of New Zealand (RBNZ) two-year fixed residential average mortgage interest rates at the end of month for registered banks. National weekly housing rental values are geometric mean weekly rents sourced from the Ministry of Business Innovation and Enterprise (MBIE, 2019). The rent data is sourced from tenancy bond database information and captured when private sector landlords lodge private bonds for all new rental bonds that are lodged each month. Further details of all the variables under analysis are presented in Table X. It is acknowledged as a limitation that data capture time periods for each variable in each quarter are varied, as the source data is not always captured at the same time period such as January or March for quarter 1. Given this limitation, the consequence is not material as capture is set over the larger longitudinal context to smooth any minor time capture misalignment. Further, the observations are largely in the middle month (e.g. February in the January-March quarter window) with mortgage rates in January but reported on the last day of that month, so again almost in the middle of the quarter.

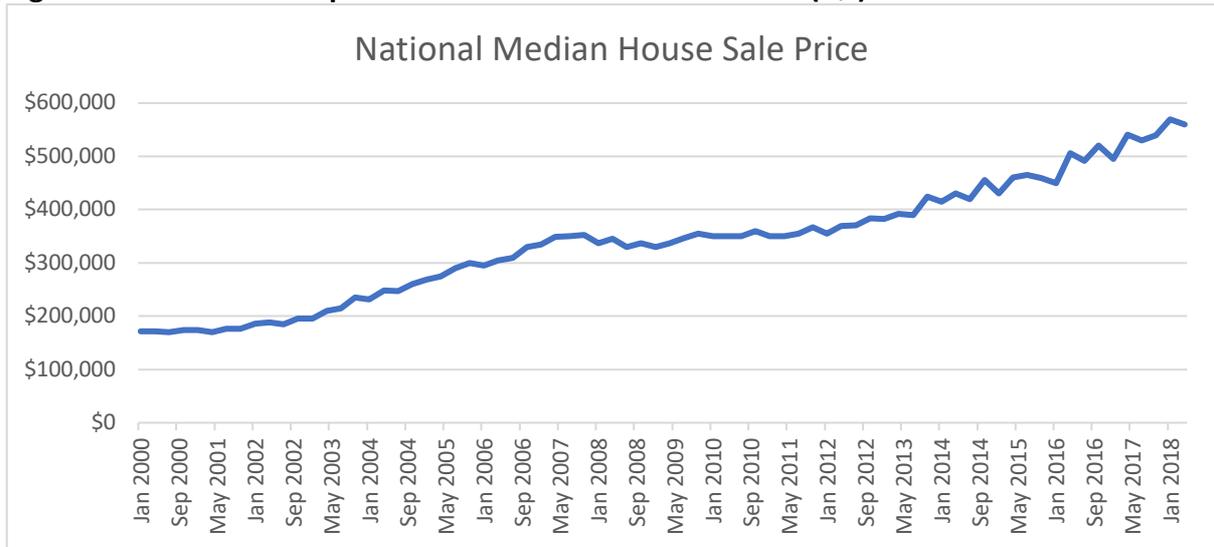
**Table X: Variables, examples, and time period data captured for each quarter**

Variable	Example	Q1 Data Captured	Q2 Data Captured	Q3 Data Captured	Q4 Data Captured
Time Period	Q1, 2000	N/A	N/A	N/A	N/A
National Median House Sale Price	\$171,000	Feb	May	Aug	Nov
National RBNZ mortgage data series for 2 year fixed rates for new residential mortgage rates	8.44%	Jan	Apr	Jul	Oct
National Weekly Wage	\$670	Feb	May	Aug	Nov
National Weekly Rents	\$148	Average of Jan, Feb, Mar	Average of Apr, May, Jun	Average of Jul, Aug, Sep	Average of Oct, Nov, Dec

Source: Authors

To gauge some broad understanding of the data we demonstrate some descriptive visual trends. Figure X presents the temporal pattern of house prices. Here we see an upward trend over the entire period with a flattening of this trend from the end of 2007 to the middle of 2012. Post 2007 trends coincides with the global recession, after which house prices proceed to slope upwards.

