Reserve Bank of New Zealand Analytical Notes

A closer look at some of the supply and demand factors influencing residential property markets

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NON-TECHNICAL SUMMARY

Housing market outcomes can be influenced by a range of different factors. In the long run, house prices will tend to converge to the cost of new housing construction (including land). However, house prices, like all asset prices, can diverge from their justifiable long-run equilibrium for extended periods of time.

Supply conditions – which are influenced by a range of regulatory and geographic factors – are a key determinant of housing market outcomes. Low housing supply responsiveness can result in volatile house price inflation and increases in house prices that appear to be semi-permanent. Expectations of future capital gains, perhaps based on past experience, can amplify the impact of supply constraints – resulting in overshoots in house prices and driving a wedge between house price and rental inflation. Because house price and rental inflation often behave differently, it is important to diagnose supply conditions independent of rents.

The Canterbury earthquakes created a significant and easily identifiable temporary shortfall of accommodation. A reduction in the number of habitable houses has put upward pressure on house prices and rents. In Auckland, there also appears to be a shortage of houses, and Auckland has experienced somewhat higher rental inflation than in the rest of New Zealand over the past couple of years. However, house price inflation has significantly outpaced rental inflation, suggesting that it is not just demand for current accommodation that has influenced the Auckland market.

Factors such as low interest rates and easier credit standards have probably contributed to increased demand to purchase houses recently. While these factors impact the whole country, house prices will have been more affected in areas where supply constraints are more binding. Supply tends to be slow to respond to increased demand in New Zealand, but particularly in Auckland where population growth is strong and "effective" land supply is constrained by regulation. Expectations of continuing land scarcity and population pressures in Auckland may be underpinning expectations that Auckland house prices will continue rising in the future.

Some market participants probably do not appreciate the considerable uncertainty around the outlook for house prices. If supply conditions in Auckland remain constrained, real house prices might be expected to continue rising over the longer run. However, expectations can be disappointed. People often do not foresee the impact that a supply response will have on house prices in the future. Rising house prices have a tendency to overshoot and then ultimately to reverse substantially. A change in the balance between population growth and new housing supply could lead to a significant and sustained fall in real house prices at some point in the future – even in Auckland.

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INTRODUCTION[1]

Residential property markets are very important. Shelter is a basic human need, and for many people a house is the largest asset they ever own. Dynamics in residential property markets can also have a significant impact on the cyclical performance of national economies. However, residential property markets are also complex. Outcomes are determined by conditions in – and interactions between – a number of individual markets: the market to rent a house, the market to own a house, and the market to build a house (which is, in turn, affected by the market for land).[2] Demand and supply conditions in each of these markets matter. And unobservable, often implicit, expectations about the future can play a significant role.

This note takes a closer look at some of the possible influences on demand and supply in residential property markets (others, such as tax treatment, are ignored). The first section of this paper provides some key observations about the behaviour of residential property markets. A more theoretical framework, which underlies these observations, can be found in the Appendix. The second section goes on to consider how such factors might be relevant in the current New Zealand context.

1. TOWARDS UNDERSTANDING RESIDENTIAL PROPERTY MARKETS

The markets to build, to rent, and to own houses are related, but they each involve something different. The market to build new houses determines the total physical supply of houses available (whether for owner-occupation or for renting), and is influenced by the price a house can be sold for, the cost of building a new house, and the cost of the land that the house is built on. The cost of building a new house and the cost of land are determined by a range of market and regulatory factors.

Renting a house is a form of current consumption, whereas owning a house is an investment to varying degrees. For a landlord, owning a house is an investment that generates both rental income (net of expenses) and capital gains (or losses). An owner-occupier consumes the current rental services implicitly associated with the property but is exposed to capital gains (or losses). And if an owner-occupier is in a shared living situation, they are trading some of their imputed rents for actual rental income.

Because renting and owning a house are not perfect substitutes (particularly given that terms of leases are typically short in New Zealand), the markets for these

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[2] Each of these markets can be thought of as an aggregation of a large number of regional sub-markets, each subject to their own market and regulatory conditions.

products tend to behave differently. House prices are influenced by a range of factors that don't affect rents in the current period.

i. SUPPLY RESPONSIVENESS AND LAND AVAILABILITY ARE CRUCIAL

Building new houses allows the residential property market to adjust to increased demand. In the long run supply will respond such that house prices tend towards the cost of new construction, which comprises the costs of the land on which new houses can be built, the costs of materials and labour required, and the associated financing and consenting costs. The cost of new construction determines both the equilibrium level of house prices in the long-term and the incentive for new houses to be built in the short term. The number of houses built in a given period – and what this means for house prices – depends crucially on the responsiveness of housing supply.

Grimes et al (2013) show that, in New Zealand, supply has tended to be slow to respond to shocks. Supply responsiveness can be affected by a number of factors – including land scarcity, regulatory barriers, and the time and regulatory processes associated with planning, development, and building. In absence of these restrictions, there is little reason to believe that the market should respond slowly to changing conditions beyond the time taken to build new houses.

In its Inquiry into Housing Affordability, the Productivity Commission (2012) identified land scarcity, restrictive urban planning, and the time and costs associated with land development and construction as factors constraining the supply of new housing in New Zealand. Grimes & Aitken (2006) found that housing supply tends to be slow to respond to changes in demand, but particularly in Auckland. The same study found that housing supply responsiveness tends to be hampered by both land scarcity and increases in construction costs – and that land availability has been the more important of these factors since the 1990s. If land is scarce, due to either geographic or regulatory barriers, this can increase the cost of new building and significantly inhibit the responsiveness of new housing supply to future increases in demand.

Geographical constraints on land availability can be important in some places. If people expect demand to increase in the future, house prices will tend to increase by more in geographically-constrained areas where people want to live. This will be particularly the case if the population is relatively immobile, whether due to preferences or the existence of one dominant city. When people can move easily, cities that face geographic or regulatory constraints will see less sustained and smaller long-term house price increases.

Because New Zealand has an abundant supply of land, regulatory barriers on the supply of land and its use are probably more important in contributing to land scarcity than geographic constraints. In the presence of regulatory constraints, the cost of land

can comprise a large part of the cost of constructing a new house and, hence, the price of an existing house.

If demand is expected to keep on increasing, persistent regulatory restrictions on land supply or how intensively land can be used will tend to put upward pressure on house prices. This can be further exacerbated by so-called "land banking". If there are no land taxes or land value ratings, land scarcity can encourage owners to hold onto land in anticipation of capital gains, further inhibiting land supply and bidding up house prices.

People do not need to directly understand the importance of supply factors for their expectations to be affected: if supply is constrained, actual house prices – which are what most people observe – will reflect that scarcity, and this will impact expectations.

Housing supply is not just a matter of new building. The substitutability of different houses on the market can also be important at times. If the types of houses demanded by renters and owner-occupiers are very different and houses cannot quickly be altered, then it may take time for the market to adjust to changing preferences. And when the market is slow to adjust to changes in demand – either because substitutability of housing is low or new housing supply is inelastic – rents and house price inflation can diverge.

If houses to buy and those to rent are not perfect substitutes, increased demand for owner-occupier housing will put upward pressure on house prices and downward pressure on rents until the composition of the housing stock adjusts. Similarly, if more households wish to invest in property, then increased demand for investment property will bid up house prices in the short term with little impact on rents. In the long-run, lower rental yields will encourage existing owners to sell their properties and house prices will return back to equilibrium.

House price inflation and rental inflation can also diverge when supply of new housing is slow to respond to changes in market conditions. When a shock occurs, it takes time for new houses to be built and for prices to normalise. But if there are supply constraints, it can take much longer. In this situation, any actual or expected changes in demand can cause house price and rental inflation to diverge.

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ii.   DEMAND TO OWN PROPERTY IS DETERMINED BY A RANGE OF FACTORS

The market to purchase property is much more than a market for accommodation. Demand to purchase a house is influenced by a range of factors, including the expected future costs and benefits associated with owning that property. Many of these payoffs are uncertain. Expectations of future house prices and mortgage interest rates influence how much a person is willing to bid for a house today. The more binding or pervasive supply constraints are, the more an increase in demand will result in rising house prices rather than increased building activity.

