

Long-run trends in New Zealand's real neutral interest rate

Author: Melissa van Rensburg

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Executive summary

Over the past few decades, there has been a persistent decline in the level of real interest rates, both in New Zealand and in many other advanced countries. This decline is thought to reflect a decline in the neutral level of the real interest rate. The neutral level of the real interest rate can be defined as the real interest rate level that would be consistent with an economy that is in equilibrium over the medium term. That is, all resources are fully utilised, inflation is stable at its target, and the output gap is closed. Whilst the neutral interest rate is not observable, and cannot be measured with much precision or certainty, it is a useful theoretical concept that can be helpful for analysing the appropriate setting of monetary and fiscal policies.

Following a long period of decline, interest rates have increased in the post-COVID-19 environment, which has raised important questions about the outlook for the structural factors affecting the level of real neutral interest rates over the long term. The objective of this note is to better understand these structural drivers. This will help us to design robust macroeconomic frameworks to ensure the effectiveness of monetary and fiscal policies in stabilising economic fluctuations.

This paper gives an overview of the literature on the drivers that have contributed to the decline in real neutral interest rates over recent decades. It considers whether the direction or magnitude of these factors are likely to change in the next few decades and possible scenarios are presented.

Key points

- Global real neutral interest rates have declined over the past few decades due to higher savings and lower investment in some economies. This has been attributed to, among other factors, higher life expectancy, increased income inequality, and lower total factor productivity growth.
- New Zealand's neutral rate has declined by more than other countries and has converged towards global rates. The convergence of New Zealand's rate to global rates, especially since the Global Financial Crisis, suggests that domestic factors may have played a relatively smaller role in recent times. This is possibly because of increasingly integrated global capital markets and increased access to global capital markets following reforms made in the 1980s.
- The future trend in the neutral interest rate is uncertain and will be influenced by whether there are changes in the magnitude and / or direction of the factors that have caused its past decline, and the ongoing effects of developments such as climate change and new technologies.
- The future trend in the neutral rate will have implications for a range of policy questions, including the likelihood of reaching the effective lower bound, the optimal level for the inflation target, available fiscal and monetary policy space, and public debt sustainability.

The key points above are broadly consistent with previous Treasury publications on the topic, although given recent developments a more circumspect view is adopted on the outlook for neutral interest rates.

Motivation

Interest rates have declined notably over the past few decades, reaching historically low levels, while inflation has also been relatively low up until recently. In the post-pandemic environment, however, inflation and interest rates have increased notably. This has raised important questions about the outlook for the structural factors that drive real neutral interest rates. Examining the outlook for these structural factors is the overarching objective of this note. By understanding these dynamics, we can assess the need to potentially adapt New Zealand's macroeconomic frameworks accordingly, while continually monitoring developments without seeking to predict specific future shifts.

Understanding the level and trend of the neutral interest rate is relevant for a number of policy issues, including:

- **Monetary policy stance.** Having an estimate of the neutral interest rate helps in estimating how expansionary or contractionary current monetary policy is.¹ If the policy rate is below the current estimated level of the nominal neutral rate, monetary policy is expansionary. The opposite is true when the policy rate is above neutral. The view taken on the neutral rate is crucial for policymakers and economic forecasters to achieve the right balance. Misjudgements can lead to policy errors, destabilising the economy (Weber et al., 2008). Estimating the neutral interest rate is part of a broader research area in the literature on how to optimally implement macroeconomic policy in an uncertain environment.
- **Policy space and coordination.** A lower neutral rate implies a higher risk of the Effective Lower Bound (ELB)² becoming a binding constraint on monetary policy. This implies less monetary policy space, which in turn has implications for the role of fiscal policy in macroeconomic stabilisation. Conversely, a higher neutral rate would lower the risk of the ELB constraining monetary policy.
- **Optimal inflation target.** There is an inverse relationship between the neutral interest rate and the optimal inflation target. Andrade et al. (2019) estimate that a reduction in the neutral rate increases the probability of hitting the ELB, which can be counteracted by raising the inflation target. They find that at low levels of the neutral rate, the inflation target should be increased nearly 1-for-1 in response to a fall in the neutral rate. The benefit of this, however, needs to be assessed against the cost of having a higher inflation rate.

¹ The neutral rate is a theoretical concept relating to the real interest rate, as in economic models it is the *real* interest rate that is important for the economy and that drives economic decisions. The interest rates that are observed in the real world, however, are expressed in *nominal* terms, so it can be useful to think about a nominal neutral interest rate when evaluating current monetary policy settings. The real neutral rate can be converted to a nominal one by adding expected inflation. Expected inflation is used instead of actual inflation, since inflation expectations better reflect the future expected return on investment. The focus of this paper is on real neutral interest rates.

² The ELB is the lowest level that a policy interest rate can be lowered to in practice.

- **Public debt sustainability.** Higher interest rates will increase debt servicing costs, which will worsen debt sustainability indicators and may crowd out other government spending initiatives. On the other hand, lower interest rates may imply that the optimal level of debt is higher.
- **Financial stability.** Low interest rates can encourage risk-seeking behaviour by banks and other financial institutions, especially if the degree of persistence of low interest rates has been misjudged.
- **Secular stagnation.** Summers (2014) and others have warned about secular stagnation, which refers to a situation where a persistent decline in the real neutral interest rate along with low inflation would prevent the achievement of full employment over an extended period. The decline in interest rates is viewed as a key manifestation of secular stagnation.³
- **Viability of investment projects.** A lower interest rate will tend to lower the Weighted Average Cost of Capital (WACC), making it easier for investment projects to be approved. However, the WACC has remained stable in recent decades despite declining interest rates, partly due to hurdle rates (the minimum required rate of return on an investment for it to be approved) being slow to adjust and the fact that there has not been a similar decline in the cost of equity finance.
- **Income and wealth inequality.** Low interest rates may affect different dimensions of income and wealth inequality depending on the distribution of savers and borrowers in the population.

³ There have been a number of rebukes to the secular stagnation hypothesis. For example, Gomme et al. (2015) note that the evidence on investment and returns on productive capital strongly rejects the hypothesis that there is insufficient aggregate demand. Still, Blanchard (2023) argues that secular stagnation is not “over”, and that fundamental factors still point towards interest rates remaining low.

Analytical framework for identifying drivers of the neutral rate

The neutral interest rate is a theoretical concept that cannot be directly measured. One possible definition is that it is the real interest rate level that would be consistent with a closed output gap over the medium term (Bernhardsen and Gerdrup, 2007). This implies that the economy is in equilibrium, all resources are fully utilised, and inflation is stable at its target.

The interest rate plays a critical role in economic adjustment and is an important variable in macroeconomic models. Interest rates act as a signal for households and firms to make decisions about saving and investing. A profit-maximising firm will invest in more capital until the cost of the additional capital (the real interest rate, net of depreciation) is equal to the additional benefit (the marginal product of capital), minus allowance for the risk (Yi and Zhang, 2017).

The benefit of using more capital, that is, the marginal product of capital, depends on the share of income accruing to capital, the productivity of all the factors of production, and the ratio of capital to labour. When production is represented using Cobb-Douglas functions, as is commonly the case in macroeconomic models, it can be shown that the following factors would result in an increase in real neutral interest rates (all other factors held constant):

- an increase in the pace of technological progress, which would enable a more efficient use of resources, and
- an increase in the supply of labour relative to capital, which would lead to a lower capital to labour ratio, and therefore a higher marginal product of capital.

Similarly, a slowdown in the pace of technological progress, and a decrease in the supply of labour relative to capital, would tend to lower the marginal product of capital and thus the real interest rate.

A further strand in the analytical framework for thinking about the neutral interest rate concerns the openness or otherwise of a country's capital market to the rest of the world. In a closed economy, investment must equal savings, and interest rates will adjust in order to achieve this outcome. In this case, the neutral interest rate will be determined by the balance between the supply and demand for *domestic* savings. On the other hand, in an open economy, capital can move relatively freely, meaning domestic savings and investment need not be equal. The neutral real interest rate for an open economy is determined by the global demand and supply of savings. Small open economies like New Zealand will have a negligible impact on those global quantities and hence the neutral interest rate, though domestic policies might affect the magnitude of an additional risk premium.

