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Secular Stagnation, the Long-Term Real Bond Rate Outlook and Policy Issues for NSW and Australia

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NSW GOVERNMENT

Acknowledgement

NSW Treasury acknowledges the Traditional Owners of the land on which we live and work, the oldest continuing cultures in human history.

We pay respect to Elders past and present, and the emerging leaders of tomorrow.

We celebrate the continuing connection of Aboriginal and Torres Strait Islander peoples to Country, language and culture and acknowledge the important contributions Aboriginal and Torres Strait Islander peoples make to our communities and economies.

We reflect on the continuing impact of policies of the past and recognise our responsibility to work with and for Aboriginal and Torres Strait Islander peoples, families and communities, towards better economic, social and cultural outcomes.

Note

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The views in this report are his own and do not seek to represent those of the NSW Government or any past or current employers. The author is grateful to Michael Warlters and Stephen Walters for suggesting this intriguing topic, and to members of NSW Treasury for comments on an early draft (particularly Michael Warlters, Luke Maguire, and Kevin Ge). All remaining errors are his alone.

Preface

Ex ante excess saving versus investment in the global economy has worked to bring about their *ex post* equality via extremely low real interest rates. Returns on investment have fallen and deflation pressure has been a feature for most OECD countries.

The *'saving glut'* view originally put forward by Ben Bernanke (2005) to explain these outcomes is the most plausible of those offered in the literature. The view that excess saving affected the US disproportionately due to its special role in the international financial system is supported by the data. Probability weighting different future global scenarios suggest convergence of the US 10-year real rate to an equilibrium of 1.85 per cent, which is also consistent with estimated potential growth.

The empirical estimate for the Australian real 10-year rate is based on interest rate parity with the US real rate and long-run Australian dollar equilibrium. The estimated real equilibrium bond rate from this approach converges to 2.1 per cent in the long run, also consistent with estimated potential growth. Cross-checking with a model based on domestic and foreign saving influences confirms similar estimates.

The savings trends in major regions, and the probabilities attached to them, are set to be consistent with global demographic trends and GDP profiles provided by the World Bank. Debt levels in the various regions, China's likely slowing, and the implications of the Belt and Road Initiative also influence the weighting for different scenarios used for the real interest rate projections.

Australian and NSW productivity growth compares poorly with other countries. The US is singled out for comparison because it has a high level of productivity (harder to improve upon) and Sweden because it is a similar size to NSW and mining is (likewise) unimportant. Both countries do better in comparison to Australia.

Mining and finance are shown to be entirely unsuitable for any plan to improve Australian and NSW productivity growth over the long run. Mining productivity growth was been especially poor. However, productivity growth excluding mining and finance, the bulk of the economy that needs to be a focus of any plan, is also poor.

A plan for NSW that makes sense is feasible, and some characteristics of Sweden's success are argued to be informative for NSW planning. Such policies will require physical and social infrastructure spending, and the growth and the real interest rate projections in this study are favourable for borrowing to implement such projects, particularly if a higher growth rate is associated with them. When assessing individual projects, hurdle rates should avoid giving too much weight to the recent distorted low rate environment.

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Abstract

Budget deficits have expanded after the Global Financial Crisis (GFC) and again significantly with measures to support the economy following the COVID-19 pandemic. These increase the need for short-term borrowing. But aside from immediate cash needs, both Australia and New South Wales (NSW) need an economic plan for maintaining prosperity in the future. Australian and (especially) NSW productivity growth compares poorly with other countries. For mining, this growth was negative for most of the 2000s and the recent cyclical boost brings it back only to near zero since 2000. Finance is oversized in Australia and NSW, and it too faces an uncertain future. Yet the other parts of the Australian economy on which a solid future depends show signs of '*secular stagnation'*: or a weakness in the long-term growth of market economies associated with falling real interest rates and companies operating at or below capacity.

Capital investment to drive better productivity in the future is essential. The real interest rate outlook in this report suggests that it is an ideal time to bring about such structural change.

State and Federal governments will need to increase emphasis on Research and Development (R&D), shown in all countries to be essential for productivity growth. Education is necessary to promote a more innovative economy. Improving the quality of existing labour to keep pace with IT producing and using companies is also important and requires investments in retraining facilities and support for workers displaced by structural change. Physical and social infrastructure investment is supportive of digitalisation and greater capital intensity of labour. Providing pandemic-proof medical services for a healthy workforce and supportive childcare facilities needs to be a part of this. So too does a transition to renewable energy, which will reduce exposure to stranded assets in the future and interruptions to energy supply.

The borrowing required for such programs requires a sensible approach. The OECD '*golden rule*' has always been that government current spending should be funded out of revenue, while borrowing for investment enhances welfare when the social returns to that investment exceeds the '*hurdle*' discount rate. Borrowing costs are at historical lows, but a strong duty of care is required because intergenerational considerations are present. Cost-benefit analyses of investments are important to avoid supporting '*white elephant'* projects that saddle future generations with under-performing assets when interest rates return to more '*normal*' (higher) levels. In short, current low interest rates are attractive from a borrowing perspective but also risky from the point of view of the rigorous assessment of investments.

Since the returns to investment accumulate over several decades, it is important for NSW governments to consider what a more 'normal' economic environment might look like for future generations. It is the real interest rate that matters for these considerations. Is secular stagnation here to stay, so rates will remain low and beneath potential growth rates? Or will

global developments lead to higher rates considered more normal in years prior to the global crisis? Answering these questions is the focus of this report.

While domestic factors are key drivers of potential growth, the underlying drivers of real interest rates are global in nature. Global bonds are priced with reference to the US Treasury bond rate — the global '*safe asset*' traded in a large deep market where central banks tend to invest much of the their foreign reserves (the reason why the US dollar is referred to as the "*reserve currency*"). US demographics and saving trends are important drivers of the US real rate. But bonds are globally traded securities and global demographic and saving trends are also key determinants of the price of the *global safe asset*. The cumulated current account deficit is a measure of how rest of the world saving affects the level of assets held in foreign portfolios for any country. It is a key influence on this critical benchmark US market and for interest and exchange rates in other countries.

