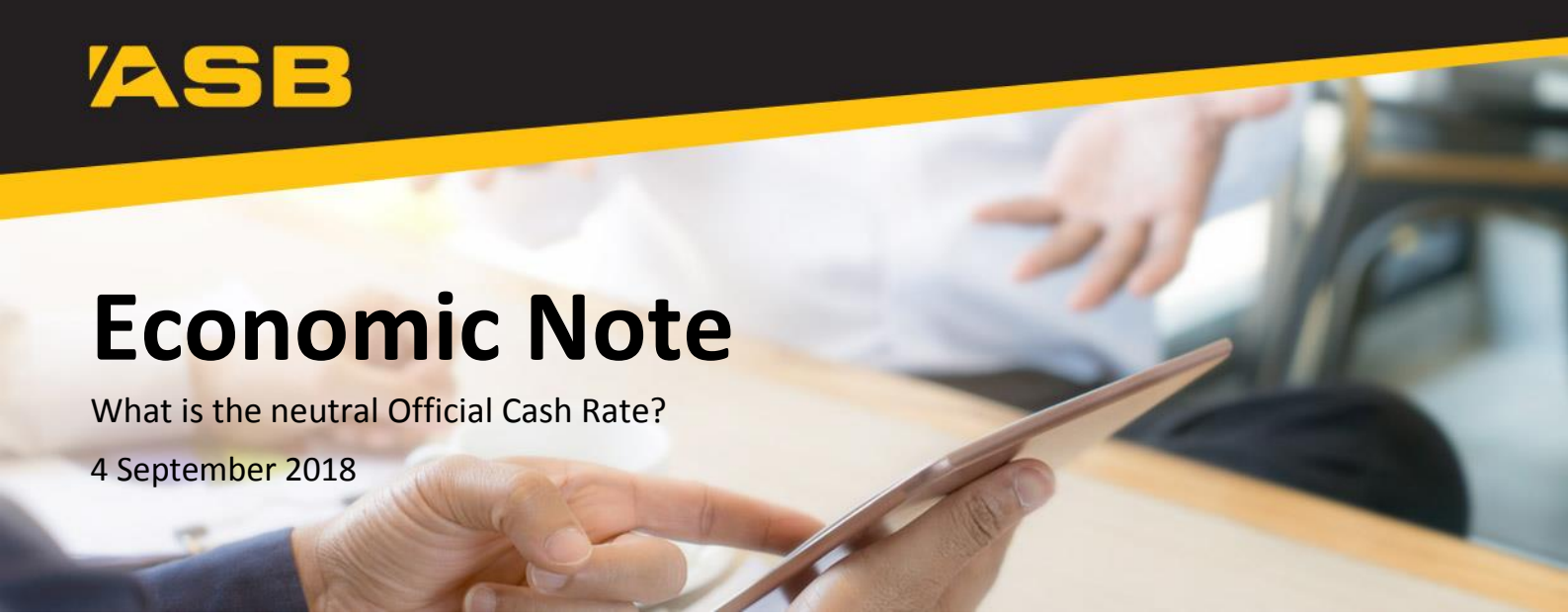

Economic Note

What is the neutral Official Cash Rate?

4 September 2018

Reassessing "neutral"

- Our estimates suggest the neutral OCR is currently in a 2½% to 3½% range, with a midpoint of just below 3%. This is lower than current RBNZ estimates (around 3½%).
- The neutral rate looks to have displayed a downward trend, which could well continue.
- A lower neutral OCR will have important implications for savers, borrowers, investors and policymakers.

Non-technical summary

Broadly speaking, the neutral cash rate can be thought of as the level of the Official Cash Rate (OCR) that is neither stimulatory nor contractionary for the economy. It forms one of the major anchors for the economy. Unfortunately, the neutral rate is not observable, with a large margin of error around estimates. There are a number of influences determining neutral interest rates. Amongst them are the four P's; productivity, population, preferences, and, prices (inflation). There are also a range of techniques for estimating what the neutral rate is, which differ in complexity and resource requirements.