Over the past few decades, international capital markets have become increasingly integrated on the back of globalisation and financial defragmentation. Combined with New Zealand's reliance on global capital, this has meant that global factors now largely influence shifts in the neutral interest rate in New Zealand. Factors specific to New Zealand may still play a role, however, resulting in the domestic neutral interest rate deviating from global interest rates and estimates of the neutral interest rate.

In summary, New Zealand's real neutral interest rate will be influenced by global factors (in turn affected by the demand and supply of capital and productivity), a domestic risk premium reflecting local factors, as well as factors affecting the domestic demand and supply of capital. These structural factors that can affect the level of the neutral rate are considered in the following section.

Historical trends and drivers

Grigoli et al. (2023) estimate a new long-term dataset on neutral rates spanning close to 150 years and identify three distinct phases in the long-term trend in neutral interest rates: stable to slightly declining neutral interest rates from the 1870s to the Second World War; an increase in neutral interest rates after the war and up to the 1960s; and a decline since then. For the median country, the decline since the 1960s peak is estimated at 4.5 percentage points, resulting in a real neutral interest rate around 2.5 percentage points lower than the average level prior to the Second World War.

The long-term global decline in neutral interest rates has been attributed in the theoretical literature to both an increase in desired savings and a decrease in desired investment.⁴ In turn, this has been attributed to, among other factors, an increase in life expectancy, which increased desired savings; a decline in productivity growth; and an increase in inequality, which boosts desired savings, since higher-income people have a higher propensity to save.

As discussed in the previous section, the level of neutral interest rates in New Zealand is heavily influenced by the global neutral interest rate. As a small open economy, while domestic factors play a smaller role, they can still contribute to deviations from the global trend. This can come about either through different trends in savings and investment preferences or changes in the risk premium. Over the past few decades (but especially since the Global Financial Crisis (GFC)), New Zealand's neutral interest rate has converged towards the global one, which implies that domestic factors have played a relatively smaller role, possibly because of increasingly integrated global capital markets and New Zealand's increased access to global capital markets following reforms made in the 1980s. In addition, it is possible that our risk premium has declined partly on the back of improved macroeconomic stability.

Neutral interest rate estimates

Various methods can be used to estimate the real neutral interest rate, including structural economic models, statistical and econometric methods, and extracting information from financial markets.⁵ In New Zealand, the Reserve Bank of New Zealand (RBNZ) uses a variety of methods to estimate the neutral interest rate, as each method provides unique and sometimes conflicting information about its level. This highlights the significant uncertainty about the actual level of the neutral interest rate. Due to the challenges in accurately estimating the neutral interest rate, revised estimates can significantly vary when updated methodologies or data are employed. This underscores the need for caution when drawing conclusions about the present level of the neutral interest rate.

The Treasury does not have its own models to estimate the neutral rate, although its forecasting model does have an implied real neutral rate. The Treasury's Long-term Fiscal Model (LTFM) uses the 10-year government bond yield, which is derived from a short-term interest rate forecast for the first five years and then assumed to gradually converge to a stable long-term level. The value of this long-term level is informed by academic research, other agencies' projection methods, and information from financial markets (Parkyn et al., 2021). This approach resulted in the adoption of a range of scenarios to reflect the high

⁴ See for example McCririck and Rees (2017) and Dorich et al. (2017).

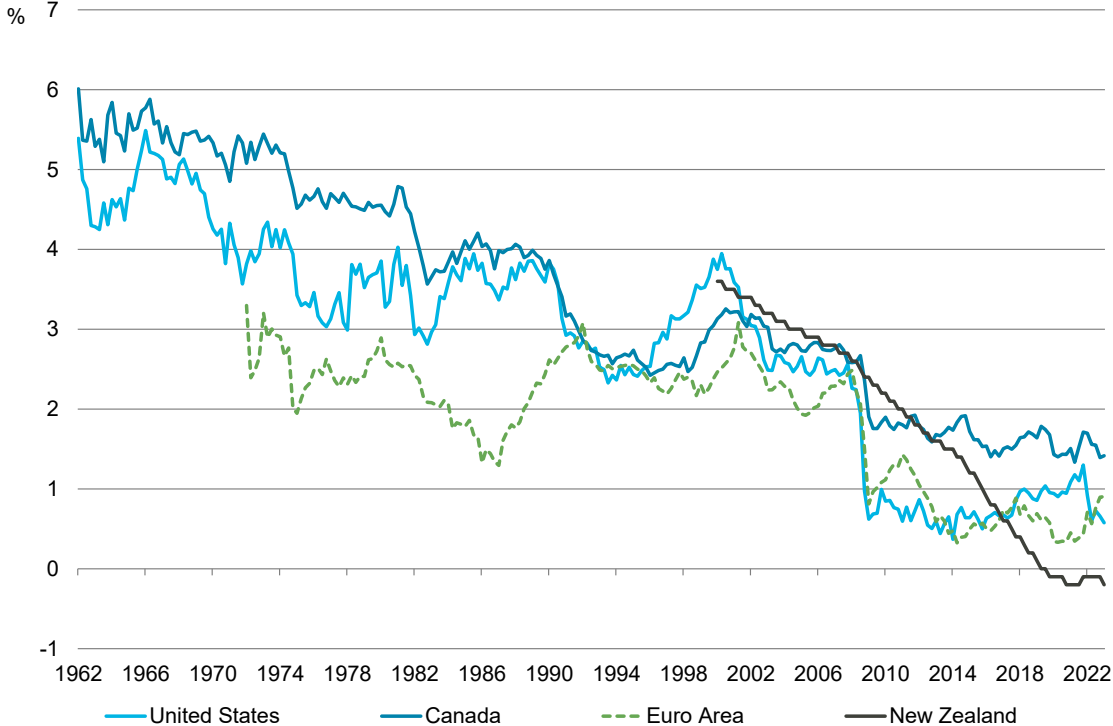
⁵ See Giammarioli and Valla (2004) for an overview.

degree of uncertainty. In the central scenario, it is assumed that interest rates will increase modestly from the very low levels that prevailed in recent decades, but will remain below historical averages.

In Figure 1, real neutral interest rate estimates based on the methodology from Holsten et al. (2017)⁶ are shown for the United States (US), Canada, and the euro area, using the Kalman filter method, in addition to the mean of the RBNZ suite of indicators for New Zealand. Note that the New Zealand estimate is not directly comparable to the other estimates, since it has been derived using a different methodology, although the broad trends should still be comparable to illustrate the similarity in the direction of change.⁷ New Zealand’s estimates are the long-run real neutral interest rate published in the November 2022 Monetary Policy Statement, supplemented by the more recent estimates for the nominal rate from the May 2023 Monetary Policy Statement, from which 10-year inflation expectations have been subtracted. The unobservability and inherent difficulty in accurately estimating inflation expectations adds further uncertainty to the estimated real value for New Zealand.

All rates show a clear downward trend over the period, and there is as of yet no indication that estimates have risen much in the post-pandemic period. New Zealand’s estimated real rate declined by 3.8 percentage points between the March quarter of 2000 to the March quarter of 2023, a bigger decline than the others. However, as noted above, caution should be exercised when comparing New Zealand’s estimates with those of the other countries.