Like the USA, other advanced economies are ageing. This should exert a downward influence on saving and upward pressure on real interest rates. China and the so-called Asian Tigers (Korea, Taiwan, Singapore and Hong Kong) are also ageing. China has played a disproportionately large part in the rise in global saving until now. Were this to reverse somewhat further upward pressure on real interest rates would arise, unless saving in other developing countries with younger populations (such as India) could combine to sustain a further increase in global saving.

Global issues also set the backdrop for Australia's growth outlook and the terms of trade which drives the Australian dollar. If the resource super cycle plays a less important role for Australia in the future, states will have to do more to offset the negative impact on future real income. The Australian dollar is also a key influence on capital account flows and the evolution of asset prices (which affect state revenues), the hedging activities of state entities, and currency choices for bond issuance. The Australian real exchange rate is likely undervalued in 2020, but its direction in the long term will depend on many of the other issues considered in this report.

Chapter 1 sets out some of the key data trends and provides a selective summary of some of the relevant literature on secular stagnation and real bond rates. Chapter 2 is more technical and sets out a tractable model framework to assess the themes most relevant to Australian borrowers. The main hypothetical scenarios for the interrelated real long-term interest rates in the US and Australian economies are provided. The exchange rate role in this process and how it might evolve given developments in Asia is also analysed. Chapter 3 then provides a view on the global outlook and trends that are most likely to affect alternative scenarios. This discussion influences the probability weights attached to different scenarios used to determine the direction of real bond rates. Finally, in Chapter 4, some policy thoughts of direct relevance to NSW are presented.

This paper is offered as part of a series of technical research papers that unpack the key drivers of long-term economic growth and the fiscal outlook in the lead up to the 2021 NSW Intergenerational Report.

1. Real Interest Rates Trends and the Literature on Secular Stagnation

Chapter Highlights

The equilibrium real interest rate is that which balances saving and investment at the global level, and rates between countries mean revert towards each other. The United States plays a disproportionate role in this process, given the size and liquidity of its bond market, and the role of the dollar as the reserve currency. Other markets 'price' relative to this safe liquid US security.

The period since 2000 has witnessed large shifts in production supply chains and saving behaviour between advanced and emerging countries. Investment and saving have shifted materially towards Asia. These countries are acquiring net US assets and the US is running large bilateral current account deficits. The reason for this is something of a puzzle, as it is advanced countries with ageing populations that should be running current account surpluses and net lending to younger higher-return emerging countries.

Much of the empirical work on the US has put too much weight on traditional economic theories of closed economies to explain low real interest rates, which are not well supported by the data (e.g. that real wages rise resulting in capital for labour substitution that offsets the effects of the fall is saving due to ageing; yet real wages are in secular decline for less educated worker cohorts and US saving is rising).

The fall in US real interest rates gathered pace after 2001, and this appears to fit better with the global saving glut view and the shift of supply chains to Asia (where investment is also strong) as opposed to some sudden shift in predictable demographic trends.

The reason for US economic success is mainly due to investment in IT producing and IT using sectors, as well as outsourcing lower-value-added production to Asia. The quality of labour rather than the size of the labour-force (emphasised in some demographic studies) may play a significant role in what happens to real returns in the future. If the quality of labour through education and training can't keep up with the demands of IT-producing and using sectors, then labour productivity and trend economic growth may well weaken.

Economic Theories

'*Secular stagnation'* is a term used to describe weak long-term growth in market economies which operate at or below capacity and are characterised by falling real interest rates with subdued inflation. Following more than two decades of deflation pressure, poor investment levels in Western economies and falling real interest rates, policy-maker concern about stagnation is rising.

There is a long history of theories of secular stagnation. Marx believed that capitalist economies invest heavily in productive capacity, while unequal income distribution

constrains consumption. Competition between companies results in excessive investment and a secular decline in the rate of profit. Alvin Hansen in the 1930s held a somewhat opposite view that the main difficulty is that full employment generates too high saving for investment to be able to fill the gap. Keynes too believed that situations like the 1930s were related to too little investment caused by capitalist 'animal spirits' that became too depressed and self-fulfilling. He believed fiscal expansion to be the only way out. Neo-Keynesian thinking also emphasizes the role of financial markets in affecting income distribution, asset market bubbles and crises.

The Harrod/Domar growth models present the idea of 'warranted growth': investment needs to be just enough to absorb saving, given the marginal efficiency of capital and the propensity to save. Higher saving and a lower capital-output ratio warrant high growth and vice versa. If growth falls below the warranted rate it might further depart from equilibrium. Furthermore, the 'warranted rate' need not be in line with the natural rate of growth determined by population growth — that rate at which full employment is maintained — resulting in secular stagnation.

The neoclassical growth model 'golden rule' posits that if consumption is to be maximised, then the first order conditions are such that the equilibrium capital/labour ratio is that where the marginal product of capital (MPK) — the real interest rate — would be equal to the natural rate of growth determined by population growth. The Ramsey growth model is more general than the familiar Solow model, as it endogenizes saving. Consumers make choices between consumption today and consumption tomorrow, and utility maximisation requires a MPK equal to population growth plus societies rate of time preference. Growth, and real interest rates can move lower due to falling population growth, ageing and any change in the rate of time preference.

Declining Real Interest Rates Trends

The past 800 years

Schmelzing (2020) presents painstaking research over 800 years, covering old kingdoms, city states and governments. He argues that the decline in real rates is a very long-term trend that is likely to continue. The work is most interesting for some of the documented historical events that saw sharp turning points in real rates. Thus, when sumptuary laws were introduced to restrict rampant luxury spending by the merchant class after the Black Death, saving was forced to flow back into the debt markets and real rates declined in the late 15th and early 16th centuries.