There are two key findings from local and overseas evidence. First, neutral interest rates are now much lower than what they were before the onset of the Global Financial Crisis (GFC). Second, it is likely that the neutral interest rate is not constant, but evolves over time. Evidence suggests that the neutral interest rate has been on a downward trend since the late 1980s.

Our updated estimates for New Zealand largely corroborate these findings. We now estimate that the neutral nominal Official Cash Rate (OCR) is just below 3%, as opposed to around 5% at the start of the decade. New Zealand neutral interest rates also look to have continued their downward trend.

Our estimates are generally lower than current RBNZ point estimates of the neutral OCR (around 3½%), but fall within the RBNZ's 2½ to 4½% range. At face value, this suggests that the current 1.75% OCR may be providing less policy stimulus than what had previously been assumed by the RBNZ. Subsequent RBNZ tightening, when it does occur, may also prove to be more gradual and culminate in a historically low OCR peak. This is consistent with the spirit of our recent forecasts, where the OCR peaks at 2.75% this cycle.

Importantly, our work also highlights the possibility that the neutral OCR could potentially decline further from here, albeit at more modest rates of decline. This will have important implications for savers, borrowers, investors and policymakers.

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Implications posed by a lower neutral OCR

Our new estimates suggest the neutral OCR is currently in a 2½% to 3½% range, and could well head lower from here in the next few years. Structurally lower interest rates will have widespread implications:

Borrowers – All else equal, improved serviceability will support asset prices at the margin. This does not mean that asset prices should necessarily be higher than they are at present. The outright level of the asset relative to underlying fundamentals – incomes and income expectations and serviceability – matters. Borrowers also need to be mindful that a low inflation environment means that it will take longer for debt levels to erode in inflation-adjusted terms.

Investors –A lower real interest rate, all else equal, will help facilitate more demand for capital and potentially more substitution (where possible) of labour for capital. More capacity-enhancing investment is a key pre-requisite for prolonging the current economic expansion. Arguably, capacity constraints are currently weighing on the expansion, and our work previously highlighted weak business investment post the GFC as being a primary contributor to the slowdown in NZ trend productivity growth.

Savers – The return to a 5%+ bank deposit rate looks some way off. Low inflation makes saving go that much further and savers should focus on inflation-adjusted returns. Savers seeking higher deposit rates will also need to recognise the potential trade-off between risk and return. There may be the temptation to chase higher yields on offer from less secure investments, but the meltdown in NZ finance companies around the time of the GFC illustrated this is not without some risk.

For hedging risk – A lower neutral rate does not necessarily mean that interest rates will not eventually increase. Indeed our latest forecasts have both the OCR and wholesale interest rates moving up, albeit gradually. There is still value to be had in hedging given that it helps to mitigate risk and can assist in controlling costs.

Policymakers – Structurally lower neutral interest rates suggest that the OCR at current levels is unlikely to be as stimulatory as was historically the case. A lower neutral rate may also mean that the extent of eventual RBNZ tightening needed to contain inflationary pressure will also be milder than past episodes. If the decline in the neutral interest rate is linked to lower potential rates for economic growth then there are broader implications for fiscal settings and wider government policies.

Recap: What is the neutral interest rate?

Broadly speaking, the neutral cash rate can be thought of as the level of the Official Cash Rate (OCR) that is neither stimulatory nor contractionary for the economy. **In an idealised world, when the OCR is at neutral, growth should be about trend, the output gap[1] zero and inflation stable at its targeted rate.**