Figure 1: Real neutral interest rate estimates for selected advanced economies



Source: Federal Reserve Bank of New York, RBNZ

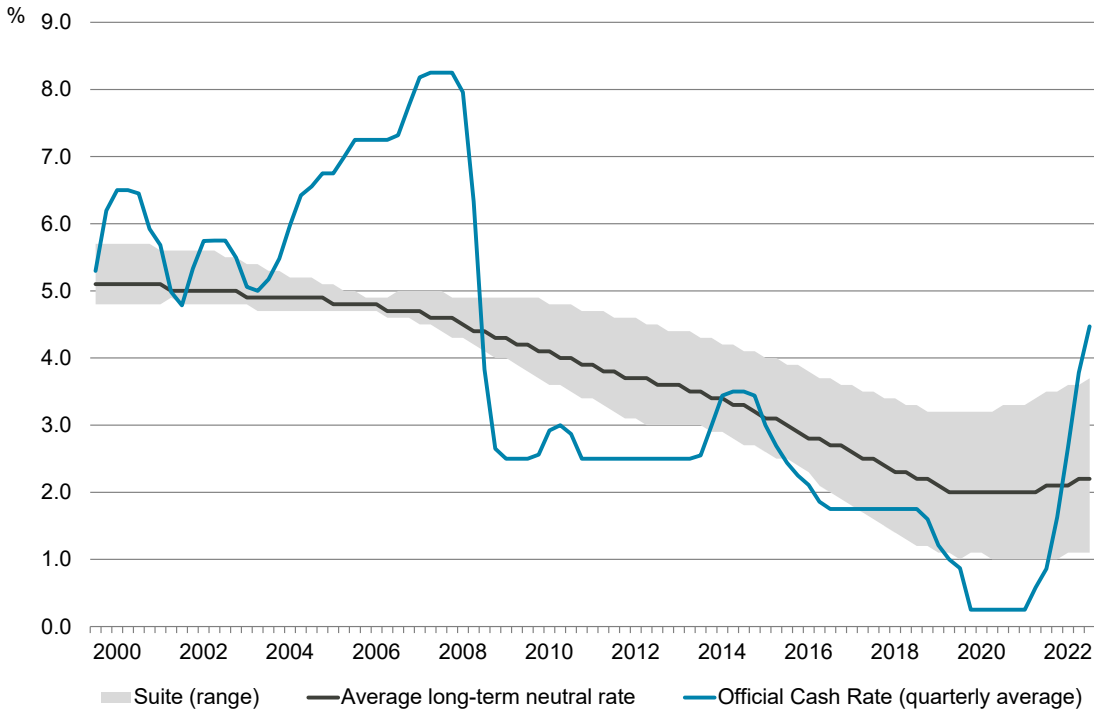
⁶ These estimates were regularly updated and published pre-COVID-19. During and in the aftermath of the pandemic, updating of the estimates was suspended owing to “the extraordinary volatility in GDP related to the COVID-19 pandemic”. Estimation has been resumed since May 2023. Federal Reserve Bank of New York, Measuring the natural rate of interest, <https://www.newyorkfed.org/research/policy/rstar>

⁷ However, the levels comparison, particularly toward the end of the period where New Zealand’s real neutral interest rate is significantly below other countries and negative, is perhaps more questionable.

Estimates for the *nominal* neutral interest rate in New Zealand from the RBNZ’s suite of models are shown in Figure 2.⁸ The estimated nominal neutral rate gradually declined over the period from 2000 to 2020. The range is relatively wide, reflecting the uncertainty associated with the different estimation methods. Furthermore, as noted above, the unobservability and inherent difficulty in accurately estimating inflation expectations adds further uncertainty to the estimation.

The Official Cash Rate (OCR) was generally above the estimated neutral rate over the 2004-08 period, due to monetary policy leaning against high inflation. After the GFC, the OCR was generally below the estimated neutral rate due to inflation being below target, although the decline in neutral rates cannot be observed in real time (RBNZ, 2022).

Figure 2: Nominal neutral interest rate estimates for New Zealand



Source: RBNZ

⁸ We show the nominal rate here since that is what is published by the RBNZ, and in order to compare its level to the policy rate. The nominal rate is derived from the real one by adjusting for inflation expectations.

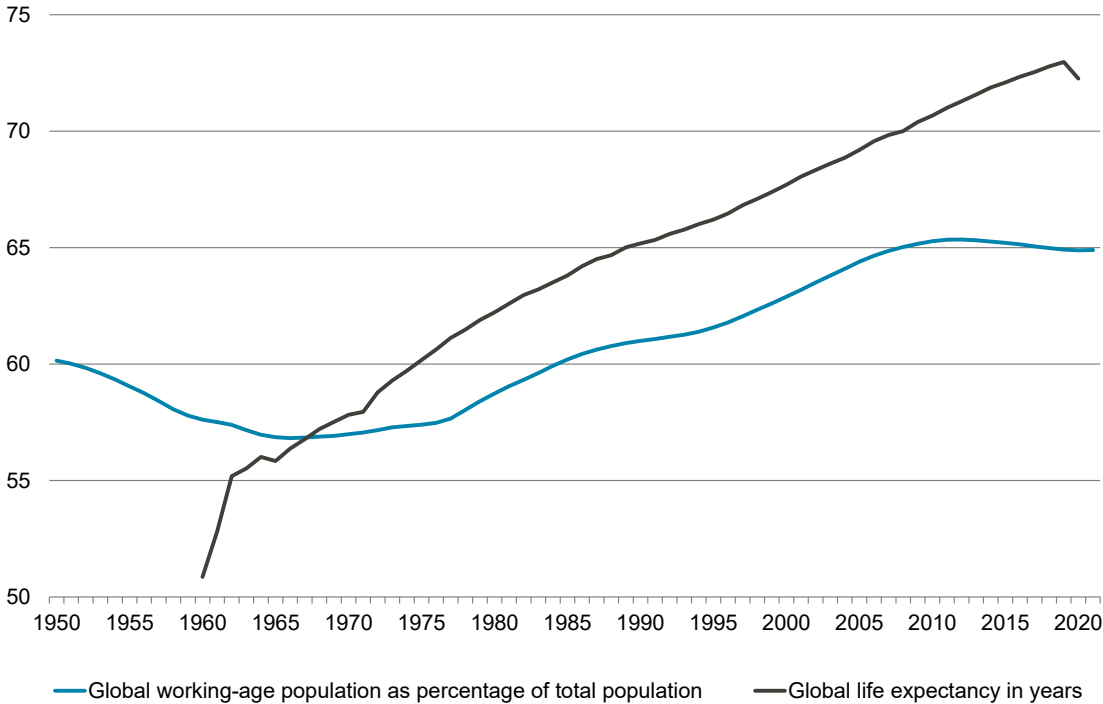
Drivers: Global factors

There is a large body of literature on possible explanations for the decline in global neutral interest rates over the past few decades. This section summarises the most important factors identified in the literature, without taking a view on the relative importance of each, as this is outside the scope of this paper. In the subsequent sub-section, we consider some New Zealand-specific factors.

Demographics

Demographic trends are thought to have been a key factor contributing to lower neutral interest rates over recent decades (see for example Carvalho et al., 2016; Lisack et al., 2017; Eggertsson et al., 2019). According to the life cycle hypothesis, at the start and end of someone’s life they spend more than they earn. During the middle (working-age) period they earn more than they spend, allowing them to both pay back the debt accumulated during the first stage and save for the future period when consumption will again exceed earnings. Over the past few decades, the global working-age population (as a share of the total population) and life expectancy have trended upward (Figure 3).

Figure 3: Trends in global working-age population and life expectancy



Source: United Nations World Population Prospects 2022

Demographic factors can affect savings preferences in different directions through the following channels (Carvalho et al., 2016; Goodhart and Pradhan, 2017):

- A change in the working-age population as a share of the total population. There was a large increase in the global working-age population as a percentage of the total between the 1970s and 2005, which would have contributed to an increase in income, and therefore savings. Projections indicate a decline in this ratio over the next few decades, implying that its effect on the neutral interest rate from this channel will likely reverse.

- An increase in life expectancy increases the number of years following retirement, boosting the incentive to save during the working-age period. In turn, this puts downward pressure on interest rates, other factors held constant.
- An ageing of the population implies a higher dependency ratio in the future. Retired people tend to save less than working-aged people, and therefore this population shift will lead to higher consumption than would have been the case in a counterfactual demographic scenario of no ageing. This therefore leads to relatively lower savings and higher interest rates. This will become more important over the next few decades, as the share of the working-age population declines.