However, extrapolating an 800-year trend aggregated from vastly different sources and concepts — most of which are impossible for readers to verify — does not seem justifiable. There is nothing resembling uniform security instruments, and inflation data prior to the 20th Century are very unreliable. The nature of 'markets' in the days when despotic kings could impose loans on the nobility with no meaningful covenant protection isn't comparable to the

deep, deregulated exchange traded markets of today, where derivatives also play a large role.

The Past 100 Years

Even the government bond markets in place for much of the 20th century aren't comparable to those of today. Prior to the early 1980s modern tenders for blocks of bonds did not exist. Instead yields were fixed, and institutions would often apply for issues. This was more like pricing used cars — the car in the yard has a price painted on the window and you can come into the yard and buy the car or not. The central bank acted as the residual lender to the government. Worse, from 1933 markets were heavily regulated, capital controls and interest rate ceilings were in place, and financial repression techniques were widely practiced.[1]

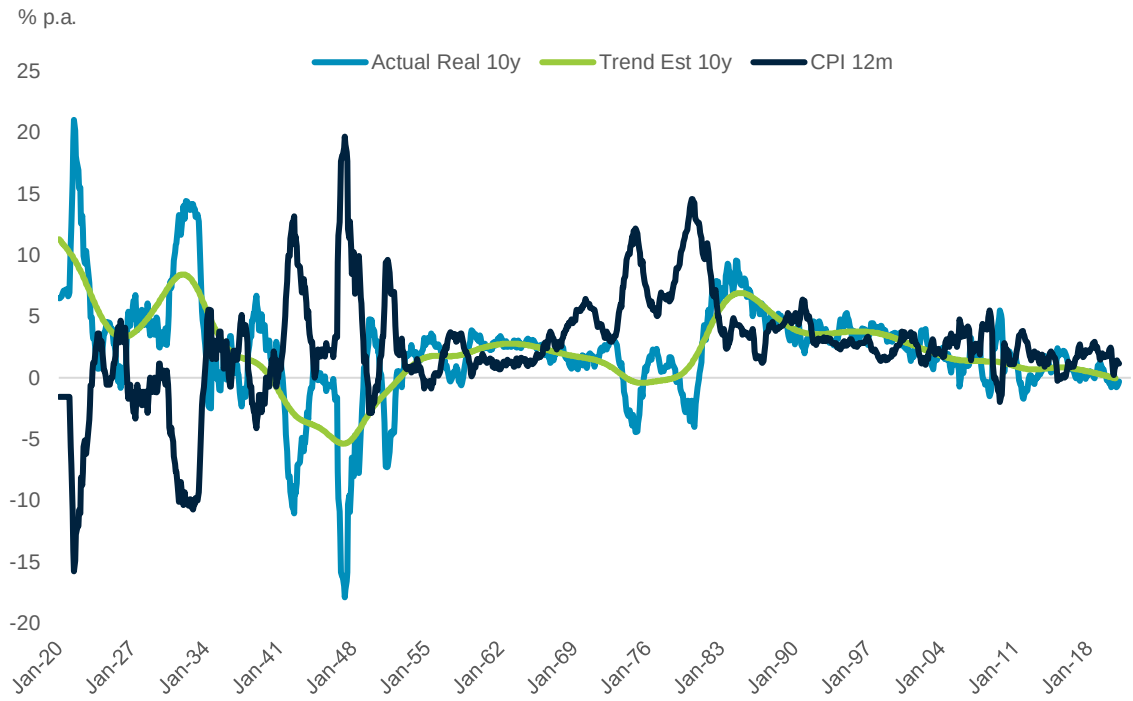
The combination of these arrangements meant that inflation movements would drive real interest rates proportionately in the opposite direction (see Chart 1). Hence, the inflation of World War II, and that of the oil shock periods in the 1970s, distort all measures of the real interest rate. The economic adjustment mechanisms for saving and investment are also very different before and after deregulation in the early 1980s. Debt could be eliminated by an inflation tax on elements of enforced saving for much of the 20th century, but much less so since the 1980s.

The period Since the Early 1980s

US capital controls were abandoned in 1974, and interest rate ceilings were removed in the early 1980s. Since deregulation saving and investment decisions can adjust more freely, and measured interest rates are less distorted. Inflation too has been declining and is now very low. Nevertheless, Chart 1 shows that over this more market-oriented period the real interest rate on government bonds in the world's largest economy has declined following the jump up during the Volcker disinflation.

[1] See McKinnon (1973) for a discussion of financial repression. This restriction, together with requiring banks and insurance companies to hold government debt by regulation, permitted governments to borrow cheaply.

Chart 1 100 Years of Real US 10-Year Bond Rate & Estimated Trend



Source: Thomson Reuters and author data and calculations.

The real rate for the US 10-year benchmark bond is also low compared to the 1920s, a period which was free of regulations, interest rate ceilings and rampant inflation episodes. It is this post-deregulation period that deserves the full scrutiny of empirical research. Indeed, some wariness in interpreting modelling results prior to 1974 and 1980 should always be front of mind.