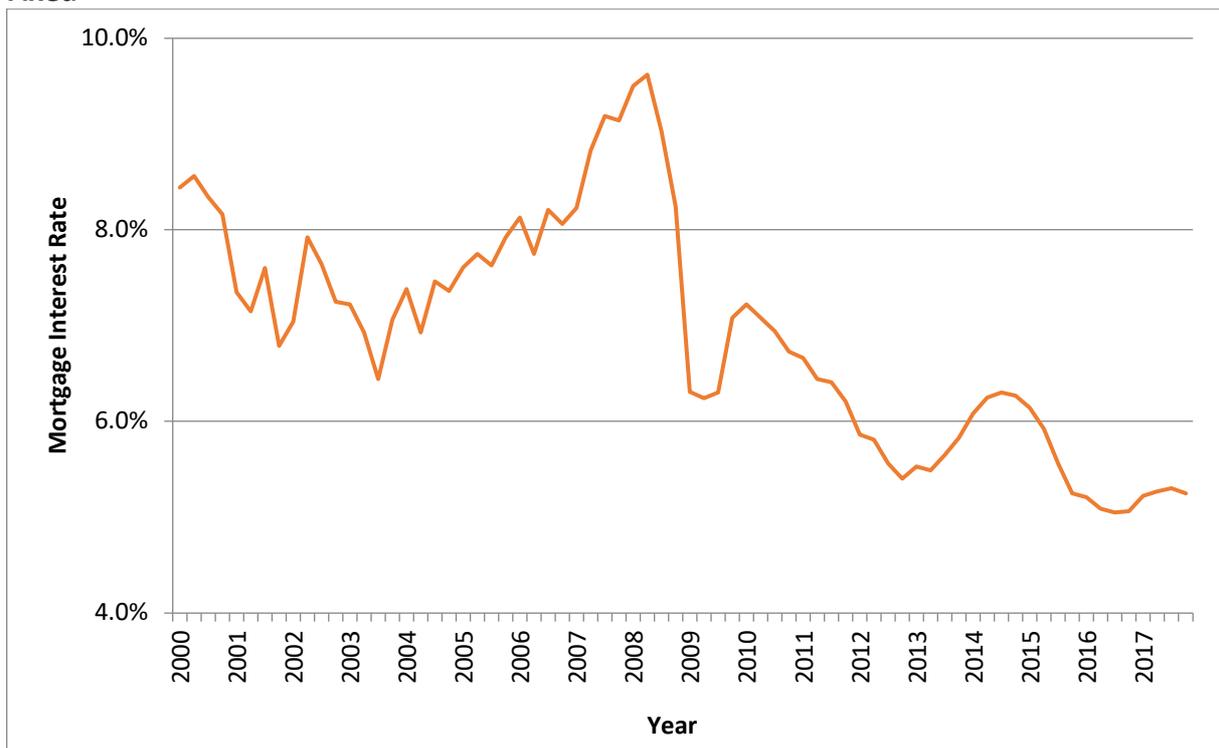
Figure X: Median house prices in New Zealand 2000 to 2018 (Q2)



Source: Authors' calculations using REINZ Data

Figure X presents the temporal pattern of mortgage rates and reveals an erratic decrease from 2000 until 2004, followed by an irregular upward trend until 2008, then a subsequent sharp decrease for 12 months, followed by a much smoother pattern thereafter. The relatively erratic nature of mortgage rate changes prior to the 2008 recession followed by a relatively smooth pattern after the recession may signal a movement away from excessive fine-tuning. As in focus of this study there may be a realisation that house prices are not as sensitive in New Zealand to mortgage rate changes as was originally thought.