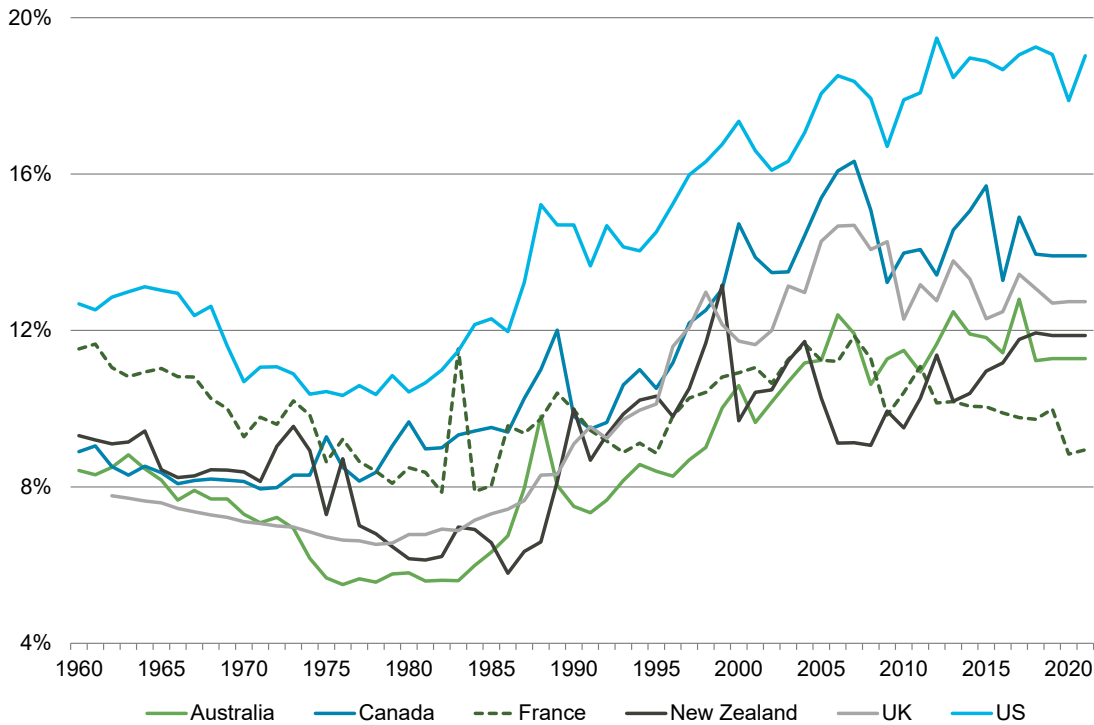
Demographics can also affect investment preferences via the capital-labour ratio. A reduction in labour force growth lowers the supply of labour relative to capital, increasing capital per worker and lowering the marginal product of capital and therefore interest rates, other factors held constant.

Overall, demographic factors can impact savings and investment decisions in different directions through a range of channels, making it difficult to determine the net impact. Carvalho et al. (2016) use an overlapping generations model to estimate the net contribution of demographic factors in developed countries on the real neutral interest rate over the 1990-2014 period. The authors find that demographic factors contributed to a decline of at least 1.5 percentage points in the real neutral interest rate over this period. The authors also estimate that the impact of life expectancy on interest rates is quantitatively larger than the impact of labour force growth.

Inequality

Changes in the distribution of income can affect desired savings because of a positive correlation between income and the marginal propensity to save. To the extent that high-income households save more, rising inequality will result in lower consumption, higher desired saving, and a lower equilibrium real interest rate. Inequality has been on an increasing trend over a number of decades in several developed countries, particularly the US (Figure 4).

Figure 4: Income share of top 1% in selected countries



Source: World Inequality Database

Using micro-data from the US for the 1950-2016 period, Mian et al. (2021) find that there has been a significant increase in savings rates for high-income households, while the differences in savings rates attributed to demographic factors are much smaller. This suggests that rising inequality may have been a much more important factor explaining the fall in the neutral interest rate in the US over the past few decades.

Emerging markets savings glut

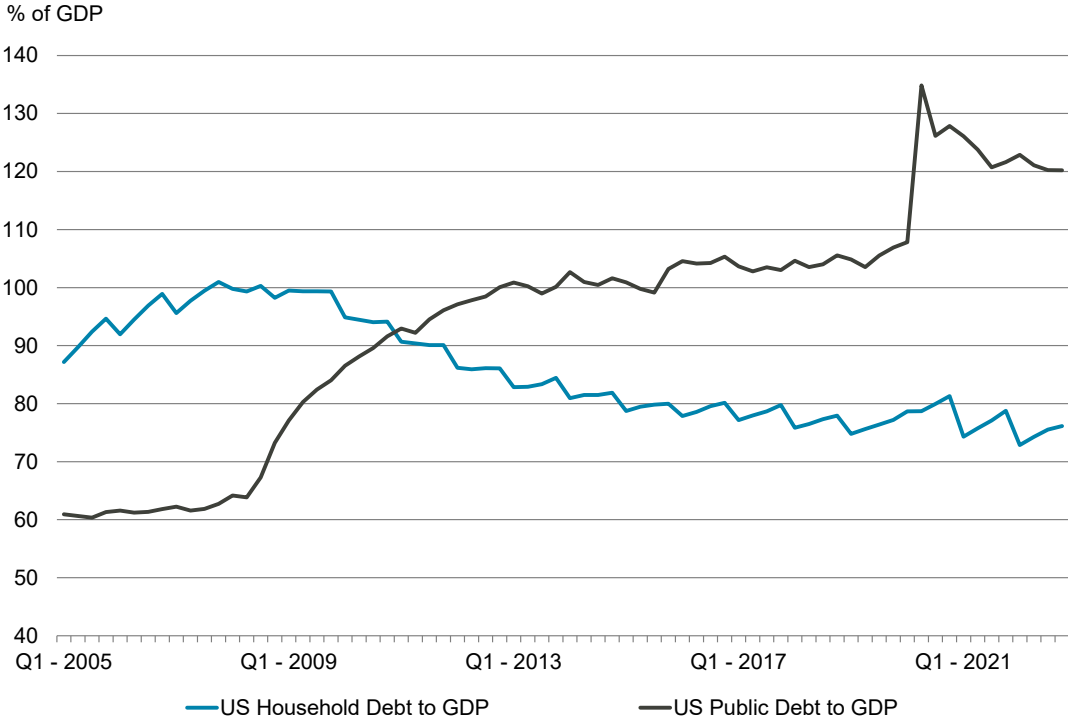
Export-led development strategies were widely adopted by many emerging markets in the post-World War II era, especially in Asia. These countries aimed to promote exports, often through policies such as export subsidies, currency devaluation, and investment in export-oriented industries, and this resulted in an increase in savings via a build-up in foreign exchange and higher profits and / or wages. Favourable demographic shifts further encouraged an increase in savings. In addition, following the Asian financial crisis in 1997, many emerging markets increased their foreign currency reserves as a precautionary measure against the risk of destabilising capital outflows (Bernanke et al., 2004). In tandem, the era of high oil prices prompted an increase in savings among oil exporters (Bernanke, 2005 and 2015).

As global savings increased, the supply of funds available for investment exceeded the demand for investment, which would have contributed to the decline in interest rates. The US current account deficit in the early 2000s was an important factor in absorbing the excess global savings. As the world’s largest economy and a net importer, the US was a natural destination for the surplus savings, which were invested in US assets such as Treasury bonds and mortgage-backed securities. There is some empirical support that the emerging markets savings glut has contributed to the fall in real interest rates (Bernanke et al., 2004; Beltran et al., 2013).

Deleveraging

Following the large build-up in debt by both the private and public sectors during the 2000s, and with public debt ramping up substantially in response to the GFC, an active deleveraging process (reducing outstanding debt without incurring any new debt) commenced (Dorich et al., 2017). It is unclear whether this deleveraging process reflects greater desired savings for the reasons mentioned elsewhere (such as demographic factors), or whether it reflects a shift in preferences towards lower leverage in the wake of the GFC. In addition, since economic growth was sluggish, governments were unable to reduce debt ratios just by relying on GDP growth, and therefore some implemented more active fiscal consolidation measures, though the extent of consolidation varied among countries. General government net debt to GDP declined over the 2010-19 period in Canada, Ireland, Germany, Sweden, and Norway, but increased in others, including in the US, UK, Australia, and New Zealand (from a much lower level). Currently, public debt remains high, as most governments have increased spending significantly to support their economies during, and in the aftermath of, the COVID-19 pandemic. Public and household debt trends are illustrated in Figure 5 for the US.

Figure 5: Household and public debt in the United States



Source: Federal Reserve Economic Data

Productivity growth

The growth in total factor productivity (TFP), which measures the amount of outputs produced by the total inputs in the production process (land, capital, and labour), was lacklustre in the 2000s, especially in advanced economies, and was arguably worsened by the after-effects of the GFC. Adler et al. (2017) identify the following structural (pre-GFC) forces that have resulted in the productivity slowdown:

- Waning gains from information and communications technologies, the slowing pace of innovation at the technological frontier, and adverse productivity spill-overs from a slowdown in TFP growth in the US (the assumed technology frontier).⁹
- Population ageing.
- Global trade slowdown.
- China's maturing integration into world trade.
- Slowing human capital accumulation.
- Fading structural reform efforts in emerging and developing economies.