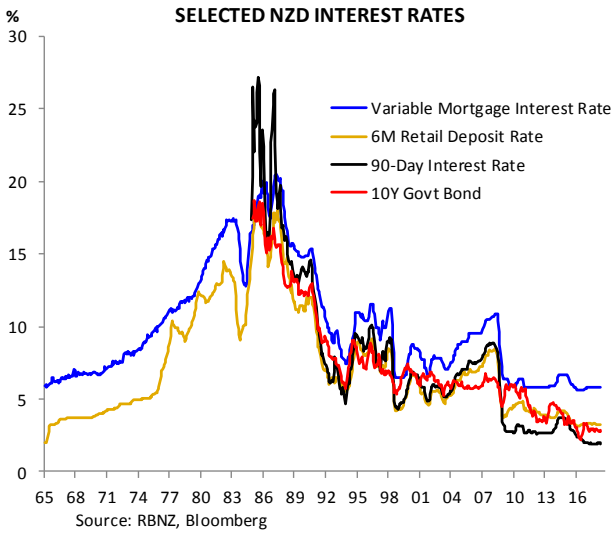
Knowing what the neutral rate is helps to identify whether current interest rates are providing stimulus or are having a braking effect on economic activity. It may also provide some insight on future interest rates movements over the longer term. As the accompanying chart shows, various NZ interest rates tend to fluctuate over economic cycles but have been on a downward trend since the mid 1980's.

In practice it is real (i.e. inflation-adjusted) interest rates that matter for the effect monetary policy has on inflation so a neutral real interest rate (NRIR) is most often used.

The real neutral interest rate forms one of the anchors in the economy, being the interest rate that would hold when variables are at their steady-state growth rates, and the economy is in equilibrium. The level of the neutral interest rate and its future direction will have important implications for borrowers, investors and policymakers.

[1] Gap between actual and potential output (expressed as a portion of potential output).

There is no single definition for what the neutral interest rate is. **Neutral interest rates are unobservable and difficult to precisely estimate so are best thought of as providing a useful conceptual framework for borrowers, investors and policymakers**. Given the shocks that hit the economy and the lags at which monetary policy impacts economic activity and inflation, estimating the neutral rate is difficult and there can be a wide margin of errors around such estimates.



What are some of the influences?

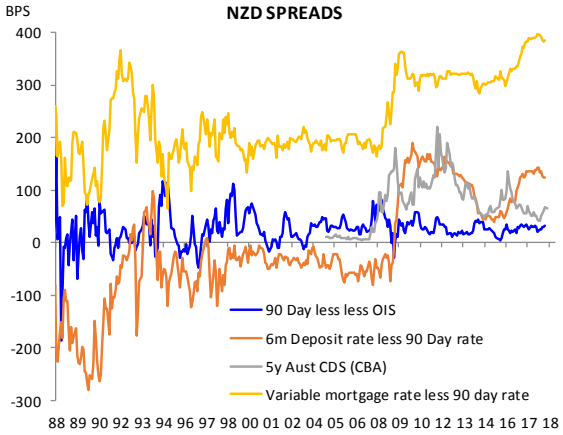
Economic theory suggests the following are likely to influence the neutral interest rate:

- Productivity (positive relation with neutral interest rates). The higher the growth rate the higher the return on capital and the real interest rate. Conversely, a sustained fall in the pace of productivity growth will lower returns to investment, making it less desirable to invest. If the desire to invest falls relative to the desire to save, a lower neutral interest rate will be required to reconcile savings and investment plans.
- Population (+). Higher population growth implied more investment is needed to maintain the labour to capital ratio. Higher interest rates are required to attract the necessary funding for investment. Lower population growth means less investment is needed to provide the necessary capital stock to employ the average labour force. As investment falls, a lower neutral interest rate – the one that equalises the supply of and demand for funds – will be required.
- Demographics (-). Typically saving rates tend to rise towards the end of working cohorts' working life in preparation for retirement. An ageing population structure would tend to result in a lower neutral interest rate given the excess of saving over investment. According to Bank of England research, productivity levels in the working age population do not peak until about age 50 but decline sharply after that.
- Risk Aversion (-). Changes in risk aversion can impact the demand for precautionary savings, impacting outright interest rate yields and the shape of the yield curve. The global financial crisis (GFC) has likely raised risk aversion and reduced neutral interest rates.
- Preferences (+). A higher rate of time preference (spend now, borrow later) tends to result in higher neutral interest rates.
- Indebtedness (-). The higher its indebtedness the greater the interest-rate sensitivity of the economy to increases in interest rates.