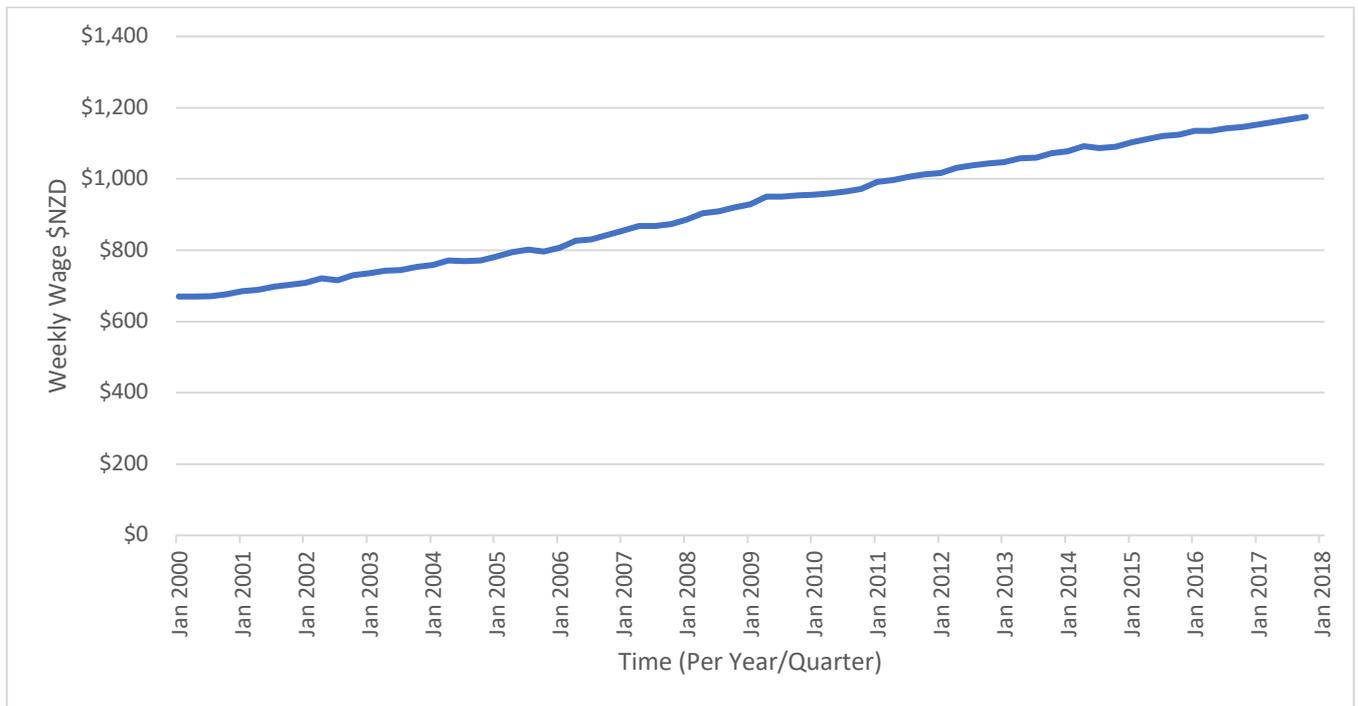
Figure X: National Mortgage Rates in New Zealand per Quarter 2000 to 2018 (Q2) – 2 Year Fixed



Source: Authors' calculations using RBNZ Data

A visual inspection of weekly wage data can be gleaned from Figure X, which reveals a gradual and uniform upward trend. Weekly wages rise from quarter 1 in 200 at approximately \$650 NZD to reach a high of nearly \$1200 NZD by 2018 (Q2)

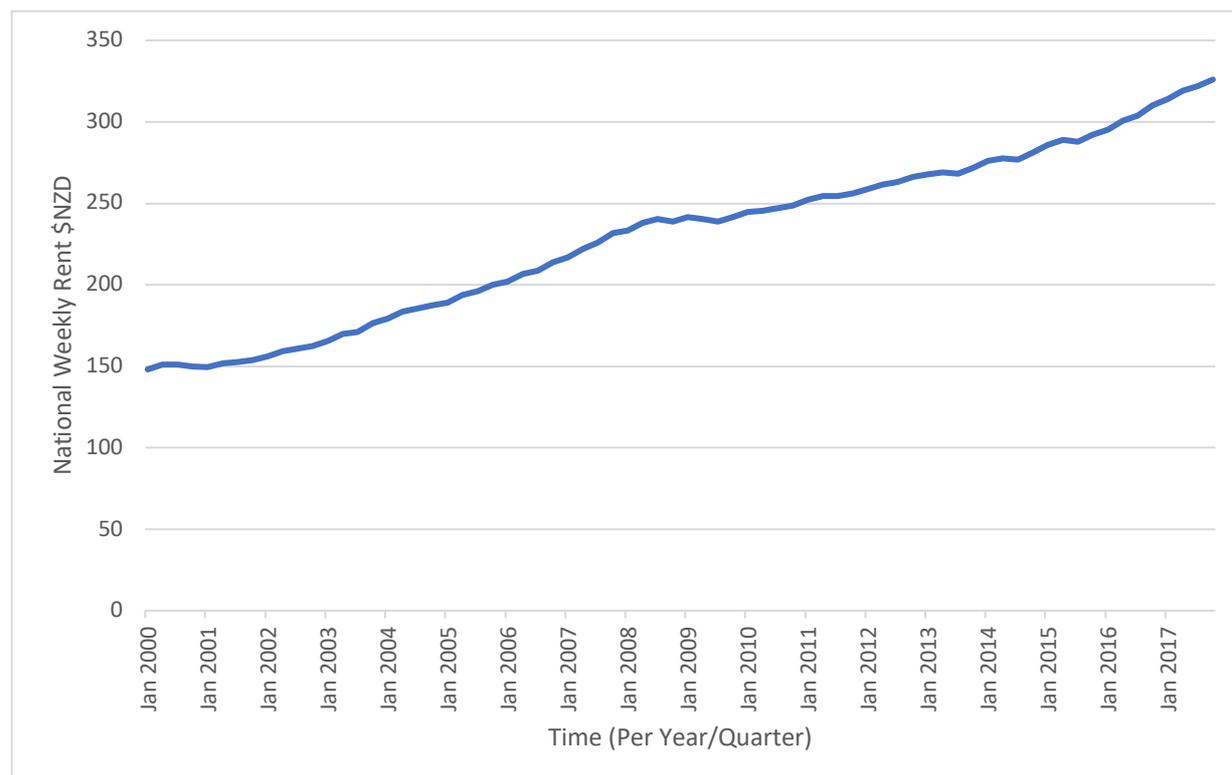
**Figure X: National Weekly Wage in New Zealand per Quarter 2000-2018 (Q2)**