Deep recessions tend to be associated with persistent output losses, meaning that the lost output is not regained in subsequent years (see for example Cerra and Saxena, 2008; and Blanchard et al., 2015). In addition to having persistent effects on employment and investment, there is evidence that there can also be protracted losses in productivity growth (Adler et al., 2017). GFC-specific factors identified by Adler et al. (2017) that have led to a slowdown in productivity growth include tight credit conditions and corporate balance sheet vulnerability; misallocation of capital; credit conditions; and protracted uncertainty.

The slowdown in the pace of TFP growth in recent decades is likely to have contributed to a decline in the real neutral interest rate.

Spread between rate of return on capital and the risk-free rate

An increase in the demand for safe assets relative to more risky ones since the GFC may have contributed to the fall in neutral interest rates. The increased demand for safe assets may have been caused by higher risk levels, an increase in risk aversion, higher savings, and / or changes in financial regulation (Blanchard et al., 2014). The relevance of the aforementioned emerging markets savings glut extends to this context as well, particularly regarding China and other emerging markets' significant expansion of their holdings of US Treasury securities during the 2000s. Rachel and Smith (2017) estimate that the increase in the spread between the return on capital and the risk-free rate has reduced desired investment and led to a fall in the real interest rate by 70 basis points.

⁹ See for example Duval et al. (2020).

Increase in corporate savings and market power

Corporations have been accumulating large cash reserves in recent decades, which they have used to finance share buybacks, dividends, and mergers and acquisitions, relatively more than has been the case historically to finance investment in physical assets.¹⁰ Some of this can be attributed to the service-oriented nature of some large global firms, which do not require as large investment outlays (Dorich et al., 2017). Moreover, the rise of the digital economy and the increasing use of automation and artificial intelligence (AI) have meant that many businesses have been able to operate with lower levels of physical capital. In some sectors, large corporations have become more dominant, resulting in greater pricing power and reduced competition. The growing size of the digital economy and the increased reliance on intangible assets by firms in that sector to generate high levels of income has also led to a perception by some that these firms are being undertaxed relative to firms in other industries.¹¹ This allows them to generate higher after-tax profits without necessarily having to invest in new capacity or hire additional workers, further reducing the demand for credit and investment. These factors have reduced the demand for credit and investment, contributing to lower interest rates.

Secular decline in the relative price of durable goods

A long-term decline in the relative price of durable goods may have contributed to the decline in the neutral rate (Summers, 2014). This is because cheaper capital goods means that the same level of investment can be achieved by relatively less borrowing, thereby reducing the propensity to invest. It can also be argued that the cheaper price of capital goods would increase its demand, however, and therefore the net effect is ambiguous.

Dorich et al. (2017) note that relative global investment prices have stabilised since the mid-2000s and therefore this factor is unlikely to have further effects on neutral interest rates in the foreseeable future. Nevertheless, it is plausible that the current trend may experience a reversal. Factors such as deglobalisation and companies' efforts to diminish their dependence on global supply chains by increasing stock levels could contribute to this potential shift.

Policy

By smoothing fluctuations in inflation and employment, **monetary policy** can make a positive contribution to living standards. Because monetary policy is believed to be neutral in the long term, however, it is usually assumed that it cannot affect real neutral interest rates. The concept of monetary neutrality typically distinguishes between the real economy, which involves the production and consumption of goods and services, and the financial economy, which involves the buying and selling of financial assets. However, the two are closely intertwined. Changes in monetary policy or financial instability can have enduring real effects

¹⁰ Chen et al. (2017) note that global corporate saving has increased from less than 10% of global GDP in 1980 to close to 15% in the 2010s, with this trend taking place across industries and in a large number of countries. At the same time, investment spending has remained relatively stable, implying that the corporate sector went from being a net borrower to a net lender. There are a number of underlying forces that can be contributing to this, including globalisation, the nature of new technology, deregulation, and the rise of monopoly power (Dorich et al., 2017).

¹¹ There is currently significant work underway at the OECD to develop a multilateral solution to addressing these tax challenges (<https://www.oecd.org/tax/beps/beps-actions/action1/>).

on the economy, impacting investment, consumer spending, and business decisions. The conventional view that monetary policy only affects nominal and not real variables may therefore not hold true in practice (Chancellor, 2022).

Some studies challenge the concept of monetary neutrality, positing that, in some respects, longer-term real economic performance can be influenced by the conduct of monetary policy, although not all of these channels reflect the mainstream view. Some of these channels include:

- If loose monetary policy leads to credit booms, which in turn have long-lasting impacts on output and productivity, then money cannot be considered neutral over extended horizons (Borio et al., 2015).
- Higher-than-necessary interest rates and a failure to minimise labour market fluctuations can result in labour market hysteresis¹² and a long-term reduction in human capital (Ball, 2009).
- Informational feedback loops between the central bank and the private sector, with both sides having incomplete information about the factors determining the neutral interest rate, macroeconomic outcomes, and the other party's assumptions, which in turn leads to large and persistent changes in the perceived level of the neutral interest rate (Rungcharoenkitkul and Winkler, 2021).¹³
- The inflation process is less responsive to economic slack than assumed, resulting in interest rates having to be lowered by more than would otherwise have been the case, which could result in a downward bias on nominal and real interest rates (Borio et al., 2017). This could affect either the level of the neutral rate, or deviations from it.
- If monetary policy reacts asymmetrically to the financial cycle by being relatively more focussed on price than financial stability, it could result in a downward bias on nominal and real interest rates, and a build-up in financial imbalances (Borio et al., 2017).

Using long-term panel data, Borio et al. (2017) provide estimates that suggest the role of monetary policy regimes in influencing the real economy may have been underestimated, citing some of the channels noted above.¹⁴ Furthermore, a number of empirical studies find a link between monetary policy and real equilibrium interest rates. Using a vector autoregression (VAR) framework, Galí (1992) finds that expansionary monetary policy accounts for as much as 60% of the variation in the real rate after five years. Gourinchas and Rey (2016) find only weak evidence that demographic factors and productivity growth affect real risk-free rates. They emphasise the role of booms and busts in explaining

¹² Labour market hysteresis can be defined as “the substantial persistence of unemployment and the protracted effects of shocks on unemployment” (Blanchard and Summers, 1986).

¹³ For example, if changes in the demand and supply of capital come about because of different views of the economic outlook or the level of the neutral rate rather than actual economic conditions, aggressively lowering interest rates in response to economic problems could backfire and lead to a lower-than-intended level of stimulus, thereby requiring further interest rate reductions. The authors use a simulated calibrated model to show that this effect could explain much of the decline in real interest rates in the United States since 2008.

¹⁴ Although there is general consensus that monetary policy can affect real variables such as real output and employment in the short-to-medium term, the mainstream view is that beyond that the effect is confined to the general level of prices. Some, like Borio et al., argue that monetary policy can have longer-lasting effects on the real economy.

movements in short-term real interest rates, which is consistent with the role played by monetary policy via the financial cycle channel. Finally, Bianchi et al. (2022) estimate that two thirds of the fall in the real interest rate since the 1980s can be attributed to changes in the monetary policy stance.

It is widely accepted that **fiscal policy** can affect neutral interest rates. Rachel and Summers (2019) find that increased government debt and social security spending in advanced economies has kept neutral interest rates higher than they would otherwise have been. The authors also suggest that, in the absence of expansionary fiscal policy, advanced economies are prone to secular stagnation.

Drivers: Domestic factors

As noted in the analytical framework section, in small open economies with relatively open capital markets like New Zealand, domestic factors will have a negligible impact on the global quantities of savings and investment and hence the neutral interest rate, though domestic policies might affect the magnitude of an additional risk premium or movements in the exchange rate.