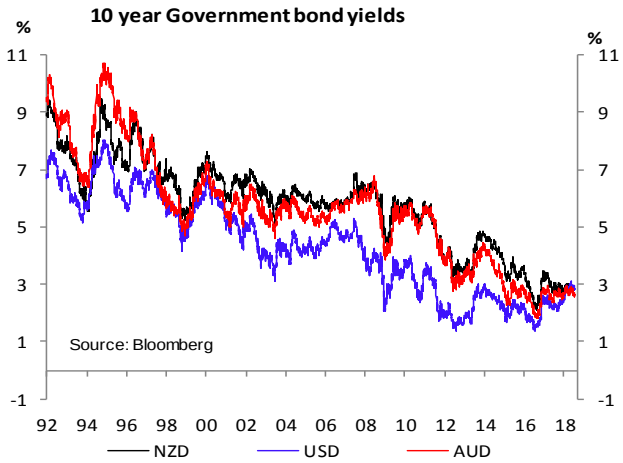
There are other influences that would also be relevant for NZ, including:
Structural changes in funding costs (-). Persistently higher costs of funding will mean that a certain level of the policy interest rate may not provide as much stimulus. In NZ the wedge between the OCR and actual interest rate being charged by borrowers has widened since the GFC, with banks placing more reliance on more stable (but more costly) sources of funding[2].

[2] The margin between floating mortgage interest rates and the OCR has widened from about 150bps pre-GFC to around 300bps post GFC (see chart). Spreads on 2-year mortgages have widened from around 100bps to around 200bps. Similarly deposit rates have risen relative to the OCR. Three month NZD bank bill spreads to overnight index swap (OIS) rates ticked up at the start of the year but have subsequently eased and are currently below historical average as are USD spreads. AUD spreads, however, remain about 20bps above historical averages.

- Increasing global integration (- for NZ). NZ interest rates have tended to be higher than global counterparts. Of late, however, NZ rates have moved much closer to global peers. International evidence suggests that declining neutral rates of interest are an international phenomenon and therefore stem in large part from developments common to many countries, rather than idiosyncratic national factors.
- Risk Premia (+). For countries dependent on imported savings, the greater the perceived risk it is to lend to that country, the higher the risk premia demanded by overseas creditors. New Zealand's external position - net foreign liabilities or around 55% of GDP and sub 3% of GDP annual account deficits – are not looking as dire as a decade or so ago, but some risk premia are likely attached to NZ interest rates.



Source: RBNZ, Bloomberg, ASB



Recent estimates of neutral interest rates

In a cross-country study, the San Francisco Fed (2016) derived historical estimates of natural rates of interest (analogous to the neutral rate) for the US, UK, Eurozone and Canada. It found that these rates had exhibited significant variation over time but had fallen over the past 25 years, reaching historically-low levels in the most recent past. The decline in the neutral rate has coincided with reduced estimates of potential growth given population ageing and the secular stagnation in productivity growth that occurred following the 2007-08 Global Financial Crisis (GFC), which have lowered the demand for capital. This has been corroborated by a range of studies, both in New Zealand and abroad. More recent 2018 US estimates from Laubach and Williams of the San Francisco Fed, suggest that the neutral rate has continued to fall: current estimates place the real neutral Fed funds rate at around 0.5% (2.5% nominal neutral).

Table 1: Neutral Rate Estimates

	Point Estimate	10 years ago	Real rate	Real rate 1990	Real rate 2007	Real rate 2016
Canada	3.0%	4.0-5.0%	1.0%	3.2%*	2.5%*	1.3%*
US	2.9%	5.0%	0.9%	3.5%*	2.3%*	0.4%*
UK			0-1%	2.9%*	2.6%*	1.5%*
Australia	3.5%	5.0%	1.0%			
NZ	3.5%	4.9%	1.5%			

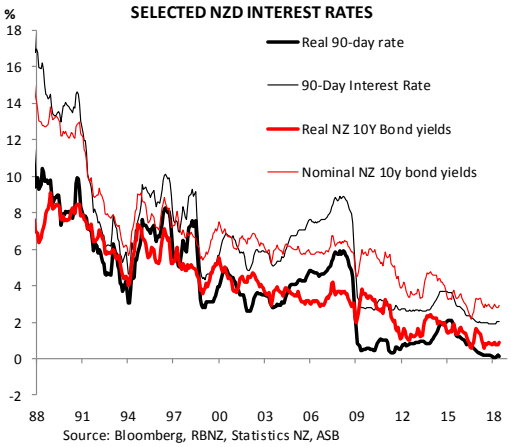
*Source: ASB, RBNZ, RBA, BOC, BOE, FOMC. *San Francisco Federal Reserve.*