In the long run, supply will respond to rising house prices, and house prices will return towards their equilibrium level, which is partly determined, inter alia, by regulatory factors. But house prices can be subject to speculative dynamics in the short term: rising house prices can give rise to increased expectations of future house price appreciation, amplifying the increase in prices. This can occur even if there is no change in the number of households wishing to purchase a home. Potential purchasers will just bid more aggressively than otherwise.

In New Zealand, the level and composition of net immigration can be an important determinant of housing demand, with immigration flows tending to vary quite considerably. If demand increases, perhaps due to a change in immigration, this will increase house prices and rents in the current period. However, if supply is slow to respond, house prices might be expected to be higher in subsequent periods as well, and these expectations will be capitalised into house prices today.

Interest rates are important in determining the payoffs associated with owning a property. When interest rates fall, owning a house becomes more attractive. However, the reason for the fall in interest rates matters a lot. If interest rates fall because the economic outlook has weakened, then, all else equal, house prices may not rise at all. In particular, houses prices are unlikely to be bid up to the same extent as they would in a situation where banks had reduced their margins or bank funding costs had fallen.

However, it is difficult to tell whether a fall in interest rates is permanent – i.e. the neutral level of interest rates has fallen – or cyclical. And the outlook for interest rates can be quite uncertain. If potential purchasers expect that a fall in interest rates is going to persist, then they will bid up house prices much more than if they think low interest rates will be temporary.

Changes in credit conditions can amplify house price cycles. Credit standards are important because they influence a household's ability to purchase property. Rising house prices can lead to an easing in lending standards, since the value of collateral associated with mortgages would tend to be rising. This can facilitate increased

demand for housing and allow house prices to be bid up even further. Such dynamics can make house price inflation responsive to financial cycles, while rents are less cyclical.

iii.   HOUSE PRICES CAN DIVERGE FROM FUNDAMENTALS FOR A LONG TIME

In the long run, house prices should be anchored to the cost of new housing construction (including land). Over time, construction costs should increase at around the rate of general inflation, since construction costs are just a bundle of tradable goods and non-tradable services. As a result, in the absence of significant land use restrictions, real house prices should eventually be anchored at a relatively constant level. As an economy grows and incomes gradually rise, people demand bigger and better homes, implying that average or median house prices will tend to trend up over time relative to incomes. But once the quality of a house is controlled for, real house prices should tend to be anchored over time provided supply conditions permit.

In the United States, where data go back to 1890, real house prices have tended to revert back to their long-run average over history (figure 1). This may be because in the United Sates regulatory land use restrictions are set by local governments and differ widely between regions. There are also many large cities, enabling people and firms to move relatively easily to areas with cheaper housing. Population can respond to rising house prices as land becomes scarce, and there has been outward migration from cities such as Los Angeles (where there are tight land restrictions) to places like Houston (with few planning restrictions).

Figure 1: Real house prices in the United States
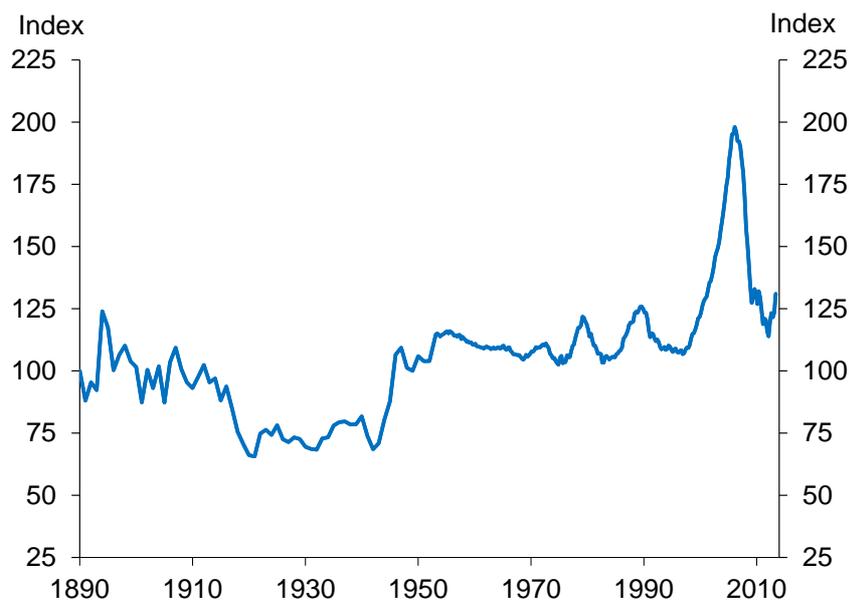
Source: Robert J. Shiller Irrational Exuberance data set

By contrast, in countries with growing populations and tight planning restrictions (e.g. the United Kingdom, Australia, New Zealand and parts of continental Europe) real house prices have tended to rise substantially over recent decades. London provides an example of a single dominant city, where building activity and land use are heavily constrained by regulatory factors. While house prices in such cities will rise and fall cyclically, the long-term equilibrium price may be largely set by regulatory factors. The structure of regulation itself is somewhat endogenous (in the political market). But without significant regulatory changes or a change in population patterns, there is little reason to expect real house prices to be anchored over time.

In the long run, investors (whether landlords or owner-occupiers) should shift between assets in search of yield, such that risk-adjusted real rental yields (assuming no expected real capital gains in equilibrium) are equal to the risk-adjusted real returns on other assets. This means that house prices will be anchored by an equilibrium house price-to-rent ratio, consistent with prevailing neutral interest rates.

If the equilibrium level of interest rates was expected to be permanently lower, this would result in lower equilibrium rental yields, and house price and rental inflation would naturally deviate for a time to adjust to the new long-run equilibrium. Without material supply constraints, lower neutral interest rates would primarily result in lower rents rather than higher house prices, since the cost of building a new house has not increased (and may indeed have decreased slightly, since financing costs are part of the direct costs of new construction).

While house prices should be anchored in the long-run relative to fundamental factors, house prices can diverge from their long-run justifiable equilibrium for extended periods of time. In the short term this can occur for entirely rational reasons. However, such deviations can lead to extrapolative behaviour, particularly since buyers often base their expectations on current conditions. [3]

If households do not have perfect foresight and incorrectly expect that house prices will be higher in the future – for whatever reason – this will be reflected in house prices today and house price and rental inflation will diverge. Expectations of higher house prices can become self-fulfilling, especially in the presence of supply constraints, and this can encourage further optimism regarding the outlook for house price inflation. If this happens, house price inflation and rental inflation can increasingly diverge.

In a boom, rising house prices can be justified by buyers' expectations. However, expectations can fail to take into account the fact that house prices will tend to be

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[3] See Shiller (2007) for more on the role of extrapolative dynamics during the 2000s housing boom in the United States.

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anchored over the longer term. Glaeser (2013) finds that in the United States house price booms have been most strongly associated with optimistic expectations, rather than changes in credit conditions, and suggests that the dominant mistake that people make when they buy property is failing to understand the impact that a supply response will have on future land and house prices.

One reason booms end is because expectations that house prices will continue to rise rapidly do not materialise. As people revise their expectations, house prices fall. And as they fall, more people revise their expectations. In some cases, this can lead to a sharp fall in house prices – as seen in the United States, Spain and Ireland during the last few years.

If the market is supply constrained, this can prolong the period over which house prices deviate from fundamentals. But a crash is still possible without a significant supply response if house prices get well ahead of the cost of new construction. In fact, supply constraints, including geographic and regulatory restrictions, can exacerbate booms and busts. Glaeser et al (2008) find that regions in the United States with more elastic housing supply tend to have fewer and shorter bubbles, with smaller price increases. And Huang & Tang (2012) find that constraints on land use lead to higher and more volatile house price inflation. If supply is constrained, rising house prices can motivate a larger eventual supply response than would otherwise be the case – resulting in first a boom and then a bust.

RECENT APPLICATIONS TO NEW ZEALAND

Over the past two decades, house prices have increased substantially in New Zealand and house price and rental inflation have often diverged (figure 2). Between 2002 and 2007 house prices doubled as demand to purchase houses outpaced new supply of houses and residential land on the market (despite the substantial construction boom during this period). As typically happens when house prices rise and the market cannot respond rapidly, house prices increased relative to rents, incomes and (non-land) construction costs (figure 3). And as explained previously, house prices may remain elevated relative to these fundamental factors for a potentially extended period of time.