Source: Authors' calculations using Statistics New Zealand Data

Finally, weekly house rental values are expected to increase most of the time. Figure X illustrates this data property and shows that the rate of increase in weekly rental values was faster prior to the recession when the subsequent rate of increase in weekly rental values slowed, and that the pace of increase in rental values eventually quickened thereafter.

**Figure X: National Weekly Rents in New Zealand per Quarter 2000-2018 (Q2)**



Source: Authors’ calculations using MBIE Data

To develop the dataset and variables further, we generated a range of new compound variables from the raw data described above. These new variables included house price affordability (weekly wages divided by house prices) and rent affordability (weekly wage divided by weekly rental values). Of particular interest are whether the change in these variables are correlated and whether a decrease in house price affordability in the current time period leads to a decrease in rental affordability in a subsequent time period or vice versa. In order to enable an examination of these dynamics, we calculated quarterly percentage changes in our variables, which is denoted by the letter D (for ‘differenced’) in the tables. We also lagged variables by up to four quarters in order to identify the length of time that any change in house price affordability has on rental affordability, and vice versa. Lags back in time are represented by the letter L (for lag) and forward in time by the letter F (for forward). Similar change values were estimated for mortgage rates and wages but are rarely reported here, as they were seldom statistically significant in our empirical estimations. Further details of these transformed variables are presented in Table X.

**Table X: Transformed and new compound variables**

Variable Code	Variable Name	Value Type
D.house_price_affordability	House Price Affordability	Quarterly % Change
D_mortgage_rates	Mortgage Rates	Quarterly % Change
• L1.D_mortgage_rates	Mortgage Rates – Lag 1 Quarter	
• L2.D_mortgage_rates	Mortgage Rates – Lag 2 Quarters	
• L3.D_mortgage_rates	Mortgage Rates – Lag 3 Quarters	
• L4.D_mortgage_rates	Mortgage Rates – Lag 4 Quarters	
• F1.D_mortgage_rates	Mortgage Rates – Lead 1 Quarter	

<b>D_rent_affordability</b>	<b>Rent Affordability</b>	<b>Quarterly % Change</b>
• L1.D_rent_affordability	Rent Affordability – Lag 1 Quarter	
• L2.D_rent_affordability	Rent Affordability – Lag 2 Quarters	
• L3.D_rent_affordability	Rent Affordability – Lag 3 Quarters	
• L4.D_rent_affordability	Rent Affordability – Lag 4 Quarters	
• F1.D_rent_affordability	Rent Affordability – Lead 1 Quarter	
• F2.D_rent_affordability	Rent Affordability – Lead 2 Quarters	
• F3.D_rent_affordability	Rent Affordability – Lead 3 Quarters	
• F4.D_rent_affordability	Rent Affordability – Lead 4 Quarters	
<b>D_weekly_wage</b>	<b>Weekly Wage</b>	<b>Quarterly % Change</b>
• L1.D_weekly_wage	Weekly Wage – Lag 1 Quarter	
• L4.D_weekly_wage	Weekly Wage – Lag 4 Quarters	