There are also some other contributing factors accounting for the observed trend decline in interest rates. Blackrock (2017) believes that evolving global risk aversion, magnified by the GFC, had motivated persistently higher precautionary savings, dragging down the neutral rate. Its estimates suggest that greater risk aversion and lower potential growth each account equally for the roughly 150 basis point decline in the US neutral rate since the global crisis. A similar occurrence may well have occurred in NZ. Using cross country data Hamilton et al (2015) finds that the relationship between trend GDP growth and the equilibrium real interest rate is more tenuous than generally believed

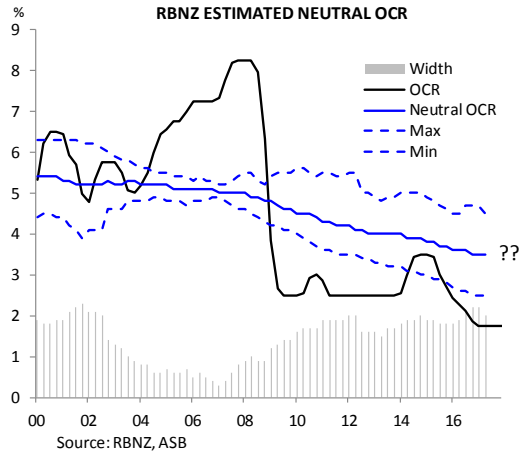
and there is only mixed evidence that the secular stagnation in productivity will continue to hold down the neutral policy rate.

Whatever the view it is clear that interest rates in New Zealand over the last few years are now lower than has historically been the case. There has been a marked decline in both nominal and real interest rates[3]. Likely culprits for the lower neutral rates include the trend decline in productivity growth - our note suggests that the slowdown in NZ productivity growth since the GFC had been reasonably generalised across most industries and reflected a slowing in capital accumulation in relation to strongly growing labour inputs. Increased investor risk aversion and structurally higher funding costs are also likely to have played a role.

The trend decline in New Zealand real and nominal interest rates have seen analysts, investors and policymakers adjust down their expectations of the neutral Official Cash Rate (OCR). The most recently RBNZ published estimates (August 2017 MPS), shows that the neutral OCR was in a 2.5% to 4.5% range by mid-2017, with a central estimate of 3.5%. This compared to around 5½% in 2000, and just under 5% over 2008/09. Other RBBZ estimates suggest that the neutral real short-term interest rates in NZ have been declining since at least the early 1990's.



Source: Bloomberg, RBNZ, Statistics NZ, ASB



Source: RBNZ, ASB

What do our estimates suggest for the neutral OCR in NZ?

2010 approach

Using data from the NZ, Australia and the US, our 2010 note decomposed the nominal neutral interest rate into the neutral real interest rate, expected inflation and a spread between bank funding costs and the OCR.

It had made three assumptions:

- There was no strong trend in inflation, and inflation expectations were stable.
- Mean-reversion occurs in the term premium as represented in the 90-day to 10-year interest rate gap.
- There was no trend in the neutral cash rate over the period.

Our estimates at that time suggested that the neutral nominal OCR rate was around 5%, roughly 1.25% lower than expectations before the GFC. Structurally higher bank funding costs (up to 1.5% higher than pre-GFC levels) were the major catalyst for the reduction in estimates of the neutral OCR. At that time we also cautioned that the estimates only accounted for the likely shift in bank funding costs post the GFC and did not take into account any potential changes in appetite for borrowing or lending. It warned that given increased household caution over indebtedness, *"the 'true' level of neutral could be even lower than our estimate".*

Table 2 (below) summarises the 2010 estimates, with updated estimates which use data up to the June 2018 quarter. **The updated estimates suggest that the average real interest rate since 1992 has averaged just over 3%, a full percentage point lower than our previous estimates.** Inflation outcomes and inflation expectations have averaged

[3] We use a selection of data of inflation outcomes and inflation expectations to derive real interest rates.

around 2% since 1992, and slightly below that since the GFC. Bank funding costs have remained 130-150bp higher than 1992-2009 averages, close to ASB (2010) estimates.