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Figure 2: House price and rental inflation in New Zealand
(annual percent change, 3-month moving average)
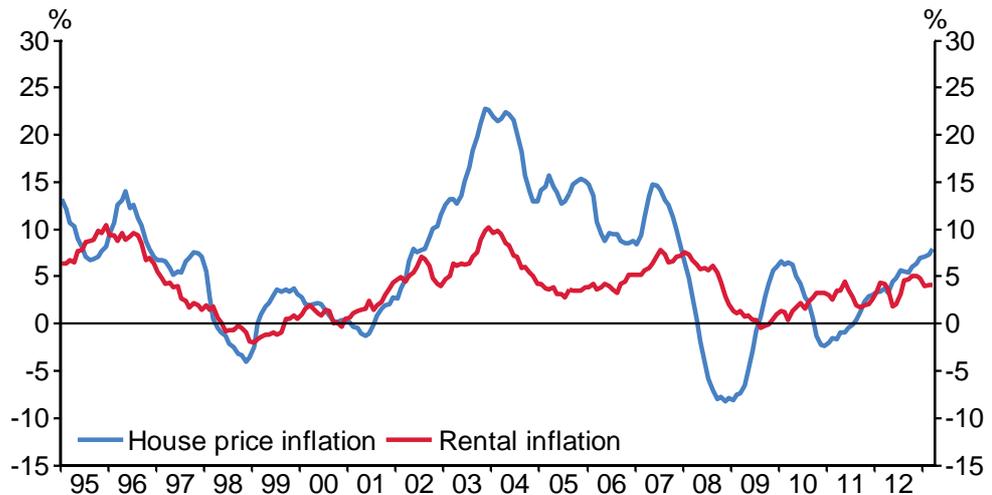
Source: Ministry of Building, Innovation and Employment, REINZ

*Figure 3: House prices relative to fundamentals (indexed)*
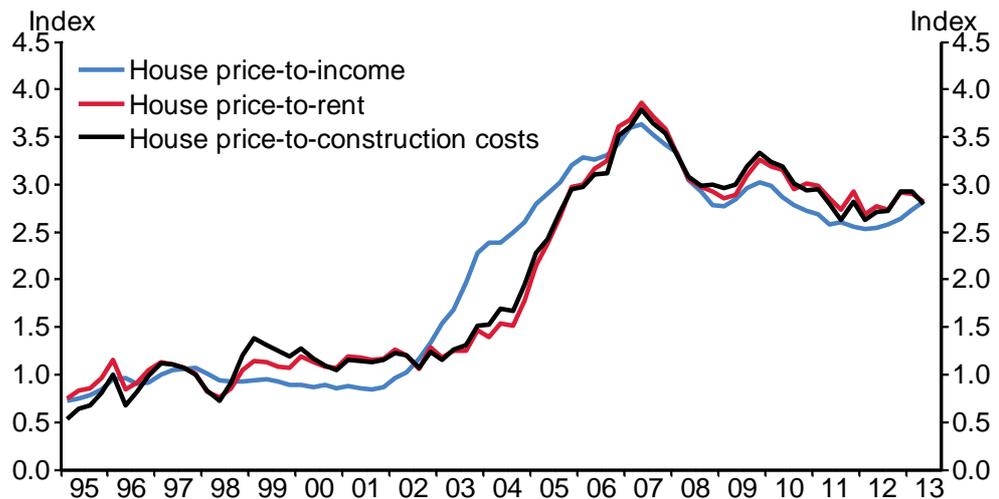
Source: Ministry of Building, Innovation and Employment, Property IQ, Statistics New Zealand, RBNZ
Note: Here construction costs exclude land costs.

Rising house prices have been seen alongside substantial increases in section (land) prices (figure 4). According to REINZ, the median section price in New Zealand rose 115 percent between 2002 and 2007, suggesting that demand for land has outpaced new effective land supply and thus underpinned rising house prices. As was seen throughout the rest of New Zealand, section prices more than doubled in Auckland between 2002 and 2012 – but for sections within 25 kilometres of inner city Auckland, land prices tripled.[4]

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[4] See Ministry of Business, Innovation and Employment (2013)

Figure 4: Median house and section prices
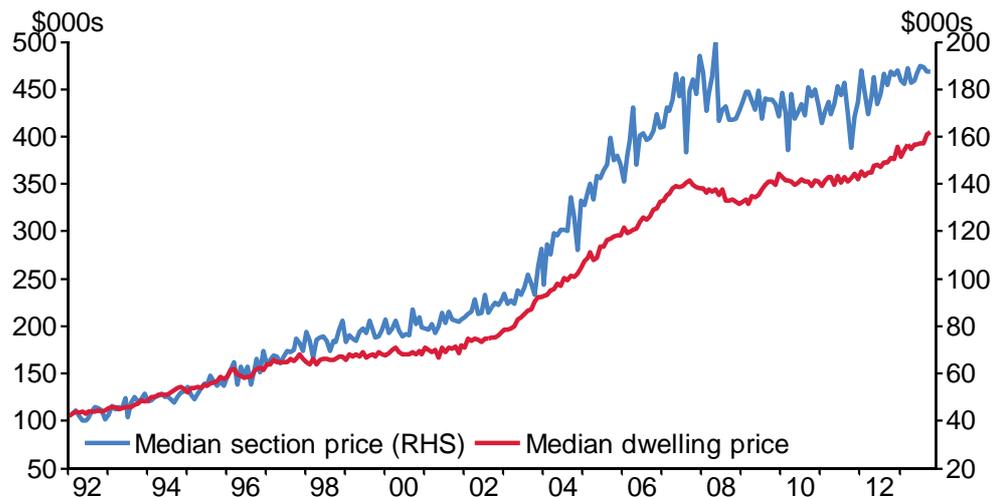
Source: REINZ

Land supply constraints have been particularly important in Auckland – perhaps because it is the city with the strongest population growth – and these constraints have led to substantial pressures on section prices. Land scarcity has become an increasing problem as the Metropolitan Urban Limit (MUL) has become more binding. Zheng (2013) estimates that in 2010, land just inside the MUL was worth nine times the value of land just outside the boundary – up from six times in 1998.[5] As a consequence, land costs now comprise 60 percent of the cost of building a new dwelling in Auckland, compared with 40 percent in the rest of the country. As the availability of land within the MUL has decreased, rising land prices appear to have curbed housing supply (and encouraged the building that has occurred to use less land per dwelling). Additionally, if current owners of land are holding on to land anticipating further capital gains (i.e. land banking), this will exacerbate the impact of land scarcity on housing supply responsiveness.

New building in Auckland has been weak for many years. A significant number of new homes were built in Auckland between 2002 and 2005 when overseas net immigration into the region was strong. However, the rate of new building slowed dramatically in 2005 – as immigration flows to the region moderated – and has remained low ever since. Excluding apartments, building of new dwellings has been in gradual decline since 2003 (figure 5). Throughout the rest of New Zealand, construction of new dwellings remained elevated until the 2008/09 recession (figure 6).
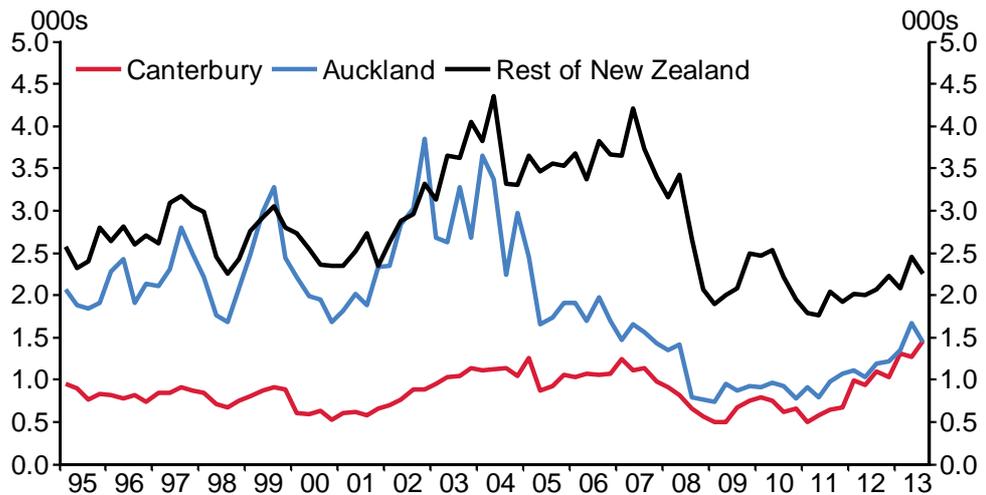
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[5] These estimates use local council land valuations, which are set based on existing regulations. They may therefore overstate difference in market values.