Source: Authors

## Methodology

To reiterate the focus of this paper, the study aims to better understand some of the constituent factors and variables that are arguably contributing to house price affordability. Here we explore house price affordability and uncover whether affordability has any strong relationship with mortgage rates and/or rental affordability. We do this by posing a central research question as to: (1) What affect mortgage rates has on house price affordability over time? (Vice versa); and (2) What temporal bi-directional relationship is there between house price affordability and rental affordability? In order to assess the statistical concurrent and inter-temporal relations between house prices, rental values and mortgage rates we chose to utilise time-series regression analyses.

An advantage of using regression analyses in this instance is that it can reveal the concurrent and inter-temporal correlations using the quarterly data and including the lagging and leading correlations. From the results of such an estimation process, we can infer a degree of causality depending on the direction (lags or leads) of the revealed correlations. We are aware that claims for causality are to be taken with caution. Causation is used in some of the analysis to bring certainty of relationship over time. This means that time separation enables us to get closer to arguing that there is a causation than there would have been otherwise. Forward (lead) and back (lag) in time analysis is also interesting to further infer causality, especially if one direction has stronger effects and thus may have occurred over time rather than by chance.

Temporal lags represent a change that occurred a quarter or more ago. For example, an increase in the mortgage rate three months ago might lead to a decrease (or a slower rate of increase) in house prices in the present period and/or an increase in house price affordability in the present period. Temporal leads represent a change that will occur a quarter or more in the future; for example, an increase in rental values in the current period might lead to an increase in house prices (and a decrease in affordability) six months later as people decide to switch out of renting and into home ownership.

We incorporated into the models four quarter lags (L1, L2, L3 and L4) and four quarter leads (F1, F2, F3 and F4) for both house price affordability and rental affordability. The reason for

such a complex lag and lead model is that the pattern of interaction between these two variables is currently unclear and that any identifiable concurrent and inter-temporal correlation will ameliorate our understanding about the possibility of effective policy to dampen the rates of decrease in house price and rental affordabilities should that be a policy objective.

Temporal lags and leads were also constructed for mortgage rates and wage variables. The rationale here is that mortgage rate changes in the current time period may have an immediate effect on house price affordability, but there is also the theoretical possibility that the rate of house price increases slows because of the expectation of a mortgage rate increase, in which case the mortgage rate change we should control for is a mortgage rate change in the immediate future (F1). There is also the strong possibility that the effects of a mortgage rate change take time to filter into the rate of change in house price affordability. Perhaps because customers have consciously decided to make a house purchase already, or perhaps because mortgage rate changes are not affecting the house purchase decision significantly. Or even perhaps because sellers have already decided upon the price that they will sell at, and hence the effect of mortgage rate changes may need to be lagged by between 1 and 4 quarters (L1, L2, L3 or L4) before a house price affordability change.

Lags and leads were also constructed for wages to enable an assessment of any related temporal effects such as when a wage increase provides the purchaser with a sense of increased wealth and a feeling of greater purchasing power.

### Findings, Analysis and Discussion

We chose to estimate our models in two steps. First, we sought to identify the relations between house price affordability and mortgage rates, as well as simultaneous account of rental affordability and wages. Then, we proceeded to re-estimate the model with the inclusion of seasonality identifiers. Initial exclusion of seasonality identifiers can be justified on the grounds that we wish to identify if the long run relations exists irrespective of the seasonality component, after all both demand and supply of housing fluctuate in the same way throughout the year with higher demand to sell and buy during the spring and summer periods; if the relations exist with and without seasonality included then we will have a higher level of confidence that the result did not occur by chance. This estimation strategy results in two main tables of results, where Table X does not contain seasonality variables, and Table X which does.