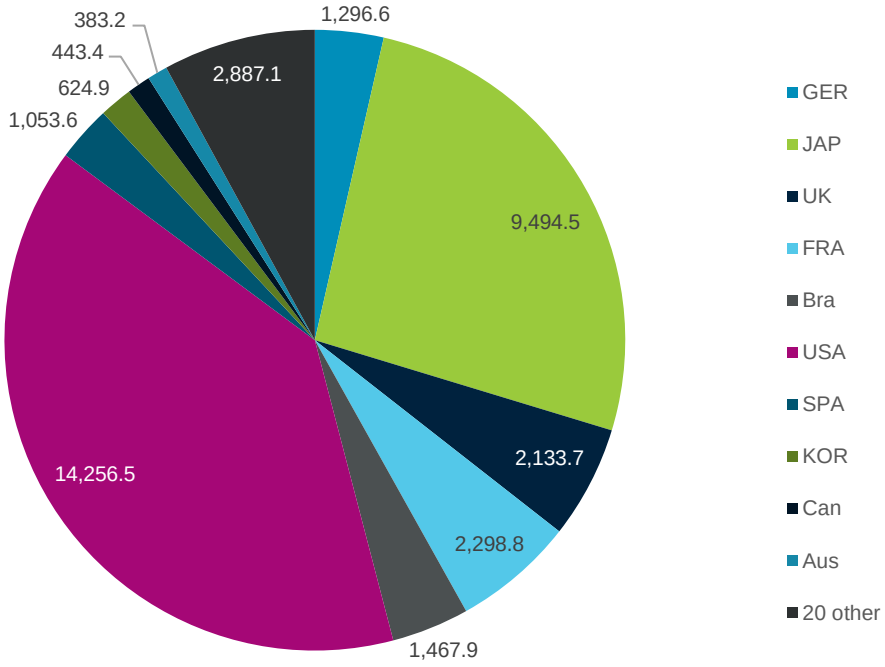
The Special Global Role of the US Treasury Market

The attractiveness of the US Treasury market derives from its vast size and that it is the most liquid bond market in the world. These were the reasons why the US dollar evolved to be the global '*reserve currency*'. Chart 2 gives some idea of the dominant size of this market for central government debt. These charts include Japan's large JGB market, where the main bulk of securities outstanding are not traded but are instead held to maturity by Japanese insurance companies. This is often described as a 'captive market'. The US Treasury market in 2019 was around USD 14.3tn, some 39.2 per cent of the USD 36.4tn total for the countries shown. If Japan is excluded, the US share becomes 53.1 per cent. The US Treasury market excludes state and local government debt. If these were included the size of US general government debt outstanding becomes USD 22tn at the end of 2019.

Investors value the liquidity and safety of US bonds and hold them in portfolios according to various benchmarks. Other markets are traded as spreads to this global liquid *'safe asset'*. Global fund managers focus on spread trades. For example, the synthetic cost of another

government's borrowing by a country in US dollars (their own bonds swapped into US dollar) is compared with the US government's cost of borrowing in dollars. Basis point premiums and discounts to the US market are compared in carry trades. But underlying these portfolio channels are the fundamentals of global capital flows between open economies.

Chart 2 Central Government Bond Market Size Comparisons (USD bn)

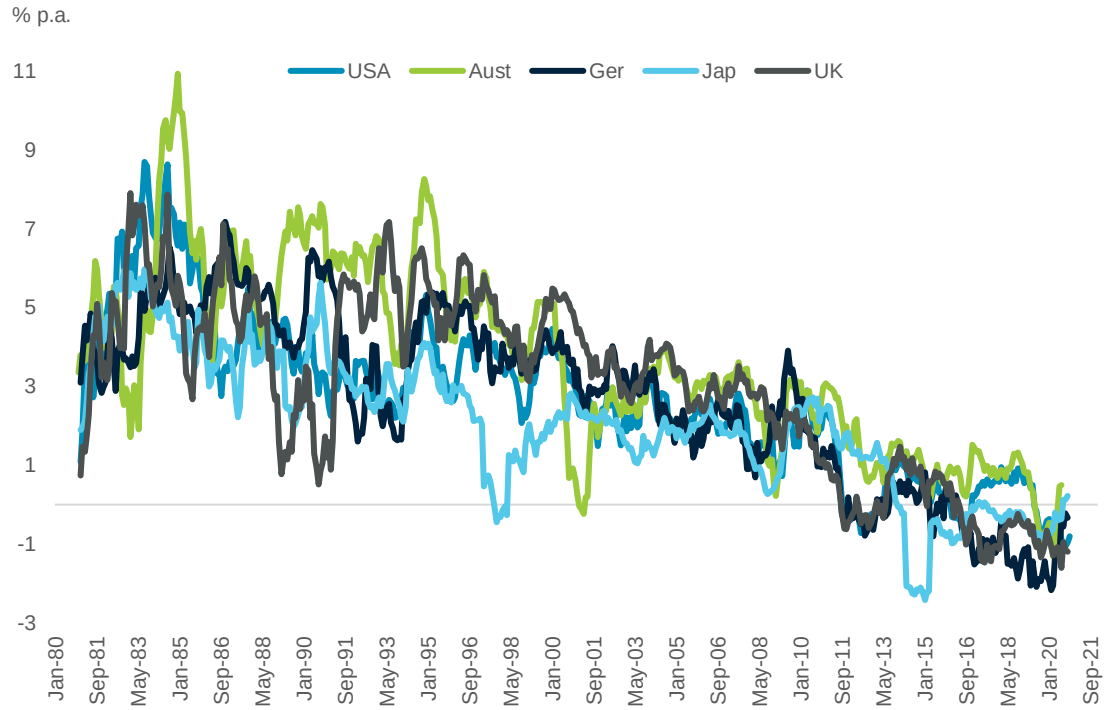


Source: BIS.

The Correlated Nature of Real Bond Yields in Advanced Countries

Real bond yields in domestic currencies are correlated with the US market (see Chart 3). This correlation likely reflects mean reversion towards US rates, given currency expectations. With globalisation, saving from all countries may fund investment anywhere in the world and rates will adjust when perceived returns for investors move out of line.

Chart 3 International Real Bond Yields are Highly Correlated



Source: Thomson Reuters and author calculations.

Policy-makers too may find that the 'elastic band' can't be stretched too far out of line with US short rates. The Volcker disinflation policy distorted US real rates to high levels at the start of the 1980s, for example, and this is associated with high rates in other countries. This is because central banks would not wish to see sharp movements in their currencies. With open capital markets global flows into the US would distort world saving away from other countries, were their real rates not to move up. Exchange rates would weaken versus the US dollar (the latter inducing central bank responses and yield curve adjustment).