*Figure 5: New building consents in Auckland*
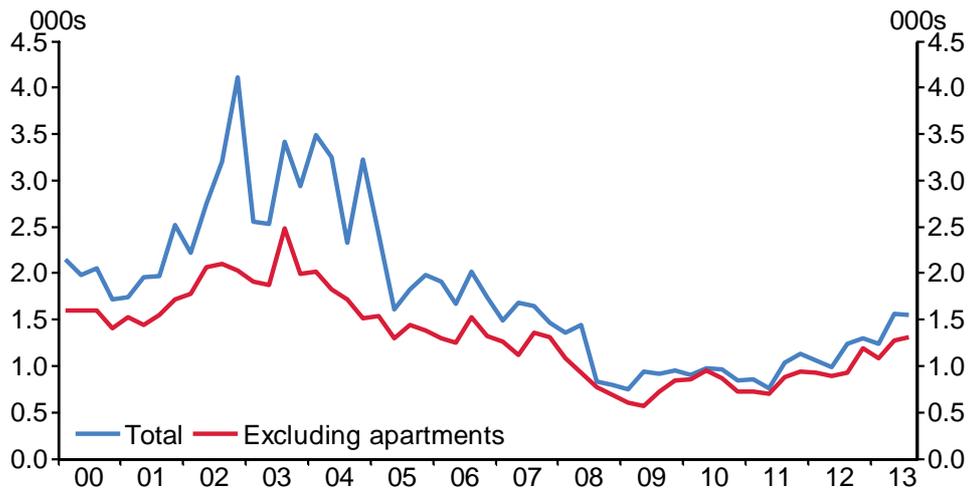
Source: Statistics New Zealand.

Figure 6: New dwelling consents by region

(quarterly)

Source: Statistics New Zealand.

While many houses were built in Auckland between 1991 and 2004, work from Motu suggests that, relative to population growth, districts in Auckland had the lowest supply responsiveness in the country during that time. Grimes & Aitken (2006) estimate that Manakau, North Shore, Auckland City and Waitakere are the areas that have the least responsive housing supply in the country and that, within Auckland, areas with lower supply responsiveness tend to have higher house price inflation (figure 7).

Figure 7: House price inflation by Auckland suburb
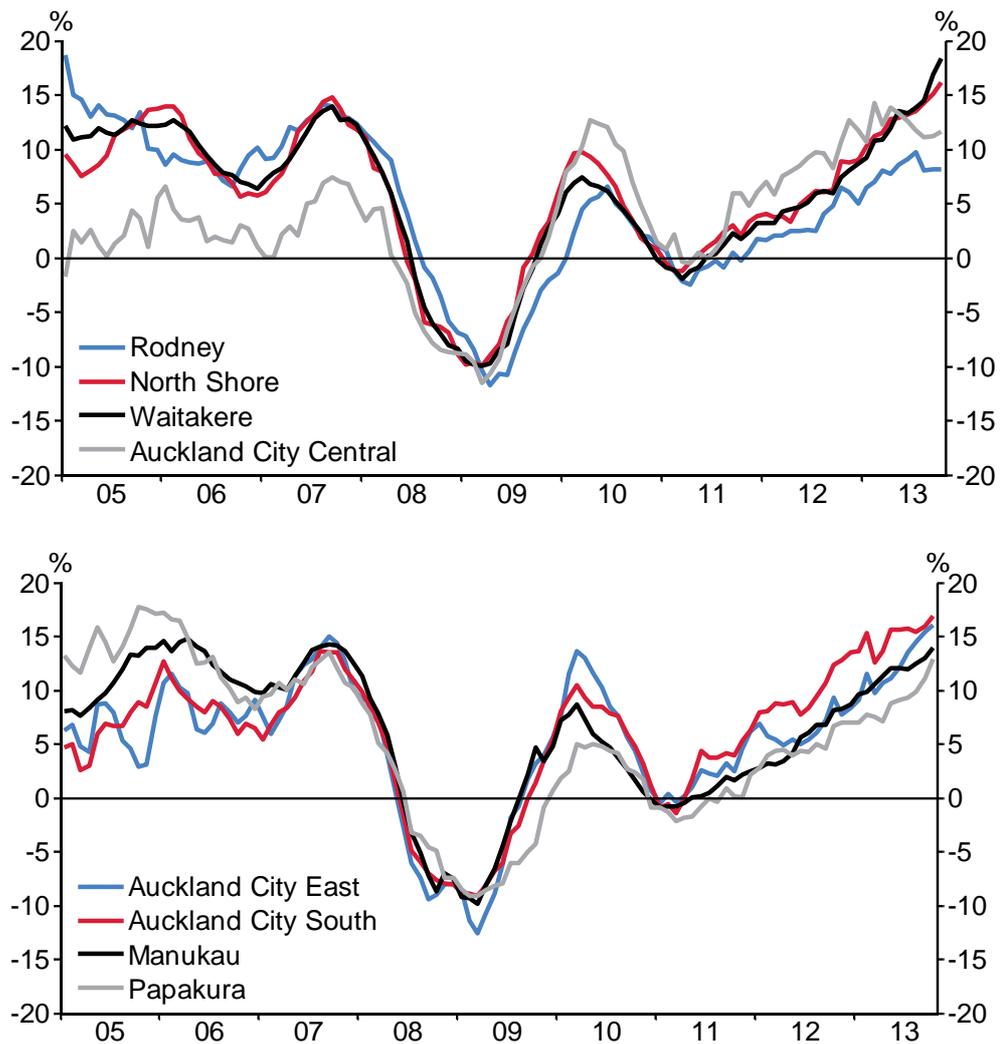
Source: Property IQ.

Low rates of building in the last few years appear to have led to a shortage of homes in Auckland. Population-per-dwelling is estimated to have risen in Auckland since 2005 (figure 8). However, the extent of the current shortfall of houses is uncertain. Data from the 2013 *Census of Population and Dwellings* suggest that the shortage of houses in Auckland is considerably smaller than previously thought. Based on updates from the Census, the current housing shortage appears to be between 5,000 and 10,000 dwellings in magnitude (assuming that population-per-dwelling returned to 2.9 persons).

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Figure 8: Population-per-dwelling estimates[6]
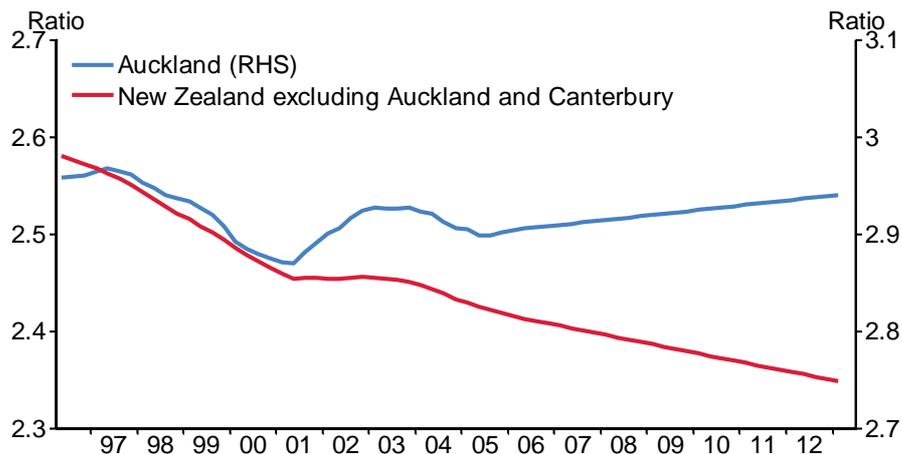
Source: Statistics New Zealand, Westpac, RBNZ calculations.