**Table X: Time series regression results: Non-Seasonality**

house_price_afford~y	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
<b>D mortgage_rates  </b>					
--.	-.0032899	.0037526	-0.88	0.385	-.0108436 .0042637
L1.	.0040019	.0036498	1.10	0.279	-.0033447 .0113485
L2.	-.0002551	.0036003	-0.07	0.944	-.0075021 .0069919
L3.	.0053365	.0036748	1.45	0.153	-.0020605 .0127334
L4.	-.0030411	.0036158	-0.84	0.405	-.0103193 .0042371
F1.	.001773	.0037028	0.48	0.634	-.0056804 .0092263
<b>D rent_affordability  </b>					
--.	.0005901	.0004758	1.24	0.221	-.0003676 .0015478
L1.	-.0005317	.0004339	-1.23	0.227	-.0014051 .0003417

L2.		.000662	.0003857	1.72	0.093	-.0001144	.0014384
L3.		-.0002456	.0003884	-0.63	0.530	-.0010273	.0005362
L4.		.0000207	.0004096	0.05	0.960	-.0008038	.0008452
F1.		.0005621	.0003743	1.50	0.140	-.0001913	.0013155
F2.		.0006889	.000384	1.79	0.079	-.0000842	.0014619
F3.		-.0005918	.0003625	-1.63	0.109	-.0013214	.0001377
F4.		.0008117	.0003706	2.19	0.034	.0000658	.0015577
<b>D_weekly_wage</b>							
--.		-9.77e-07	3.07e-06	-0.32	0.752	-7.17e-06	5.21e-06
L1.		5.42e-06	2.79e-06	1.94	0.059	-2.03e-07	.000011
L4.		8.54e-07	2.83e-06	0.30	0.764	-4.85e-06	6.55e-06
<b>cons</b>							
		-.0000357	.0000413	-0.86	0.392	-.0001187	.0000474
<b>Further Data:</b>							
Number of observations = 65							
F( 18, 46) = 1.64							
Prob > F = 0.089							
R-squared = 0.391							
Adj R-squared = 0.153							

Source: Authors' Calculations

### *Findings 1 - Mortgage Rates do not have a Concurrent Effect on House Price Affordability*

Table X reveals results that changes in mortgage rates do not have a concurrent effect on house price affordability, although mortgage rates do not seem to have the expected negative effect if anything. In fact, the results presented below indicate that there is no statistically significant effect across any of the four lags and one lead for mortgage rates (statistical significance demonstrated by P values smaller than 0.1). These results are consistent with the recent contribution to the literature by Squires and Webber (2018), which also focused on the New Zealand economy, and corroborates understanding that mortgage rate adjustments have a blunt effect if any on house price affordability. Our results extend the literature by highlighting that changes in mortgage rates in a subsequent quarter, which might have a strong element of predictability, do not statistically significantly affect changes in house price affordability (Iacoviello, 2005). In other words, if you expect mortgage rates to change in the next quarter and they do, then this does not affect house price affordability (Hubbard and Mayer, 2009).

### *Findings 2 - Bidirectional Inter-Temporal Interactions between Rental Affordability and House Price Affordability*

Of particular interest is whether changes in house price affordability are correlated with changes in rental affordability, and the second group of results in table X reveals the estimated correlations between house price affordability and lags and leads of rental affordability. Our results suggest that an increase in rental affordability reduces the upward pressure on house prices thereby making house prices more affordable 6 months later (i.e. L2, which is a positive coefficient; and a P-value at 0.093 indicating that we can be over 90% sure it didn't occur by chance). This is in line with expectations because it illustrates that if it becomes relatively cheaper to live in a rented abode then there is less demand to purchase one (Dieleman, 2017). The temporal lag of interest here is L2, suggesting that the lag is equal to 6 months. Again, this is intuitively appealing because half a year is likely to be a rough approximate estimate of the time it would take to search for and find a property of interest to purchase and also to bring the rental contract to an end with proper notice (Sinai and Souleles, 2005).

The above discussion suggests that there is a positive causality from changes in rental affordability to changes in house price affordability. It is interesting to explore whether there is any evidence for a positive causation in the opposite temporal direction. The results suggest that an increase in house price affordability increases rental affordability 6 months (2 quarters, F2) and 1 year (i.e. 4 quarters, F4) later as a forward-lead effect. The relatively high speed of sale of a property in New Zealand may be behind the significant estimate for 6 months; it is also perhaps understandable that a longer time period of 1 year is even more significant (P value at 0.034) as home ownership typically requires the devotion of extra resources and care towards the property which is associated with greater emotional attachment which may well delay the causation (Foye et al., 2017).