New Zealand's interest rates have typically been higher than those of other advanced countries, although in recent years the gap has narrowed. Several papers have attempted to explain the source of this interest rate differential, including domestic savings/investment imbalances (Labuschagne and Vowles, 2010), demand pressures driven by expansionary fiscal policy and an increase in net inward migration (Mabin, 2010; Reddell, 2013; Fry, 2014), and the existence of a country risk premium (New Zealand Treasury, 2014). Some of these factors are assessed in this section.

Risk premium

Differences in interest rates between countries can arise via the following three channels:

- Liquidity and default risk.
- Expected changes in the exchange rate.
- A currency risk premium, that is, the risk that the exchange rate will be different to what is expected.

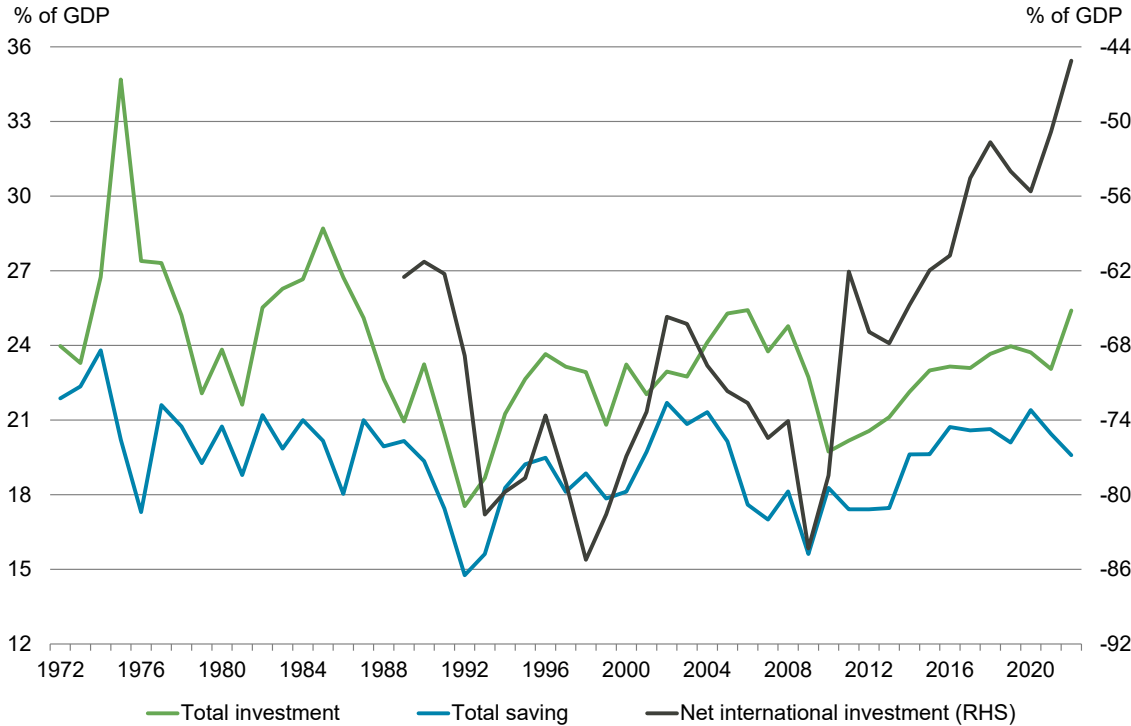
Hawkesby et al. (2000) estimate the first two for New Zealand and attribute the residual to a currency risk premium since it cannot be measured directly. They find that over the 1990s, New Zealand faced a significant currency risk premium relative to the US, and a smaller one relative to Australia. Meanwhile, Burnside (2013) finds that New Zealand's interest rates were substantially higher than those in the US and Japan mainly due to extreme event risk.

Stable inflation, a resilient domestic economy, and low global bond market volatility have contributed to a substantial decline in New Zealand's risk premium in recent years. In addition, increased integration into global capital markets following reforms made in the 1980s, as well as increased globalisation, has increased access to the global pool of savings, which has likely also played a role.

While it is difficult to explain exchange rate movements, a common methodology is to estimate an interest parity condition, which links domestic and global interest rates with the expected exchange rate and a risk premium. In line with this theory, exchange rate movements that are contrary to expectations could affect the equilibrium interest rate.

Net foreign asset (NFA) accumulation is another important channel to consider when assessing the neutral interest rate, as this reflects changes in savings and investment preferences. As shown in Figure 6, the gap between New Zealand’s investment and savings declined over the past decade, from an annual average of around 5% of GDP in the 2000s to 3% of GDP in the 2010s, contributing to an improvement in the net international investment position (along with increases in the underlying value of assets and liabilities), which may also have contributed to a decline in the risk premium. This was mostly due to slightly lower investment rather than higher savings.

Figure 6: New Zealand key external balance indicators (percentage of GDP)



Source: Stats NZ

Note: Savings and investment are flow measures, while the net international investment position is a stock measure.

In summary, recent trends suggest that New Zealand’s risk premium has declined, which may have contributed to a lower neutral interest rate. Exchange rate movements that are contrary to expectations can also affect the equilibrium interest rate. NFA accumulation is another important factor, as it reflects changes in savings and investment preferences. The declining investment and savings gap in New Zealand has contributed to an improvement in the net international investment position, which may have contributed to a decline in the risk premium.

Demographics

Demographic factors are likely to have contributed to an increase in New Zealand's savings rate over the past few decades, all other factors equal, which would have tended to reduce the neutral interest rate. The ratio of New Zealand's working-age population (assumed here to be 15-64 years) to the total peaked in 2006, before declining. Life expectancy increased significantly over this period.

New Zealand's population growth was above average following a marked liberalisation in immigration policy in the late 1980s and early 1990s (Reddell, 2013). This has often been regarded as a significant influence on potential output by increasing the amount of labour input. This trend is even more pronounced when considering that New Zealand has relatively high rates of labour force participation, particularly among older people, when compared to other Organisation for Economic Co-operation and Development (OECD) countries. The strong growth in labour supply relative to capital has led to relative capital shallowness (a decline in the capital-labour ratio). As per the analytical framework introduced earlier in the paper, an increase in the supply of labour relative to capital would tend to lead to higher capital productivity, which would have put upward pressure on the neutral rate, all other factors constant. Determining the overall effect of demographic factors on the neutral rate in New Zealand is challenging. As mentioned in the global section, however, in estimation models, the influence of life expectancy on interest rates appears to have a greater quantitative impact compared to the effect of labour force growth. That said, given New Zealand's small size and relatively free flow of capital, these factors are likely to have only had a negligible impact on the domestic neutral rate.

Inequality

Income inequality in New Zealand increased from the mid-1980s to the early 1990s and has remained roughly constant since then (Ball and Creedy, 2016). To the extent that this led to an increase in aggregate savings, this may have contributed to the decline in New Zealand's neutral interest rate. However, any potential effect of income inequality on aggregate savings and the interest rate is likely to have been overshadowed by the larger forces at play in the global economy given New Zealand's interconnectedness with global capital markets. The Ministry of Social Development's (MSD's) monitoring reports on trends in household incomes in New Zealand suggest that there is no evidence of a sustained change in income inequality since the 1990s, with the income share of the top 1% being steady at around 7%-9%, up from 5% in the late 1980s (MSD, 2019). Once subtracting housing costs, however, incomes are distributed more unequally since housing costs account for a larger proportion of lower-income households' income. This measure of income inequality increased slightly during 2011-18 compared to the mid-2000s and earlier. More recent data from Stats NZ suggest that there may have been a decline in income inequality in the last few years. Owing to a lack of a robust time series, it is not possible to make clear conclusions on the trend in wealth inequality.¹⁵

¹⁵ The recent report published by the Inland Revenue Department (IRD, 2023) on the tax paid by 311 high-wealth households over 2015-21 is not sufficient to make conclusions about the overall trend in wealth inequality in New Zealand.

Deleveraging

New Zealand's public debt was on a declining trend, reaching a low of 5.4% of GDP in 2008,¹⁶ before increasing in the aftermath of the GFC and the Canterbury earthquake in 2011. Following these events, the Government focused on returning its budget balance to surplus, which was achieved from 2014/15 to 2018/19, before the pandemic resulted in large deficits and an increase in debt. Meanwhile, household debt relative to household incomes increased until the GFC and has been broadly flat at relatively high levels since then. It is not clear what the net impact of these changes may have been on New Zealand's neutral interest rate.