Table 2: ASB Neutral Rate Estimates (2010 approach)

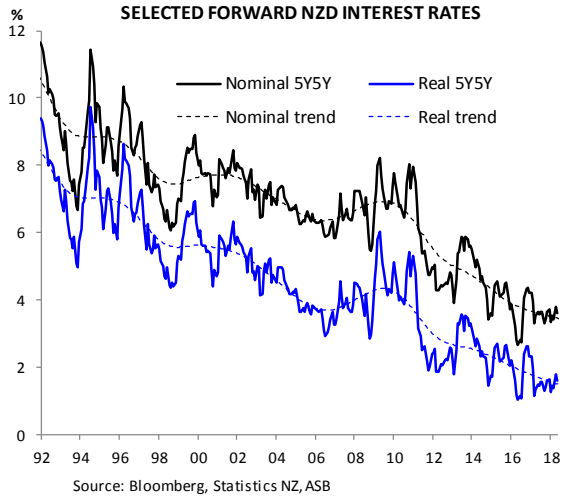
	2010 Estimates (1992-2009)	Current Estimates (1992-)	Current Estimates (2009-)
Real Interest rate	4.1%	3.2%	1.3%
Inflation	2.2%	2.0%-2.2%	1.5%-2.3%
Bank Funding costs	-1.2% to -1.50%*	-1.3% to -1.50*	-1.3% to -1.50*
Neutral nominal OCR	Circa 5.0%	Circa 3.5%-4.0%	Circa 1.5%-2.0%

**post GFC period. Source: ASB, Bloomberg, Statistics NZ, RBNZ.*

All up, our updated estimates suggest that the neutral nominal OCR has averaged just over 3.5% since 1992, around 1½ percentage points lower than our 2010 estimates. **Restricting the period of analysis to the post-GFC period suggests that the neutral nominal OCR has been in a 1.5%-2% zone**. These estimates are consistent with recent local and overseas estimates suggesting the neutral rate is non-stationary and has been trending downwards.

New approach

There are a range of methods used to estimate the neutral rate which range in terms of complexity and resource requirements. Rather than employing a black box approach our intention was to maintain transparency. As such, we steer clear of formal modelling techniques.



We follow the approach outlined by the RBNZ (2015). To abstract from the business cycle effects, the RBNZ estimates the implied zero coupon 5-year-5-year forward government bond rate from observed NZ 10-year government bond yields. This is the five-year interest rate that is expected to prevail starting five years from now, implied by the current structure of the yield curve. It provides an estimate of the average short-maturity government yield that is likely to prevail in the long run. We note that despite the long-run nature of this neutral rate indicator, such a measure can be volatile, as markets continually update prices. As such, a range of de-trending approaches are used, including a linear trend and a Hodrick-Prescott Filter (we add interest rate forecasts to mitigate the end-point problem from the filter).

Viewing the selected forward rates shows the downward trend has been evident since at least the early 1990s**.** The downward trend of NZD forward rates suggests that using longer-term historical averages are likely to produce estimates of the neutral OCR that will be a little on the high side. **Real and nominal rates look to have declined by an average of around 25bps per annum since then according to our estimates.** Some periods – including the period following the GFC – have seen steeper falls in the trend, while others have seen more modest declines or even modest increases (leading up until the GFC). **Of late, we have observed a modest flattening out in this downward trend, with more modest falls in the neutral OCR as interest rates approach their lower bound**. At lower interest rates, uniform movements in interest rates (say, 25bp movements) are likely to have larger economic and financial market impacts.