Also of note is that the magnitudes of the marginal effects of the 6 month lag and lead effects are insignificantly different from each other, suggesting that the effect of changes in rental affordability on house price affordability are the same as the effect of changes in house price affordability on rental affordability. A degree of equality is synonymous with a strong interaction effect between the two markets. Hence, the main finding is that there are clear bidirectional inter-temporal interactions between rental affordability values and house price affordability values in the New Zealand housing market. Interactions of owner-investor and rental markets are worthy of policy attention, and even needs to stretch beyond this analysis to consider other tenures as part of the broader housing system. Particularly if housing market shaping is inherently favoured to towards a majority owner-occupying class (Squires and White, 2019).

The third set of results in Table X suggests a relationship between wages and house price affordability, with increases in wages leading to an increase in house price affordability 3 months later (L1). This is likely to reflect a feeling of greater wealth and purchasing power which may leads a household to make the decision to purchase a property which they can call their own (Ben-Shahar et al, 2018). That said, the coefficient for wage calculations in relation to house price affordability are so small it is not too important an effect to postulate further.

### *Findings 3 – Inclusion of Seasonality Indicates House Price Affordability Leads Rental Affordability 1 Year Later.*

The exclusion of seasonal effects on the housing market in Table X above may bias the estimated results. It is also possible that including seasonality in our models with reveals a stability in the results that can enhance our confidence that the identified relations are stable. Table X below presents a re-estimate of the above model but this time including a set of dummy variables to reflect seasonality. Of further note for model comparison is that the variables included in the previous model shown in table X were able to explain 39 percent of the variation in house price affordability. The inclusion of these seasonal controls increases this such that the new model is able to explain 58 percent of the variation in house price affordability (i.e. R Squared 0.58), indicating a substantial improvement.

Prior to regression, we examined the raw data and it appears that house price affordability was lowest in quarter 4 (October-December, which is spring in New Zealand), implying that it is a sellers' market in spring in the New Zealand housing market when relative high prices are

paid for properties. This could be the case if there are fewer purchases who may instead be saving for the festive and holiday season towards the end of December and into January and February, or it could be due to buyers willing to pay higher prices during this season before other purchasers entering the market in the summer time (REINZ, 2019). Due to the observation that house price affordability is lowest in quarter 4, we chose to use quarter 4 as the base category for seasonality so that all of the other seasonal dummies have a positive coefficient, and hence they illustrate greater house price affordability in a particular season relative to springtime.

**Table X: Seasonality in Time Series Regression Results**

house_price_afford~y	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
<b>D mortgage rates</b>						
--.	-.0013024	.0033075	-0.39	0.696	-.0079727	.0053678
L1.	.0031698	.0031846	1.00	0.325	-.0032526	.0095921
L2.	.000974	.0031591	0.31	0.759	-.0053969	.0073449
L3.	.0027706	.0032385	0.86	0.397	-.0037604	.0093016
L4.	-.0013047	.0031517	-0.41	0.681	-.0076607	.0050514
F1.	-.0010225	.0032666	-0.31	0.756	-.0076103	.0055652
<b>D rent affordability</b>						
--.	.0003947	.0004419	0.89	0.377	-.0004964	.0012858
L1.	.0000717	.0004201	0.17	0.865	-.0007754	.0009188
L2.	.000354	.0003418	1.04	0.306	-.0003352	.0010433
L3.	-.0000517	.0003579	-0.14	0.886	-.0007736	.0006701
L4.	-.0002013	.000379	-0.53	0.598	-.0009656	.000563
F1.	.000475	.0003344	1.42	0.163	-.0001993	.0011494
F2.	.0004553	.0003403	1.34	0.188	-.000231	.0011417
F3.	-.0002945	.0003266	-0.90	0.372	-.0009531	.000364
F4.	.0006985	.0003236	2.16	0.036	.000046	.001351
<b>D weekly wage</b>						
--.	3.07e-07	3.10e-06	0.10	0.922	-5.95e-06	6.57e-06
L1.	2.35e-06	3.00e-06	0.78	0.437	-3.69e-06	8.39e-06
L4.	1.32e-06	2.80e-06	0.47	0.639	-4.32e-06	6.97e-06
<b>Seasonality Rel. to Q4</b>						
Q1	.0001227	.0000356	3.45	0.001	.000051	.0001945
Q2	2.14e-06	.0000379	0.06	0.955	-.0000742	.0000785
Q3	.0000684	.0000436	1.57	0.124	-.0000195	.0001564
cons	-.000075	.0000422	-1.78	0.083	-.0001602	.0000102
<b>Further Data:</b>						
Number of observations	=	65				
F( 21, 43)	=	2.77				
Prob > F	=	0.0023				
R-squared	=	0.5753				
Adj R-squared	=	0.3680				

Source: Authors' Calculations

Our results in table X show that house price affordability increases the most quarter 1 of the calendar year, summer, suggesting that it is a buyers' market immediately after the Christmas festive period, perhaps because this is the traditional time of year for moving house in New Zealand and there are relatively more houses available to purchase on the market which encourages the vender to sell at a lower price rather than to miss a sale (Johnson et al., 2018).