Productivity growth

TFP growth in New Zealand has declined over the last two decades (New Zealand Productivity Commission, 2021), which is likely to have put downward pressure on the neutral rate, other factors constant. Some of the structural factors discussed in the global section putting a drag on TFP growth are also relevant for New Zealand, for example the global trade slowdown and adverse productivity spill-overs. On the other hand, the GFC-related factors are less relevant, in particular tight credit conditions and corporate balance sheet vulnerability, meaning that firms with weaker balance sheets and with impaired access to credit suffered productivity losses. This was especially acute in countries whose banking sectors were more affected by the global financial turbulence. The banking sector in New Zealand was not as severely affected by the GFC, reflecting the fact that the sector is less focussed on riskier types of investment and more focussed on utility banking, while having sound bank capital structures (Bollard and Ng, 2012).

Furthermore, a rising terms of trade (export prices relative to import prices) have played a crucial role in bolstering New Zealand's income growth in the past few decades. To the extent that this may have led to higher profitability and increased investment, it could have exerted upward pressure on New Zealand's neutral interest rate, other factors held constant. However, the impact of this, and of lower TFP growth, is likely to have been overshadowed by global forces on the neutral interest rate.

Policy

The 'compulsory opt-in voluntary opt-out' KiwiSaver scheme was introduced in 2007 to try to counter low and declining levels of household savings. The retirement savings scheme has financial incentives in order to encourage participation. However, Law and Scobie (2018) found that KiwiSaver membership was not associated with greater accumulation of net wealth, although the sample period only extended to 2010. Law (2019) finds that increased savings through KiwiSaver have been partially offset by a reduction in savings in other vehicles, meaning the impact on overall savings rates has been limited.

New Zealand's monetary policy has mirrored other advanced economies over the past 10 years, though unconventional monetary policy tools were employed much later. The channels identified in the global section through which monetary policy could affect neutral interest rates may apply to New Zealand as well. The extent to which policy in New Zealand affects the country's risk premium and / or the openness of capital markets could have a bearing on the level of the neutral interest rate.

¹⁶ This is according to the measure of net core Crown debt, which was the Government's primary measure of debt prior to Budget 2022. The equivalent level according to the new net debt measure, which includes the financial assets and borrowings of the NZ Super Fund, is -5.0%.

Outlook for the long-run trend in the neutral interest rate

The outlook for the neutral interest rate is extremely uncertain. Some factors are likely to put upward pressure on the neutral interest rate, while others may exert downward pressure, and there is also a substantial degree of uncertainty regarding the magnitude of these drivers. This applies to both the global and domestic drivers of savings and investment preferences, as well as New Zealand's risk premium. After considering the current global consensus view, the outlook for some key factors is discussed, and some illustrative scenarios are presented.

Global consensus view

Although the outlook for neutral interest rates is extremely uncertain, the consensus view still appears to be weighted towards them staying low. The debate appears to have shifted somewhat over the past year or so, with prominent economists now being more split on the direction of travel, and more emphasis placed on the uncertainty of the outlook. However, while observable interest rates have increased, it is not clear that estimates of neutral interest rates have risen, as reflected in the earlier section on *Neutral interest rate estimates*. In addition, the US Federal Reserve's (the Fed's) median projection for the longer-run level of the Fed funds rate remained at 2.5% in June 2023, unchanged from its pre-pandemic level.¹⁷

Bailey (2022) discusses new research on the global neutral interest rate and concludes that, absent a substantial reversal of the historic trends that have driven it down, it may well remain low. The significant degree of uncertainty is acknowledged, and it is emphasised that neither the direction nor size of the effect of many trends are known – climate change in particular. Bailey states that “the findings of our recent research have left us with as many new questions as answers”.

According to Goodhart and Pradhan (2020), as the proportion of older individuals in the population increases in the future, the effect of an ageing population on the savings rate may potentially reverse. This reversal could lead to an increase in real interest rates since the dissaving of the elderly could exceed the savings of the working-age population.

Gopinath (2022) considers whether the pandemic or Russia's invasion of Ukraine will have a lasting impact on the neutral interest rate. The author notes that an increased demand for safe assets and higher wealth inequality could exert downward pressure on neutral interest rates, while greater use of fiscal policy and catch-up investment in the climate change transition could put upward pressure on neutral interest rates. The effects of other factors are uncertain (labour supply and productivity) or unaffected (demographic factors). Gopinath concludes that the neutral interest rate is likely to remain low, but with a high degree of uncertainty about its trajectory.

Following a review of the evidence, Blanchard (2022) notes that there is “no obvious reason why [the historical drivers] should change sign any time soon”. One factor noted that may push up the neutral interest rate is an increase in investment owing to climate change adaptation. Estimates suggest that green investments could result in a 2% of GDP increase in global investment for a decade or more, in addition to potentially boosting productivity growth, which would also put upward pressure on neutral interest rates. Blanchard concludes that fiscal policy should be expansionary enough to ensure that the neutral interest rate is at least high enough that the ELB on monetary policy is not strictly binding.

¹⁷ The data are available from here: <https://fred.stlouisfed.org/series/FEDTARMDLR>.

Outlook for key factors

Demographics

If the growth in life expectancy slows and plateaus, one source of negative pressure on neutral interest rates will be lessened, which could lead to more upward pressure in net terms, especially as the dependency ratio is expected to rise. A fall in the working-age population ratio to the total may result in a reduction in both savings and investment preferences. The net impact on neutral interest rates will depend on the magnitude of these changes, which is uncertain. Goodhart and Pradhan (2017) argue that ageing will lower both desired savings and desired investment, but that savings will fall by more, resulting in an increase in interest rates.

The relatively free movement of capital across borders allows for the diversification of demographic risks. Countries that are ageing relatively more rapidly will have excess capital, which can be invested in countries that are not ageing as rapidly (Liu and McKibbin, 2022). In turn, this will increase the effective return on capital in the countries that are ageing more rapidly.

Inequality

Globally, the future trend in inequality is uncertain, but in the absence of significant policy changes, inequality is unlikely to fall significantly from current levels. On the other hand, it may be argued that social opposition to current relatively unequal income and wealth distributions in some countries may be sufficient to result in policy changes that could result in a reversal in this trend. If there is a notable decline in inequality at a global level, savings could fall, and neutral interest rates increase, other factors constant.

In New Zealand, there has been significant investment in addressing income adequacy in recent Government budgets, and data from the past few years indicate there has been a decline in some income inequality measures. The future trend in income inequality will depend on whether future governments implement policies to bring about a more equal income distribution, and the success of those policies.

Productivity growth

Since the pandemic, some industries may have benefited from the increase in the share of workers working from home and greater use of technology, though the evidence is mixed. De Vries et al. (2021) find that, once accounting for the large fall in productivity in the hospitality and culture sector during 2020, there is no sign that the trend of slowing productivity growth pre-pandemic has reversed. The future trend will depend on whether gains (if any) in industries with above-average digital intensity will outweigh falls in other areas.

It is possible that technological improvements in the future will boost productivity growth, driven by AI, robotics, the internet of things and the blockchain (Qureshi, 2020). Damioli et al. (2021) use data from more than 5,000 firms worldwide over the 2000-16 period and find that AI patent applications have significant positive impacts on productivity, especially in small and medium-sized enterprises in the services sector.

A key question is why productivity growth has slowed in recent decades despite the advancement of the technologies mentioned above. This seeming paradox is investigated by Brynjolfsson et al. (2019), who conclude that while AI technologies have not yet significantly benefited productivity growth, they are likely to have big diffusion effects and enable complementary innovations that could multiply their impact in coming decades. Moreover, these innovations are costly, take time, and are hard to measure with current methods. Given the importance of intangible assets, the way we measure productivity may need to change. Furthermore, policymakers may need to ensure that the gains from new technologies are more equally distributed, otherwise they may put strains on the social cohesion and institutions needed for achieving sustainably higher living standards.

The extent to which New Zealand manages to benefit from global spill-overs from technological progress in the decades ahead, and to close its productivity gap with other advanced economies, may lead to an upward shift in the trend of the country's real neutral interest rate.