Outside Auckland, low rates of building since 2008/09 appear to have been consistent with low housing demand. However, Auckland's population has continued to increase at a relatively strong rate, albeit less than pre-census estimates had assumed (table 1). Prior to the pick-up in immigration that has occurred this year, immigration into Auckland continued at a steady rate while net inflows were low elsewhere (figure 9).[7] Reflecting the shortfall of housing (to live in) in Auckland, rental inflation in Auckland has been higher than in the rest of New Zealand recently (figure 10). Population intensification in the existing urban area will have dampened upward pressure on rents to some extent.

*Table 1: Population growth by region*

Region	Annual average percent change		Region	Annual average percent change	
	2001-2006	2006-2013		2001-2006	2006-2013
Auckland	**2.4**	**1.2**	Tasman	1.5	0.8
			Nelson	0.6	1.1
Northland	1.2	0.3	Marlborough	1.5	0.3
Waikato	1.3	0.8	West Coast	0.7	0.4
Bay of Plenty	1.5	0.6	Canterbury	1.6	0.5
Gisborne	0.2	-0.3	Otago	1.3	0.6
Hawke's Bay	0.7	0.3	Southland	0.0	0.4
Taranaki	0.2	0.7			
Manawatu-Wanganui	0.2	0.0	New Zealand excluding Auckland	0.8	0.5
Wellington	1.2	0.7	**Total New Zealand**	**1.5**	**0.7**

Source: Statistics New Zealand.

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[6] Figures from 2006 onwards are interpolated by the Reserve Bank using census results and should be treated as approximate. Total population counts and rebased quarterly dwelling estimates will not be available until mid-2014 and 2015 respectively.
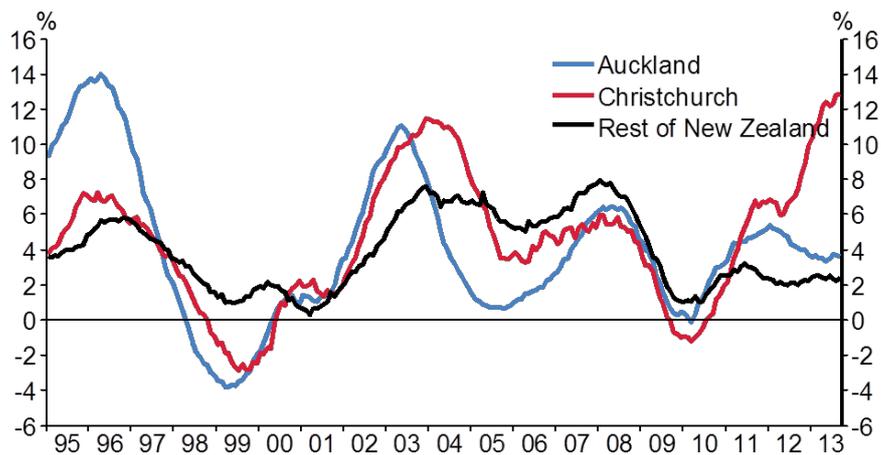
[7] Other work by the Reserve Bank shows that the composition of immigration can change the way in which a change in population translates into housing demand. See McDonald (2013) for more details.

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Figure 9: Net PLT immigration by region (quarterly)
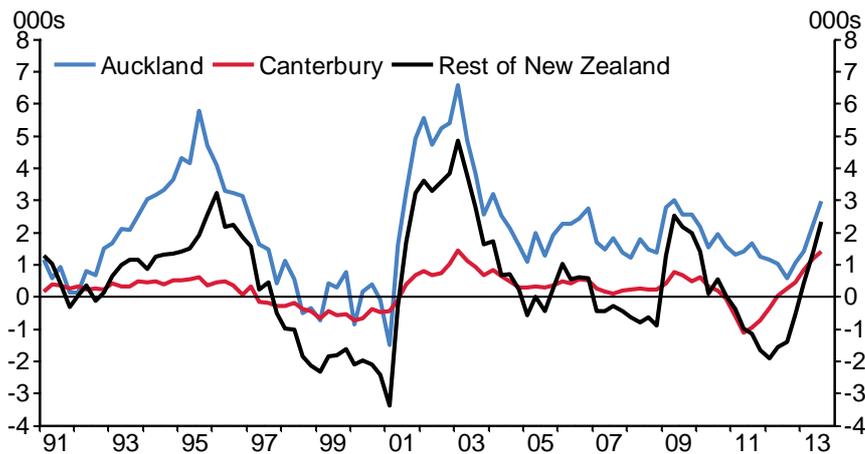
Source: Statistics New Zealand.

Figure 10: Rental inflation by region
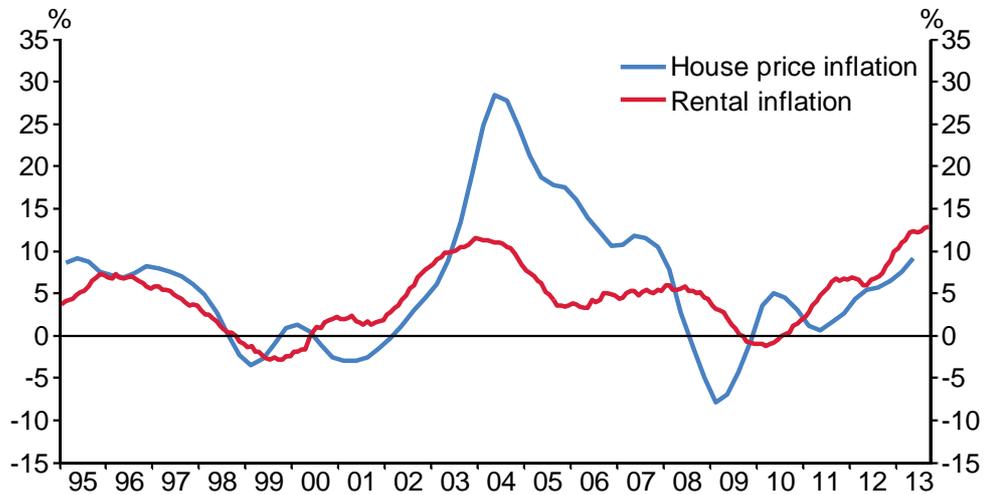*(annual average percent change)*

Source: Ministry of Building, Innovation and Employment.

Rental inflation in Auckland has been higher than in the rest of the country since 2010
– consistent with some shortfall of accommodation there – but this is a relatively
recent phenomenon. Over the past 20 years, rental inflation in Auckland and in the
rest of New Zealand has been quite similar on average. Rental inflation in Auckland
can vary considerably, likely driven by big swings in net immigration.

In Christchurch, rental inflation has increased substantially following the Canterbury
earthquakes. A sudden "supply shock" has created a substantial shortfall of
accommodation. This shock has reduced the supply of houses to live in and buy, and
put upward pressure on both rental and house price inflation (figure 11). Rents have
increased by more than house and land prices, such that rental yields are now the
highest in any large New Zealand city. This is consistent with an expectation that the

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accommodation shortage will prove to be temporary – that rental inflation will moderate as earthquake reconstruction takes place and that rental yields will fall.

Figure 11: House price and rental inflation in Christchurch
(annual average percent change)

Source: Ministry of Business, Innovation and Employment, Property IQ.

While rental inflation has been higher in Auckland than in the rest of New Zealand, house price inflation in Auckland has significantly outpaced rental inflation, suggesting that demand to purchase houses has been influenced by much more than just a need for accommodation (figure 12).
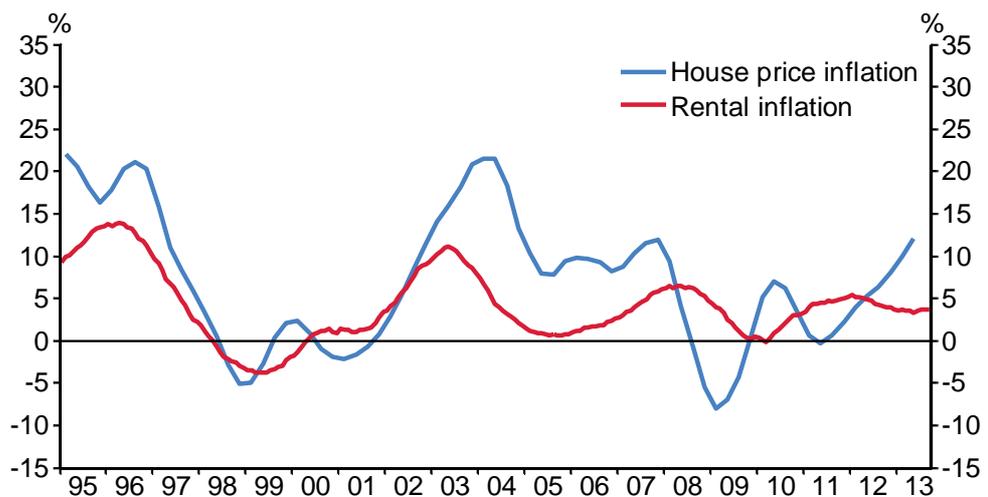
Figure 12: House price and rental inflation in Auckland
(annual average percent change)

Source: Ministry of Business, Innovation and Employment, Property IQ.