Table X also highlights that the inclusion of seasonal controls does not affect our conclusion that mortgage rate changes have an insignificant effect on house price affordability in New Zealand over this time period. None of the lag or lead mortgage related variables are

statistically significant at traditional levels, which leads us to conclude that mortgage rates are a very blunt tool to control the overheating in the housing market and in influencing the affordability of house prices, and hence any policy maker who is interested in influencing these two connected markets should look elsewhere (Zhu et al., 2017).

The inclusion of the seasonal controls appear to have a correlation with the rental affordability variables, as the magnitude of the coefficients fall, although most of them retain the same estimated sign. Specifically, our results above suggested that there was a bi-direction of causality between house price affordability and rental affordability. These new results, which include seasonal controls, suggest that changes in rental affordability do not affect house price affordability in six months' time. Part of the reason for this could be that home ownership also has a degree of positive stigma and status, which reduces the sensitivity of rental affordability to house price affordability (Foye et al., 2017).

The results presented in Table X corroborate the idea that an increase in house price affordability increases rental affordability 1 year (i.e. 4 quarters, F4) later. The one-year temporal effect signifies that a fall in house price affordability, probably associated with an increase house prices, will eventually feed through to an increase in rental prices. This is intuitively appealing because it likely reflects greater prices changed to renters who do not have the financial ability to purchase a house and the time delay is likely to reflect the higher rental values when rental contracts are renewed in subsequent contractual agreements (Jordà et al., 2017). Hence, these results emphasise the need to control house price affordability because it significantly affects those who are financially constrained and unable to purchase a house (Austin et al, 2014).

So, when we ignore seasonality there appears to be clear evidence of bidirectional temporal interactions between rental and house price affordability values, where increases in house price affordability leads to an increase in rental affordability and (importantly) vice versa. But when we include seasonality in our estimations, perhaps reflecting some underlying socio-habit of moving at a particular time of year, the bidirectional causality becomes weaker and what remains is a clear direction of causation: changes in house price affordability affect and lead rental affordability 1 year later.

With this in mind, it is worth questioning whether controls on rental affordability would quell the upward pressure on house price increases, especially if buying to let incentives are reduced with less upward pressure on rental returns (Hulse et al, 2015).

## Conclusion

The current literature is currently unclear about the concurrent and inter-temporal associations between (1) house price affordability and house rental affordability rates; and (2) mortgage rates. Yet the former are close substitutes, and the latter is believed to be a key policy lever to affect the others. An investigation into these associations in a single model is unknown especially for the New Zealand economy. This paper presents the first empirical examination of New Zealand house price affordability, rental affordability and mortgage rates for the period from 2000 until 2018, using quarterly data and utilising time series regressions with lags and leads.

The results indicate that during this time period mortgage rates did not have a significant effect on house price affordability. We did find a bi-directional inter-temporal relation between house price affordability and rental affordability albeit with 6 months' lags, so that a change in house price affordability influences rental affordability two quarters later, and vice versa. Our results also suggest that a change in house price affordability has a positive association with rental affordability albeit over a longer term of one whole year.

When we include the effects of seasonality in our models to take account of the socio-habit (or unidentified determinant) of moving house at a particular time of year, the bi-directional causality between changes in house price affordability and rental affordability becomes weaker. Our identification of a longer-term association between changes in house price affordability leads to a positive change in rental affordability remains relatively stable.

Hence, this paper provides evidence which suggests that mortgage rates are a very blunt instrument for controlling house prices in the New Zealand economy, and we should focus our policy attentions on substitutes for a home ownership instead, which is the rental market. Although decreases in house price affordability subsequently decrease rental affordability, future research should explore whether rent controls or allied policy would reduce this price pass through effect and diminish upward pressures on house price affordability.

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