Is There 'Secular Stagnation' and When did it Begin?

Even after the Volcker distortion, the US real rate remained high at close to 4 per cent for the second half of the 1980s. This may have been due to better expectations of profitable investment opportunities and growth following financial deregulation, the taming of inflation and the earlier opening of international capital markets. Household saving rates had also begun to decline. This period was followed by the recession of 1991. The average real 10-year rate for the period 1991 to December 2001 was 3-3/4 per cent, not that much lower than that for the second half of the 1980s, and certainly well above the 1.1 per cent average for the earlier period (distorted-by-regulation) from January 1950 to December 1980.

These data suggest that secular stagnation, if it is present, is best thought of as starting from around 2001 and continuing to the present. This corresponds with China's World Trade Organisation (WTO) entry, and the beginning of their net acquisition of foreign assets (see

Chart 16 below) as vast increases in savings exceeded investment and had to be recycled to the rest of the world to finance the current account surplus.

US real rates began to decline continuously for two decades with other countries following. From January 2002 to December 2008 (just after the Lehman collapse) US real rates averaged 2.2 per cent, some 1.5 per cent below the decade to 2001. Since 2009 real rates have averaged 0.6 per cent. This latter period includes the main added impact of the global financial crisis. But as this crisis ended, real rates did not return to their pre-crisis levels. This suggests that the Asian '*saving glut*' is a very important influence on secular stagnation concerns. Its stabilisation or reversal will be important in any return to a 'normal' inflation and real bond-yield environment.

Global Factors or Coincidence?

For smaller open economies like Australia, this report will adopt a global framework for analysing the real bond rate and future scenarios. It is of course possible that the correlations between the US and foreign bond rates could be a coincidence. For example, similar domestic demographic factors may be at play in all OECD countries (such as ageing populations). Some of the literature goes this way. Other writers focus on savings and investment factors and constraints to economic growth. Still others focus on excess indebtedness and some on the global savings 'glut'. The following sections try to draw together some of the literature on these trends as a prelude to setting the framework for subsequent empirical analysis and discussion of major issues in this report.

Selective Literature Survey

Neutral short rates and the Fed

Fed literature on the neutral real short rate is aimed at providing a sort of compass for monetary policy. The underlying theory is linked to the Ramsey economic growth model. Consumers smooth saving over time. Low productivity growth would cause them to save more (as future income will be lower). The increase in saving results in more investment in lower-yielding projects, so the MPK and real interest rates fall. Expected consumption and the discount rate of consumers are the key drivers.

Taylor (1993) formulated a monetary policy rule around this idea. In the end monetary policy should aim to set rates consistent with savings and investment incentives and the neutral rate over the long run.

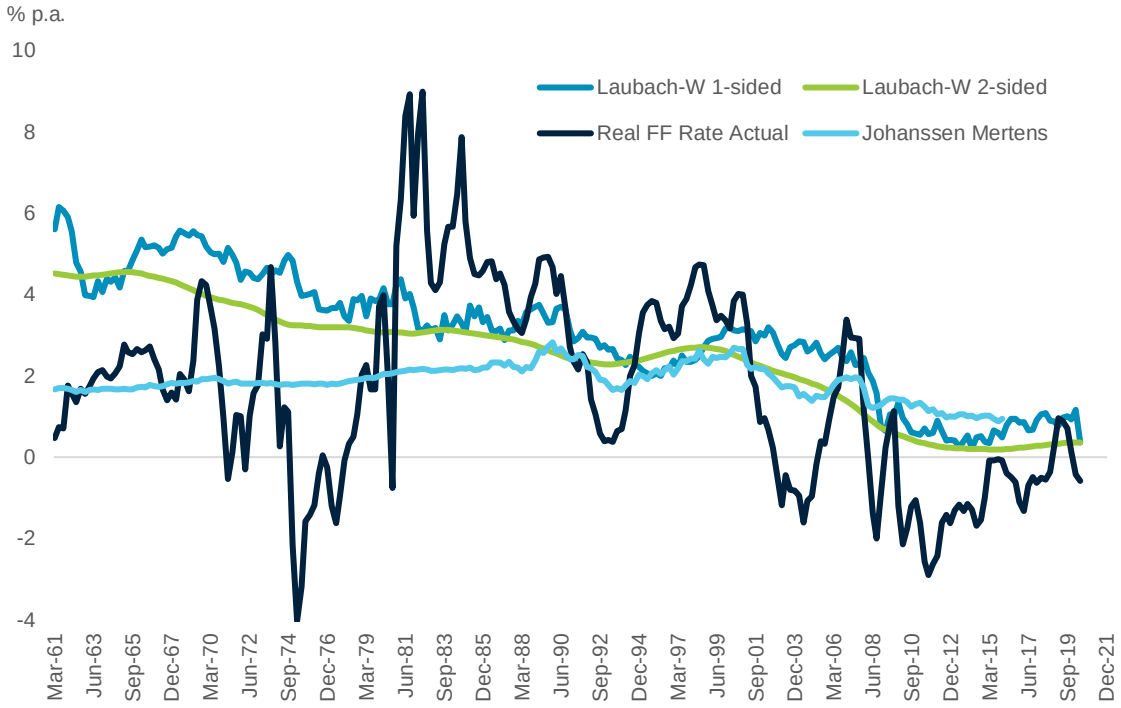
Fed economists Holsten et al. (2016) focus on the neutral short rate relevant for monetary policy using times series techniques that are agnostic about lags, and allow for shifts in trend growth and the unobserved neutral rate.[2] They equate the neutral real short rate with trend growth, but where stochastic processes affect both. A statistical filtering technique is used to

[2] See also Laubach and Williams (2015).

identify these shifts in the neutral rate.[3] Inflation expectations and the output gap are key elements of the calibrating procedure. They find that trend growth and the neutral rate are falling over time, and that there is co-movement between five countries suggesting global factors are at play. They point out that their estimates are imprecise (a standard error of 1.1 percentage points) and suggest there is a need for models incorporating more structural and global factors.