Global trade trends

The pandemic disrupted global supply chains because of lower supply (due to public health restrictions on activity) and a shift in demand from services, which usually involve face-to-face contact, to goods. While these constraints have since eased, there may be lasting impacts on companies' supply chain models, such as shifting from a 'just-in-time' model to a 'just-in-case' one. Since the latter is more costly, it may put downward pressure on productivity and lower the returns from investment, which could lead to lower neutral interest rates. It is not yet clear how enduring these trends will be. For example, while shipping costs returned to pre-pandemic levels at the beginning of 2023, other events could again disrupt supply chains.

Meanwhile, Russia's invasion of Ukraine may exacerbate the retreat from globalisation that has been underway in recent years, due to increasing concerns about economic security, and result in increased protectionism (Blackmore et al., 2022). This could affect the neutral interest rate in two ways. Firstly, it would have a negative effect on productivity and hence the real neutral interest rate. On the other hand, reduced access to global capital and higher risk levels are likely to put upward pressure on New Zealand's neutral interest rate as a small open economy reliant on foreign capital. Given the relative importance of the second factor, the net effect of increased risk levels is expected to push the neutral interest rate upward.

Savings glut and current account balances

The decline in oil prices during 2014-20 contributed to a decline in the emerging markets savings glut, which was also reflected in a narrowing in current account deficits in the US and other advanced economies. China's trade surplus has also declined on the back of a structural rebalancing of its economy from exports to domestic consumption. Another factor that could drive the emerging markets savings glut lower is an increase in capital flows from rapidly ageing to less rapidly ageing countries. Therefore, except for cyclical periods when commodity prices rise, the emerging markets savings glut could dissipate over the next few decades, which would put upward pressure on neutral interest rates.

Climate change

Climate change could have significant effects on the financial system, inflation, the neutral interest rate, and economic growth. Physical risks from extreme weather and global warming could cause demand and supply shocks that impact output and productivity. There is evidence that extreme heat could lower the cognitive performance of human capital, reduce productivity levels, and reduce the labour supply.¹⁸ There are also transition risks that may negatively impact economic growth through demand and supply shocks (Batten et al., 2020). The expectation that climate change will lower future investment returns may already have affected current investment decisions.

Climate change may result in either a decline or increase in the neutral rate, while the magnitude is uncertain. One channel through which climate change could put downward pressure on the neutral interest rate is via negative productivity effects. In addition, increased uncertainty associated with climate change could boost precautionary savings, also putting downward pressure on neutral interest rates. On the other hand, the transition to a greener economy will require substantial investments and policy changes, which would push up the neutral interest rate (Hernández de Cos, 2021; Benmir et al., 2020). It is possible that these investments will have positive effects on productivity, which could partially offset the negative productivity effects noted above. However, recent model simulations on the potential effect of climate change on the neutral interest rate show that scenarios where the neutral interest rate decline are more frequent (Mongelli et al., 2022).

The unpredictable shocks associated with climate change might make it more difficult to estimate potential output, and therefore the neutral interest rate, thereby making it more difficult to know exactly what the policy stance is and should be (Batten et al., 2020).

Fiscal policy

Over the past decade and more, fiscal policy across the world has generally been expansionary due to a combination of factors, including propping up the perceived insufficient level of aggregate demand, and to help households and businesses smooth their incomes in the face of shocks. While New Zealand's public debt-to-GDP ratio is a lot lower than that of other advanced economies, it has increased during, and in the aftermath of, the COVID-19 pandemic.

The very factors that could affect the level of real neutral interest rates, such as population ageing and climate change, are also expected to create adverse pressures on the underlying fiscal position. For example, an ageing population will lead to higher healthcare and superannuation costs, while both the physical and transition effects of climate change could worsen the fiscal position, for example via increased disaster-related costs and higher investment in clean energy. In addition, New Zealand has a large infrastructure deficit, estimated at \$104 billion by a report commissioned by the New Zealand Infrastructure Commission (2021). These factors suggest higher government spending in the future, which will put upward pressure on neutral interest rates.

¹⁸ For example, Deryugina and Hsiang (2014) find a 1.7% decline in productivity for each 1°C increase in the daily average temperature above 15°C using data from the US over a 40-year period. Acevedo et al. (2018) find that higher temperatures also correlate negatively with wellbeing, per capita income, educational achievement, and life expectancy.

New Zealand risk premium

Some of the factors noted in the previous section that have resulted in a decline in New Zealand's risk premium may now be reversing. In particular, there has been an increase in risk aversion globally, volatility has risen, and there are a number of ongoing geopolitical concerns. There has also been a notable increase in New Zealand's current account deficit and a depreciation in the exchange rate, although at least part of the current account widening is related to the pandemic and not due to structural changes. Overall, these trends suggest a higher domestic neutral interest rate from this source in the future.

Scenarios

Because there is significant uncertainty about both the current level and the outlook for the neutral interest rate, it may be helpful for policymakers to identify plausible scenarios and consider whether policy frameworks are robust to each scenario. Three broad scenarios are identified, along with some key factors that will assist in monitoring the likelihood of each (Table 1). **In the coming years, it will be helpful to monitor the following factors and related research to help determine which of the identified scenarios are more likely to occur:**

- How AI and other technologies could benefit productivity growth, and progress with improved measurement of productivity.
- The likely net impact of climate change on productivity growth.
- The trend in globalisation and its effect on productivity growth and access to global capital.
- Trends in inequality and public debt.
- The net impact of population ageing on interest rates.
- The persistence of impacts related to the pandemic, for example on human capital and productivity growth.

Table 1: Scenarios for long-term trends in the real neutral interest rate

Scenario 1: Remain low / decline further	Scenario 2: Small increase	Scenario 3: Moderate increase
Examples of factors that could result in scenario playing out (factors not mutually exclusive)		
Population ageing results in a sharper decline in investment than in savings.	Population ageing results in similar declines in savings and investment.	Population ageing results in a sharper decline in savings than in investment.
Inequality increases further.	Inequality remains high but does not increase further.	Governments implement policies that are successful in lowering inequality.
Significant consolidation in public debt-to-GDP ratios.	Public debt-to-GDP ratios remain at their current levels.	Public debt-to-GDP ratios increase.
Negative productivity shocks from climate change more than offset benefits of increased investment / transition policies.	Negative productivity shocks from climate change are roughly offset by benefits of increased investment / transition policies.	Negative productivity shocks from climate change are more than offset by benefits of increased investment / transition policies.
Productivity gains from new technologies fail to live up to expectations.	New technologies result in a moderate increase in productivity.	New technologies result in a substantial increase in productivity.
Pandemic has lasting negative impact on productivity.	Pandemic does not have lasting impact on productivity.	Pandemic-related change in how we work boosts productivity.
Globalisation picks up again, resulting in improved access to global capital, partially offset by higher TFP growth.	Deglobalisation continues at the same pace as seen in previous decades.	Deglobalisation intensifies, resulting in higher risk levels and reduced access to global capital, partially offset by lower TFP growth.

Conclusion

Improving our understanding of the past drivers of the real neutral interest rate enables us to shape our perspective on its potential future trend and devise robust macroeconomic frameworks. The decline in the neutral interest rate over the past few decades has been attributed to an increase in desired savings and a decline in desired investment caused by factors such as demographics, higher inequality, and a decline in productivity growth.

Given the difficulties in estimating the current level of the neutral interest rate, updated approaches or data revisions can lead to substantial differences in revised estimations. This emphasises the importance of being cautious when drawing conclusions and making policy decisions based on the current level of the neutral interest rate.

In addition to uncertainty about the current level of the neutral interest rate, its future trend is also very uncertain because it will depend on whether there is a change in the direction or magnitude of the various factors discussed in this note. The consensus view is still weighted towards neutral interest rates staying low, but there are also a number of factors that suggest they may increase. More clarity could arise if we know more about, for example, the likely future trend in productivity growth, including due to the effects of climate change and new technologies like AI.

The future level of the neutral interest rate, whether that is higher or lower than the current level, could have implications for the likelihood of monetary policy being constrained by the ELB, the optimal level for the inflation target, the amount of policy space available, public debt sustainability, and other policy issues. Given that the likelihood of being constrained by the ELB remains relatively high, ways to address this constraint should remain a priority for policymakers. This note has identified a number of areas that we should continue to monitor to keep our assessment of scenarios for the neutral interest rate up to date.

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