As explained in previous sections, the divergence in house price and rental inflation in Auckland is not very surprising. Supply constraints are probably contributing to this divergence. When housing supply is expected to be slow to respond in the future, this will be reflected in house prices today, with little impact on rents.

Given that supply tends to be slow to respond to changing market conditions in New Zealand – particularly in Auckland – expectations that demand will increase in the future (either for accommodation or to purchase houses) will be capitalised into house prices today. Auckland's population is expected to grow markedly over the next 30 years, and this may be underpinning expectations that house prices will continue to rise. The fall in Auckland house prices during the 2008/09 recession proved short lived, perhaps reinforcing perceptions that real house prices will continue rising over the long term.

Land scarcity is likely to be a continuing problem in Auckland. According to the Ministry of Business, Innovation and Employment (2013), land in the pipeline for subdivision in Auckland is estimated to be well below the amount required to meet future population pressures. Expectations of future land scarcity will tend to be capitalised into land and house prices today with little impact on rents.

Important steps forward have been taken by local and central government to increase land and housing supply in Auckland – including through the Auckland Housing Accord, which recently came into effect, and Auckland's Unitary Plan. Such regulatory changes, which can be quite complex, may have little immediate impact on the market when they are announced. But, over time, permanent changes in supply conditions tend to be the most important determinant of where real house prices settle.

Some nationwide factors are also likely to be impacting demand to purchase homes. And because the market is slow to adjust, this may be contributing to a divergence in rental and house price inflation. However, the divergence between house price and rental inflation has been much more muted in regions outside of Auckland, highlighting that supply is more of a constraint in Auckland than in the rest of the country.

Low interest rates, easy credit standards, changing household preferences, and speculative dynamics could all be contributing to increased demand to purchase homes. The neutral interest rate appears to have fallen in New Zealand since the global financial crisis,[8] contributing to the divergence between house prices and rents as rental yields adjust.

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[8] See Chetwin & Wood (2013) for more details.

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Households' desire to purchase houses may have increased recently, perhaps because people have delayed house purchases due to the recession or because returns are relatively low on other assets. Very low interest rates are also likely to be encouraging people to purchase homes, particularly if they expect low interest rates to persist. Indeed, despite falling rental yields, Westpac's (2013) 'investor value' housing model suggests that it has been a good time to buy over the past 18 months, but that property has become less favourable recently.

Over 2012, credit standards eased – with banks competing aggressively to lend and high-LVR loans increasing as a proportion of new lending. Less stringent credit standards will have enabled more people to enter the market and allowed households to borrow more. This is likely to have contributed to pressure on house prices, particularly if household expect house prices to continue increasing. House price expectations have increased across all New Zealand regions since 2010 (figure 13). And the net percentage of people expecting house price rises has tended to lead increases in quarterly house price inflation (figure 14).[9]

Figure 13: House price expectations
(net percentage of respondents)
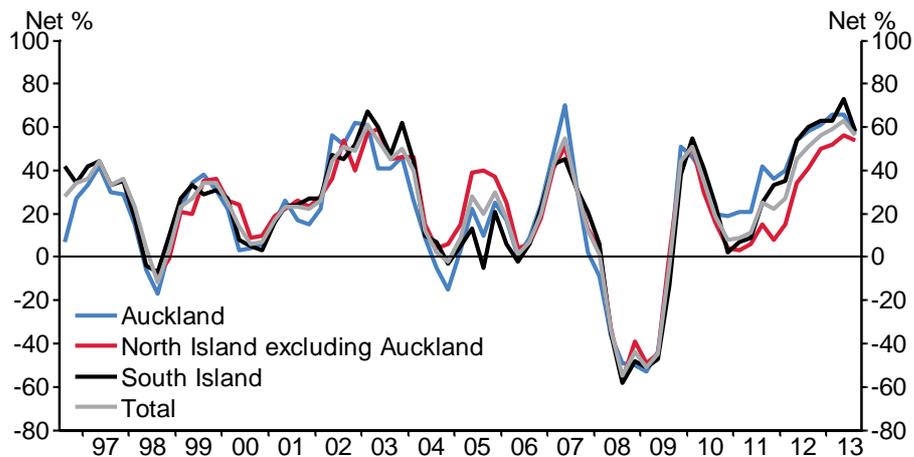
Source: ASB.

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[9] Other surveys of house price expectations produced by ANZ and the RBNZ also show that house price expectations have increased over this time but the magnitudes of these expected price rises appear fairly low (with expectations of annual house price inflation around 4 percent per annum). These time series are not long enough to compare with expectations in previous house price cycles.

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Figure 14: House price expectations and house price inflation
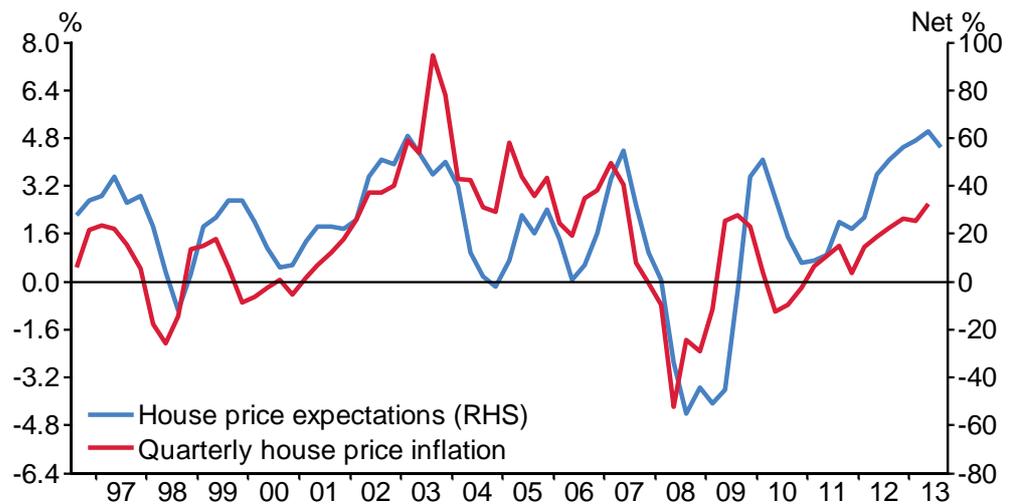
Source: ASB, Property IQ.

Over the long-run, new housing supply is expected to eventually increase in response to price increases, such that house prices are anchored by fundamentals. However, in supply-constrained markets such as Auckland, where land constraints appear to be severely inhibiting housing supply and contributing to rising house prices, this can take a very long time to occur.

Because new housing supply is typically slow to respond in New Zealand, house prices may remain high in many places and continue to be unaffordable for many households. In this case, adjustment may occur in other ways. Households and businesses may move to other regions where land is more abundant, or households might choose to rent rather than own. Outward migration to more affordable regions is an endogenous response to very high house price inflation that can help to relieve population pressures. However, the scope for such changes in population within New Zealand may be quite limited. Businesses may be reluctant to relocate from Auckland given its appeal as a major commercial centre, and this could dissuade households from moving, despite high house prices.

Expectations that prices will continue rising can see house prices continue to be bid up, and can result in house prices diverging from their long-run justifiable equilibrium for a potentially extended period of time. As work by Glaeser (2013) shows, it is possible that people are not fully taking into account an eventual housing supply response when making decisions. This may be particularly the case in Auckland, given the perceived scarcity of land in the region and continuing population growth.