The updated work shown in Chart 4 has the neutral rate falling from around 5 per cent in 1960, to 2¼ per cent by 1990. It then picks up to around 3 per cent by 2000, before collapsing to ½ per cent by Q2 2020.

Chart 4 Laubach-Williams Neutral Rate



Source: US Federal Reserve: https://www.newyorkfed.org/research/policy/rstar ; and: http://dx.doi.org/10.17016/2380-7172.1703

Other Fed economists Johanssen and Mertens (2016) model the equilibrium real Fed Funds (and a 5-year bond), with Bayesian time series techniques, referencing an unemployment gap, inflation and long-term bonds. The real Fed Funds rises from the 1960s to around 2-3/4 per cent in the late 1980s achieving that peak again in 2000. Subsequently, the real rate declines by 1-3/4 per cent to just under 1 per cent by 2015 — suggestive of a trend decline from 2000 (also shown in Chart 4).

While both sets of authors work at the Fed, with comparable techniques, the results are quite different in the lead up to 2000, possibly due to the use of an output gap in one and an

[3] A Kalman filter.

unemployment gap in the other. Different statistical techniques are also employed. However, both approaches agree that trend growth and the equilibrium real Fed Funds begin to decline after 2000 (coinciding with the period when world saving began to rise as a share of world GDP, with a sharp rise in emerging market saving offsetting declines in many Western countries as shown in Chart 7 below).

Hamilton et al. (2015) are very dismissive of these growth and output gap approaches. They focus on the US economy, but also examine cross-country data and look back to the 19th Century. They find the relationship between growth and real short rates to be very weak, and certainly period specific. There are many reasons for this. Factors affecting the estimates include inter alia: Regulation Q and other constraints that came into effect following the Great Depression; debt defaults; trends in inflation; growth headwinds like the trade deficit; and asset bubbles. In the past, long periods of high, low and negative real rates have persisted and then reversed because of such factors. They argue there is no reason why this won't continue to occur into the future.

The authors find that the only thing that appears stable, is that the US real short rate is cointegrated with estimates of the median of a global real rate (calculated from auto-regressive estimates of each country's real rate based on a 30-year rolling window). If the US rate is below this, it will rise and vice versa. The global real rate does not revert to a mean, and therefore may shift up in the future for reasons that are difficult to anticipate in advance.

Monetary Theories

Borio et al. (2017) are sceptical of the real economy being the driver of falling real interest rates. Using long data periods their panel regression work compares two sets of factors:

- Those that pertain to savings and investment interactions (the marginal product of capital proxied by labour productivity growth, total factor productivity, the dependency ratio, population growth, the relative price of capital, and inequality proxied by the income share of the top 1 per cent).
- Those that pertain to monetary policy regimes (the Gold Standard, the inter-war Gold Standard, the post-War Bretton Woods arrangements, pre-Volcker, and post Volcker inflation targeting).

Over the full sample and monetary regime subsamples, the savings variables are mostly insignificant or of the wrong sign. Monetary policy regime dummies, on the other hand, are almost always highly significant. This they argue casts doubt on the idea that monetary policy is neutral in the long run. The authors assert that their empirical findings support the idea that real rates are a monetary phenomenon, and the saving-investment framework has little support in the data.

One must be sceptical of monetary theories of real returns considered over long periods of time. The authors touch on the problem in a footnote asserting that excluded third factors like oil price shocks might be causing changes in monetary regimes and real interest rates. But they reject this on the grounds that oil prices affected both the post-Bretton Woods and

the more recent inflation targeting periods, yet the regime dummies had opposite signs. But other issues confound this interpretation. For example, interest rate ceilings were introduced in the US Banking Acts of 1933 and 1935 and were maintained until the early 1980s. The ceilings are present for Bretton Woods but not for the inflation targeting period — regulations are not monetary policy regimes. The oil price impact on output, inflation and measured real rates will be quite different when rates are free to adjust and when they are not. Problems of interpretation also arise for the gold standard period, since the impact of a monetary shock caused by gold discoveries would impact on real rates depending on how countries stuck to the rules of the game. The US and England did so, whereas continental Europe frequently cheated.

The study is interesting however in the findings about demographic variables, productivity and the relative-price-of-capital. These are taken for granted in many of the studies considered in this report, yet they struggle to find support against real world data. The Asian '*saving glut*' was not tested.

Demographic Factors

Domestic monetary policy fixes short rates in the interbank market, with inflation targeting goals in mind. Real long-term rates adjust with non-bank private demand playing a more important role. Lifecycle and precautionary motives for saving depend on uncertainty about future income and demographic drivers, including population growth, fertility, mortality and the dependency ratio (very young people and retirees versus the working-age population).

In the 'sweet spot' of a younger and growing population, as with the middle years of the baby-boom generation, a large 'lump' of saving begins to work its way through the system and would, other things given, reduce real interest rates. Of course, Western societies are well past the baby-boom demographic sweet spot, and a decline in saving should begin to put upward pressure on real rates. This mechanism, however, appears to have been offset by other factors, some of which are also demographic in nature.

The increase in longevity, shown for several countries in Table 1, is one such factor. Since 1950, every 10 years has seen OECD country average lifespans increase by about 1 year. People need to save more for a longer retirement if pension vesting or entitlement birthdays are not increased commensurately.

Table 1 Life Expectancy Changes – Life expectancy at 65 years: selected countries

Country	1960		2018		Added years per decade	
	Men	Women	Men	Women	Men	Women
USA	12.8	15.8	18.1	20.7	0.8	0.7
Japan	11.6	14.1	19.6	24.4	1.2	1.5
Germany	12.2	14.2	18.1	21.1	0.9	1.0
France	12.5	15.6	19.7	23.8	1.1	1.2

UK	11.9	15.1	18.9	21.1	1.0	0.9
Spain	13.1	15.3	19.5	23.5	0.9	1.2
Italy	13.4	15.3	19.6	22.8	0.9	1.1

Source: OECD.