By mid-2018 the trend real 5Y5Y rate was around 1¼ % as compared to around 4¼% a decade or so ago. The nominal 5Y5Y rate was around 3½ % (6¾%). It is important to note that these estimates only partly account for higher funding costs as they are obtained from a yield curve for government bonds. Bank funding costs have continued to remain high in relation to wholesale interest rates (130-150bps higher than the pre-GFC period according to our

estimates), suggesting a lower neutral nominal OCR, all else equal. Arguably, however, higher borrowing rates relative to the OCR have played a role in contributing to the flatness evident in the NZD yield curve and fall in 5Y5Y rates. **Assuming that around 50bps of the increase in funding costs has not been incorporated into the yield curve estimates would lower our neutral nominal OCR estimates to just below 3%, with the neutral real OCR at around 1%.** A 95% confidence interval around the neutral OCR is around 2½% to 3½%. A similar confidence interval for the real OCR would be roughly ½% to 1½%.

Looking ahead

Our estimates suggest that neutral real interest rates in NZ are non-stationary and have been trending lower over the last few years, albeit to a more modest extent than immediately post the GFC. The NZ neutral OCR could always move higher if there was a persistent narrowing in bank funding costs, global interest rates moved structurally higher (linked to improved risk sentiment), or there was a persistent upward shift in trend inflation. **While this is a possibility, we view many of the recent developments pushing down NZ interest rates as having a persistent impact.**

Extrapolating forward current trends (see table 3) could see the nominal OCR approach 2.50% by late 2021, with the real OCR slightly above zero. Confidence intervals around these estimates are reasonably large, with the neutral OCR likely to be anywhere from 2% to 3% in late 2021. The chart below depicts our historical estimates (solid lines) and forecasts (dots) of the real and neutral OCR, along with historical 95% confidence intervals (dotted lines).

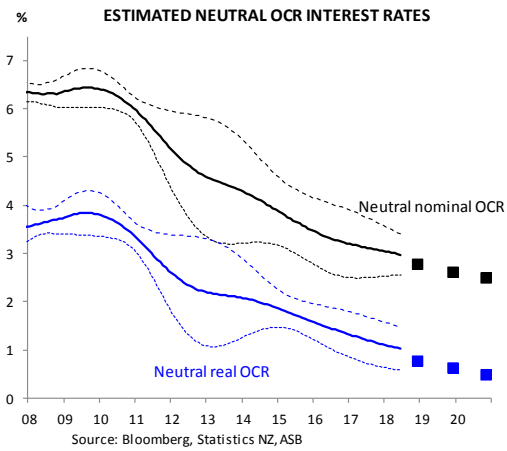
Extrapolating forward current trends (see table 3) could see the nominal OCR approach 2.50% by late 2021, with the real OCR slightly above zero. Confidence intervals around these estimates are reasonably large, with the neutral OCR likely to be anywhere from 2% to 3% in late 2021. The chart below depicts our historical estimates (solid lines) and forecasts (dots) of the real and neutral OCR, along with historical 95% confidence intervals (dotted lines).

Table 3: ASB estimates of the Neutral OCR (new approach)

	Neutral real OCR midpoint and range*	Neutral nominal OCR midpoint and range*
Mid 2018	0.50% - 1.00% -1.50%	1.50% - 3.00% - 3.50%
End 2019	0.25% - 0.75% - 1.0%	2.25% - 2.75% - 3.25%
End 2021	0.25% - 0.50% - 0.75%	2.00% - 2.50% - 3.00%

*Source: ASB. *Rounded to the closest 25bp.*

What about beyond that? The further ahead you look the greater the potential uncertainty and hence the larger the potential confidence intervals of such estimates. One thing we do we with a reasonable degree of certainty is population ageing. All else equal, an ageing population structure would tend to result in a lower neutral interest rate, with recent projections from Statistics NZ suggesting that the number of persons aged over 65 is expected to climb from 15% of the NZ resident population to over 25% by 2068. NZ is not the only one.



Moreover, the relationship between trend growth and the neutral real interest rate is not exact, but it still matters. Our forecasts assume a potential growth rate for the NZ economy of around 3% over the next few years, in line with the RBNZ's August 2018 MPS projections. Beyond that, however, population ageing and a weaker labour productivity outlook could well trim potential growth rates, tilting the saving and investment mix towards a lower neutral rate.

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