Without a significant supply response, real house prices might be expected to continue to rise over the longer term. However, upward cycles in house prices have a tendency to overshoot and ultimately reverse. Households may expect house prices

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to continue rising indefinitely and, if these expectations are incorrect, house prices may undergo a boom and a bust, even without a significant supply response.

A change in the balance between population pressures and housing supply (e.g. though a change in land use restrictions), could produce a substantial and sustained fall in real house prices in the future. For long-lived assets such as houses and residential land, the change in the balance between these factors may not need to be particularly large to induce a significant change in real house and land prices over time. Many advanced economies have experienced substantial falls in real house prices at times in recent decades, including New Zealand in the 1970s.

CONCLUSION

Residential property markets are both important and complex. Dynamics in residential property markets can significantly impact the cost of living, net worth of households, countries' cyclical economic performance, and the wider financial system. Outcomes in residential property markets can be influenced by a range of factors, some of which can be difficult to identify.

A number of factors appear to be influencing New Zealand's residential property market at present. The Canterbury earthquakes created a significant and easily identifiable temporary shortfall of accommodation, and this has put upwards pressure on house prices and rents in the region. In Auckland, there is also a shortfall of houses, and Auckland has experienced higher rental inflation than in the rest of New Zealand over the past couple of years. But house price inflation has significantly outpaced rental inflation, suggesting that it is not just demand for accommodation that has influenced the Auckland market.

A number of Auckland-specific issues appear particularly relevant. Supply tends to be slow to respond to changing market conditions in New Zealand, particularly in Auckland where land supply is constrained. Auckland's population is growing quite rapidly (albeit a little more slowly than previously thought), and expectations of land scarcity may be resulting in higher house prices today, with little impact on rents.

While a number of nationwide factors may have contributed to increased demand to purchase houses recently, they will have affected house prices more markedly in areas where supply constraints are more binding (e.g. in Auckland and Christchurch). Factors that may have increased demand to purchase homes recently include low interest rates, relatively easy credit standards, household preferences, and expectations that house prices will increase in the future. Increased demand can lead to a divergence in house price and rental inflation when the housing stock is slow to adjust. The neutral interest rate has also probably fallen.

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Of course, the outlook for Auckland house prices is very uncertain. Without a significant supply response, real house prices might be expected to continue rising over the longer run. However, expectations can often be disappointed. People often do not foresee the impact that a supply response will have on rents and house prices in the future, and upward cycles in house prices have a tendency to overshoot and then, ultimately, substantially reverse. A change in the balance between population growth and new housing supply, that may not need to be particularly large, could lead to a significant and sustained fall in real house prices at some point in the future.

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APPENDIX: A THEORETICAL FRAMEWORK FOR UNDERSTANDING RESIDENTIAL PROPERTY MARKETS

To understand dynamics in residential property markets, a theoretical framework is helpful. Theory here draws, in particular, on work by Gordon & Shapiro (1956) Tobin & Brainard (1977), Poterba (1991), Grimes & Aitken (2006), Coleman & Scobie (2009), and Glaeser (2013).

A.1. THE MARKET TO RENT A HOUSE

To rent a home is to pay for the provision of rental services for a specified length of time (for simplicity, we assume a year[10]). The cost of renting is determined by the demand and supply of rental services at the time the contract is negotiated. The supply of rental services is typically fairly inelastic in the short term: it takes time for more houses to be built or for the composition of the housing stock to change in response to a change in rents. Demand for rental services can adjust more easily given the supply of houses available through, for example, changes in living arrangements (e.g. young people staying at home rather than flatting).

It is assumed that a house cannot be built or transformed in the current period, but that the housing stock can adjust in the next year. Investors and owner-occupiers can choose to sell their properties in response to market rents at the end of each period. However, their property cannot be sold until the next period when rental contracts are negotiated and people make decisions about their consumption of rental services. These decisions determine the composition of the housing stock, and hence the stock available to rent, in the next period.

Because supply is assumed to be fixed at the time the contract is negotiated, the market to rent and the market to own are segmented in the short term. For simplicity, government provision of rental housing and tax treatment of property returns are ignored. In the short term,

$$P_r = f(D_r, \bar{S}_r)$$

where P_r is the price of rental services for a year, D_r is the demand for rental services at that point in time, and $\bar{S}_r$ is the fixed supply of rental houses available.

Each time a rental contract is due to be renegotiated, households who are renting choose whether they wish to continue to rent or become an owner-occupier. This decision is influenced by household preferences, the availability of credit, and the

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[10] In New Zealand, unlike many European countries, there is little market for long-term rental contracts. Rental reviews are relatively frequent (often annual), so this is a reasonable simplifying assumption.

expected paths of interest rates, house prices, and rents. The number of household renting is given by,

$$H_r = f(\lambda, P_h, P_r \; P_h^e, P_r^e, r^e, \eta, p)$$

where λ represents household preferences for owning versus renting and P_h is the current price of buying a property. P_h^e is the expected path of house prices, P_r^e is the expected path of market rents, r^e is the expected path of mortgage interest rate, η represents availability of credit, and p is the rate of population increase.

The number of households renting is influenced by these factors in the following way:

- If household preferences change in favour of owning rather than renting, then the number of household renting will decrease.
- As the current price of purchasing a property increases (relative to the cost of renting), fewer people will opt to purchase their own home and the number of households renting increases.
- As the expected path of future house prices increases, expected capital gains increase, and more people opt to purchase their own home and the number of household renting decreases.
- If market rents are expected to increase in future, more people will opt to purchase their own home and the number of households renting decreases.
- If the expected future path of mortgage interest rates increases, fewer people will opt to purchase their own home and the number of households renting increases.
- As non-price lending standards ease, credit is more readily available, more households are able to purchase homes, and the number of households renting decreases. Likewise, as a household's income increases, more households are able to meet debt-servicing conditions, and the number of households renting decreases.
- As population increases, more household are formed and need accommodation and the number of households renting increases. Immigration is a particularly important determinant of population pressures in New Zealand, as net immigration flows tend to vary quite considerably.

Once a household has decided to rent, they then decide the quantity of rental services they would like to consume over the next year given current market rents. Households can adjust their consumption of rental services (i.e. how much house they utilise) by altering household size, the rate at which new households are formed, or the type of property that they rent. Consumption of rental services is, hence, influenced by the cost of renting, population pressures – determined by the number of households that are renting and their size – and household incomes. When a rental contract is negotiated, demand for rental services is determined by

$$D_r = f(H_r, i, y, P_r)$$

where i is population intensification (or people-per-dwelling) and y is household incomes.

Intuitively, rental demand is influenced by these factors in the following way:

- As population intensification increases, fewer homes are needed for a given population, and demand for rental services decreases.
- As household incomes increase, households wish to live in bigger and better homes and demand for rental services increases.
- As the cost of renting increases, demand for rental services decreases. This can occur through population intensification (i.e. renters opt for shared living arrangements or reduce the rate of household formation) or through households choosing to rent smaller or lower quality properties.

In the long run, the supply of rental services can adjust: more (or fewer) homes can be built to service renters and more (or fewer) people can choose to become landlords. The supply of rental services will depend on rental rates (net of expenses), the price of purchasing a property (i.e. the rental yield), expected house price increases (i.e. expected capital gains), returns from other assets, and expected mortgage interest rates. Rents are determined by the flexible adjustment of demand and supply to a market-clearing equilibrium in the long run.

$$P_r = f(D_r, S_r)$$

In the long run, rental supply is determined by

$$S_r = f(P_r, P_h, P_h^e, r^e, r^*)$$

where r^* is the expected yield available on other assets.

Intuitively, rental supply is influenced by these factors in the following way:

- As the price of rental services goes up, the rental yield on a property of a given value goes up, and the supply of rental services increases.
- As the current price of buying a house goes up, the rental yield on a property of a given value goes down, and the supply of rental services decreases.
- As the expected path of future house prices increases, expected capital gains increase, and hence the supply of rental services increases.

- If expected future mortgage interest rates increase (or the expected yields on other assets), supply of rental services decreases as fewer people opt to purchase an investment property.

When the supply of rental services increases through someone choosing to purchase a property and become a landlord, this also affects demand to own property.