Furthermore, uncertainty about future income and lifespans interact with other economic developments. The hollowing out of the middle class demonstrated empirically by Autor et al. (2016), for example, has seen falling real wages across large sections of Western society. This implies lower internal returns in PAYG pension schemes, which compounds financial sustainability issues. For defined contribution private pension schemes lower wage growth combined with low real interest rates generates retirement-income adequacy concerns. With financial returns not delivering, loss of confidence in private pension schemes provides an incentive for more saving. This has been compounded by a mistrust of public pensions being able to deliver on promises, especially in Europe (see OECD 2018). If the asset backing of pension funds is inadequate saving would need to rise for precautionary reasons.

Carvalho et al. (2016) use a life-cycle model to focus on the three main demographic channels that affect the equilibrium real interest rate: an increase in longevity, which increases savings and reduces real rates; a reduction in population growth, which raises capital/labour ratios tending to reduce the MPK and real rates; and the offsetting tendency for dependency ratios to rise as population growth slows, which may reduce saving and push rates up (as retirees save less). Calibrating these factors, the model explains around half of the decline in real short rates between 1990 and 2014. Policies to raise the equilibrium rate mentioned by the authors include that set of factors that might raise productivity growth, as well as raising the retirement age.

Gagnon et al. (2016) use a US demographic model to study the real US 10-year rate. They show a trend decline of about 1-1/4 per cent in the equilibrium real rate from 1980. They suggest that fertility declined in the 60s and 70s as the baby-boomers began entering the workforce. This peaks around 2000, where this cohort begins to reach mature age, and the number of their dependent children falls. When the baby boomers saved for retirement capital-to-labour ratios were relatively low. This all began to reverse after 2000.

The baby boom generation began to draw down their capital on leaving the workforce and, as labour supply was reduced, capital-labour ratios began to rise. The model suggests that even though saving was beginning to decline after 2000, the equilibrium real interest rate continued to fall due to the extent of this capital-for-labour substitution. This mechanism explains about a ½ decline in rates. The decline in mortality since 1980 explains another ¼ per cent of the decline. The authors suggest that it might be something of a coincidence that real rates are falling in all OECD countries — it is because the same local demographic baby-boom factors have been at play everywhere.

This domestic closed economy approach is not convincing. First, US real wages for the less-than-tertiary-educated workers have been falling throughout, and if capital-labour ratios are rising it is more likely due to the way US companies have responded to the challenge of

globalisation. Second, the US has the highest fertility of OECD countries, an echo of the baby-boom generation from the mid-1980s, and immigration is also stronger in the US than other OECD countries.

Global Factors versus Demographic Trends

Global factors are frequently ignored in demographic studies of the falling real rate. One exception to this is Krueger and Ludwig (2007), who allow for OECD-wide effects and provide a long-run extrapolation to the decline in the equilibrium real interest rate (from 2005 before the flurry of interest since the financial crisis) based on ageing population demographics. They make use of United Nations population projections from 2005 to 2080. Working age population ratios are declining over this period as baby boomers retire, fertility rates decline and longevity increases. This leads to rising real wages (by 4.1 per cent between 2005 and 2080). Despite declining savings ratios (it is mainly the young that save), capital deepening occurs because labour "tomorrow" becomes increasingly scarce. This investment reduces the MPK. Equilibrium real interest rates are projected to decline by some 86 basis points between 2005 and 2080.

The assumption of free capital flows between OECD countries doesn't mitigate this effect on the US economy. This is because Europe and Japan have even more dramatic ageing trends. The US essentially imports worse factor price trends from these countries. The authors mention policies that would mitigate the fall in real interest rates. These include increasing the retirement age to 70 and human capital formation through education that would make labour more effective (reducing the scarcity effect).

It is a pity that this work excludes the non-OECD world. The results could differ, depending on the relative importance of ageing countries like China and the Asian Tigers versus faster-growing and younger economies in Africa, India, other parts of Asia and the Middle East.

These global 'emerging market' developments may be critically important for understanding changes in real rates from 2001. Too much weight might be placed on local demographic trends and capital-for-labour substitution in Western countries. The sharp changes from 2001(emerging market saving) and 2009 (global crisis) are clear and relatively recent. Demographic trends in the West, on the other hand, are relatively stable and predictable in advance. There have been no sudden surprises that can explain why the decline in real rates has for the most part happened after 2001.

Headwinds to Economic Growth and Low Real Rates

Gordon (2012) identifies four phases of US productivity: 1891 to 1972 when it grew on average at 2.3 per cent; the first major slowdown from 1972 to 1996, when it grew at 1.3 per cent; the recovery from 1996 to 2004, when growth rose to 2.5 per cent; and the slowdown from 2004 to 2012 with 1.3 per cent growth

Gordon focuses on frontier technology as the main driver. This was located in the UK to 1906, and in the US ever since. From 1750 to 1830 steam and railroad discoveries and their proliferation over a long period afterwards was the key driver. This was followed from the

late 19th Century by electricity, the internal combustion engine, running water and indoor toilets (freeing women from carrying water), communications, entertainment, chemicals and petroleum. This phase was the most important, lasting eighty years and leading to so many spin-offs (e.g. aeroplanes, air conditioning and interstate highways, and more). Once these had run their course the first major slowdown of productivity occurred.

Most recently the frontier has become computers, the internet and mobile phones. This has been short-lived and doesn't seem to have had the same breadth and durability necessary to overcome six headwinds going forward, only one of which is demography. The others are:

- The quality of education.
- A sharp rise in inequality — he suggests that it is possible that growth of consumption per-capita of the bottom 99 per cent of households could become as low as ½ per cent pa in the future.
- Globalisation, including the outsourcing supply chains enabled by ICT. With the *'China shock'* possibly to be followed by India, other parts of Asia and Africa, factor price equalisation is hurting higher-wage countries the most.
- Global warming, energy and the environment, where the necessity of raising the price of carbon will slow growth.
- The severe overhang of government and household debt — recently made worse by the response to the corona virus epidemic.