A.2. THE MARKET TO OWN A HOUSE

Owning a home is an investment to varying degrees, while renting is a form of consumption only. Using a simple asset-pricing approach, demand and supply should equate such that the price of a house equals the sum of its expected discounted stream of future earnings, comprising (actual or implicit) rental income and capital gains. That is, the price of a house in the current period could be represented as

$$P_h = \sum_{t=1}^{\infty} \frac{P^e_{r\,t}}{(1 + r_t - \delta)^t} + \sum_{t=1}^{\infty} \frac{P^e_{h\,t} - P^e_{h\,t-1}}{(1 + r_t - \delta)^t}$$

where $P^e_{r\,t}$ is the expected price of rental services for the period until the contract is renegotiated at time t. For simplicity, we assume that all rental contracts are renegotiated yearly. $P^e_{h\,t}$ is the expected house price at time t, r_t is the discount rate at time t, and δ is the depreciation rate.

The discount rate is the rate at which a person discounts future returns today, assuming that houses can only be purchased with cash or an interest-only loan. A household paying with cash will discount their returns based on the opportunity cost of earning the returns available on other assets. A person with a mortgage will discount their returns by factoring in the interest costs of owning the property. The expected mortgage interest rate is assumed to be a good proxy for the discount rate.

House prices are influenced by expected rental returns in the future. Rents are determined by the demand and supply of rental property each time a rental contract is negotiated. So if house prices are influenced by the expected stream of rental income, then the value of a house today encapsulates expectations of the demand and supply of rental services both now and in the future.

House prices are influenced by these factors in the following way:
- If expected future mortgage interest rates increase (all else equal), expected returns from owning property will fall, there will be less demand to purchase property and house prices will be lower.
- If demand for rental services is expected to increase, rental returns increase and house prices will increase.

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- If the supply of rental services is expected to increase in future (and the owner-occupier housing stock remains unchanged), this will reduce rental returns and house prices will be lower.

House prices today are also likely to be influenced by expected house prices in the future. Owning a house is a risky asset: there is a distribution of possible outcomes for house prices and rental returns. The outlook for house prices is uncertain and can be influenced by a variety of exogenous factors and expectations of future house prices will vary depending on the purchaser's views about the future. The level of house prices today will vary with changes in the distribution of expected house prices. If a person believes that house prices are likely to increase a lot in the future, they will be willing to pay a lot to buy a house now. But if another person believes that house prices won't increase as much, then they will be willing to pay less for the same house.

The expected rate of house price inflation will be influenced by factors such as the expected supply of houses to buy and the expected demand to purchase housing in the future. Expected future supply will be influenced, at least implicitly, by factors such as regulatory restrictions on land use, geographical constraints, and changes (regulatory or otherwise) in real construction costs.

Expected demand will be determined by expectations of future population pressure (i.e. the number of households that will require accommodation and expected population intensification), the expected cost of renting versus owning, the expected path of mortgage interest rates (or returns from other assets), the expected availability of credit, and the expected strength of households' preferences towards homes ownership (perhaps due to the security of tenure that it provides).

Expected demand to purchase housing is influenced by these factors in the following way:
- If more households are expected to require accommodation in the future, expected demand to purchase property (from both owner-occupiers and investors) will increase and house prices will be higher today.
- If the cost of renting is expected to increase relative to the cost of owning, expected demand to purchase property (from both owner-occupiers and investors) will increase and house prices will be higher today.
- If credit is expected to be more readily available in future, more people will be able to purchase property and expected demand (from both owner-occupiers and investors) will increase and house prices will be higher today.
- If more households are expected to want to own their own home or become property investors, then demand to purchase property will increase and house prices will be higher today.

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House prices are also influenced by the current and expected supply of houses to buy. Supply of houses to buy and rent are determined by a third market – the market to build houses.

A.3. THE MARKET TO BUILD HOUSES

For simplicity, government construction of housing is ignored. The supply of total houses at the start of a given period comprises the stock of rental properties available, the stock of existing owner-occupier properties, and the stock of houses that have just been built or are for sale.

$$\bar{S_t} = \bar{S_r} + \bar{S_h} + \bar{S_o}$$

$\bar{S}_t$ is the fixed supply total houses at the start of period t. $\bar{S}_r$ is the number of rental houses available, $\bar{S}_h$ is the number of houses available to buy, and $\bar{S}_o$, is the number of existing owner-occupier houses.

At the end of each period, existing investors and owner-occupiers can choose whether to sell or retain the properties they own, based on prevailing, and expected, market pricing. This determines the number of houses for sale at the start of the next period.

Over the longer term, supply is able to respond to changing market conditions – if house prices increase relative to the cost of new production, the profit from building and selling a new house will increase. This will encourage an increase in the supply of houses.

The total supply of houses depends on costs of construction (including the cost of land) and the selling price of new houses on the market. The cost of new housing construction is determined by both market and regulatory factors. The availability of land, land development, and other process and compliance costs are heavily influenced by central and local government regulation. The availability of land can also be influenced in some areas by geographic constraints. So while the costs of labour and materials are largely market determined, the cost of land is determined by a mix of market, regulatory and geographical factors.

If regulatory restrictions on land use are expected to remain binding, or become increasingly binding, then expectations of future land scarcity can also influence the market for land today by bidding up land prices today and encouraging so-called "land banking". Current and expected mortgage interest rates are also important for those investing in new housing, particularly as development can be quite a protracted process and so can influence the rate of new housing construction.

As stated previously, it is assumed that it takes a year for a house to be built and for the size of the housing stock to adjust. If a person decides to sell their house, it will not be sold and ready to live in until the next period – meaning that it takes a year for the composition of the housing stock to adjust. The number of houses built per year will depend on the responsiveness of supply to price incentives. Building of new houses between period *t* and period *t+1* is determined by

$$S_{t+1} - S_t = \phi\left(P_{h_t} - P_{c_t}\right) - \delta S_t$$

where S_t is the total stock of houses at time *t*, P_{h_t} is the price of buying an existing house at time t, P_{c_t} is the price of building a new house at time *t*, and ϕ is the responsiveness of housing supply to changes in price incentives.

In the long-run, housing supply should, in principle, be able to respond to any changes in price. If house prices increase relative to the cost of production, this will encourage the supply of housing to increase, which will, in turn, reduce pressure on prices. Eventually, supply will respond fully to a change in price and the only building needed each period will be to meet the expected on-going rate of population growth and to replenish the housing stock as it depreciates. As the market moves towards this equilibrium, house prices will tend towards the cost of production. In the long run, if population is expected to be unchanged,

$$S_{t+1} - S_t = \delta S_t$$
$$P_{h_t} = P_{c_t}$$

At time *t*, the supply of existing housing and available land to be built on is perfectly inelastic. However, over time, housing supply can respond and move towards the long-run equilibrium described above. The responsiveness of housing supply, represented by ϕ, determines how quickly the supply of housing can move towards its long-run equilibrium. Over the longer term, the responsiveness of housing supply is influenced primarily by regulatory factors, such as the time associated with regulatory processes and the rate at which land is made available (relative to changes in underlying demand). Without these restrictions, the market should be able to respond quickly to changing conditions.

Such factors also determine how exactly the market responds. For example, if land prices are high as a result of regulatory restrictions, there will be an increased incentive on purchasers and suppliers to economise on the use of available land (i.e. build more dwellings on land available). Intensification of available land and infill on

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existing residential properties can dampen the impact on land prices (and especially on total housing costs) of increased housing demand.

If supply is slow to respond (ϕ is low now or in the future), then house prices can deviate from the cost of new construction for an extended period of time. Indeed, expectations of slow housing responsiveness – perhaps due to expectations of continuing land scarcity, or from a past experience of rising land and house prices – will tend to be capitalised into house prices now. The cost of building is also important both in the short and long run. If the cost of building new homes (including the cost of land) increases, this will reduce incentives to build in the short term, and will also determine the price towards which house prices should tend in the long-run.

Changes in price will not only encourage change in the size of the total housing stock, but also its composition. The housing stock can be owned by investors or owner-occupiers, determining supply in both the rental and ownership market. The composition of the existing housing stock will adjust to changes in demand to rent or own – but this is expected to occur over time (here we assume a year, but it could be much longer). New builds are also sold to investors or owner-occupiers at the beginning of the next period, depending on demand in the market at the time. The interactions between the three markets are shown in figure A1.

Figure A1: Stylised representation of interactions in residential property markets