Without policies for change these headwinds will slow growth further because the latest innovations (the iPod, smartphone, iPad, etc.) mainly provide the opportunity for consumption at work and for leisure activities — they are not replacing human labour with machines and countering the globalisation forces.

Debt Overhang

Reinhart et al. (2012) and Lo et al. (2015) focus on the debt overhang episodes in advanced countries. In their survey of the literature Lo et al. (2015) find there is agreement about the need for better education and for high-return infrastructure investment, but the transmission from the overhang mechanisms are less clear. The slowdown in growth could arise through generalised deleveraging. Alternatively, it could also be due to country's attempt to run primary budget surpluses following a debt overhang, raising taxes and/or cutting spending.

Education and Labour Quality

Jorgenson, Ho and Samuels (2014) focus on the role of education in the growth process from 1947 to 2010 in 65 industries. They examine industry outputs and inputs of capital, labour, energy, materials and services to analyse productivity growth. They use OECD methodology for production accounting which has become the basis of a new approach to measuring productivity. They find that 80 per cent of growth over this period was due to capital and labour inputs, while only 20 per cent was due to productivity. The expansion and upgrading of the labour force and investment in intangibles such as R&D and software explain most of the growth in output. The 1995-2010 growth recovery was dominated by IT-

producing and IT-using activities. Future growth will require the replication of established technologies across a broader front of industries.

The authors identify the main impediment to this future growth as improvements of labour quality (in agreement with the Gordon study). In this detailed disaggregated work labour supply is of course affected by ageing, as in the demographic studies. But this misses what turns out to be the more important factor in labour quality. The authors break the labour force data into age, gender and educational attainment cohorts. Employment rates are much higher for cohorts associated with higher educational attainment. But while the current level of education attainment is high, its growth rate is slowing.

Herein lies the main problem. The 1995-2000 investment boom drew more females, young people and poorly educated workers into the work force. But this peaked in 2000, and subsequently employment for these less-qualified (male and female) cohorts began to fall, a process that accelerated after the global recession of 2008. The loss of these labour inputs that are not suited for growth in the IT-producing and using sectors is a major impediment to growth.

If gender, age, and educational employment rates are held constant at the 2014 full employment levels, and growth in educational attainment continues to slow, labour productivity growth will automatically follow. This is because it is the IT-producing and the IT-using sectors that contribute most to growth and labour quality isn't keeping pace with the needs of these sectors. The authors provide a base case of 1.8 per cent GDP growth for the following 10 years. A low-growth scenario of 1.6 per cent is produced with more pessimistic assumptions on these drivers. A high-growth scenario of 2.4 per cent can be achieved with more optimistic assumptions. To move in the higher-growth direction will require policies that promote more investment that create opportunities for employment of the marginal cohorts. They state that policies to stimulate innovation will have little or no impact on growth — basically such policies don't work.

The Relative Price of Capital Goods and Asset Inflation

To explain the observed phenomenon of falling real interest rates and rising house prices and household debt, Thwaites (2015) builds a model based on a production function and lifecycle saving capable of incorporating falling capital goods prices. He finds some support empirically from production function parameters and from the house price implications of his theory. In this framework, households finance their retirement by selling their accumulated claims on the company sector. As technology reduces the price of capital goods, the increased use of capital reduces the MPK and real returns fall, while output and wages rise.

Housing demand is boosted by lower interest rates and, since the housing stock is fixed, this causes house prices to rise to choke of the demand. Household debt rises because people buy early in life and borrow to do so. This is an alternative to buying claims on companies to fund retirement. At the global level, company demand for household saving falls, and housing provides an alternative channel for saving. This mitigates the fall in the real interest

rates, since funds that would have gone to companies are instead lent to younger households.

For small open economies Thwaites suggests that the acquisition of net foreign assets becomes a further channel for saving in addition to claims on home country companies and housing. Small economies are price takers for world real interest rates. As the fall in the relative price of capital goods reduces the demand for funds at home, *ex ante* real rates fall relative to the global rate, inducing households to buy claims on foreign companies. This mitigates the pressure on house prices and, with rising wages, younger households require less housing debt. Real rates move back towards the world rate. At the policy level, Thwaites points out that macroprudential policies to limit the accumulation of household debt would accelerate the fall in real interest rates.

These thoughts may be relevant for studying real rates in an economy such as Australia. However, one offset to the mechanism of falling capital goods prices causing more investment is '*virtualisation*'.[4] This has become more scalable than ever with IT developments in recent years and it reduces the need for capital expenditure while cutting operational and other costs. Even the need for physical office space can be reduced.

The Global 'Saving Glut' View

Rachel and Summers (2019) model the equilibrium real interest rate for OECD countries. Their calculation of the equilibrium real rate falls by 3 percentage points from 1972 to 2018 (from 3.5 per cent to 0.5 per cent). They note that falling trend growth doesn't explain this decline. Instead, they use a private saving and investment approach.[5] They justify ignoring the developing-country world by noting that the OECD current account deficit is small and doesn't move by very much.

One of their models is based on private precautionary saving behaviour. As the income level of the wealthy rise sharply, they become increasingly concerned about hanging onto it in the face of unpredictable income shocks. Private saving rises (a buffer). Their models suggest that were it not for budget deficits filling in for excess private saving and rising debt the decline in real rates would have been much larger than the calculated equilibrium. The authors suggest that OECD governments need to get on the front foot with fiscal policy. Printing more money and forcing nominal interest rate to large negative levels will create too many other problems for the future — and possibly inflation of asset and goods prices. The authors argue that government debt should not be thought of as a constraint on policy when interest rates are very low.

One problem with this paper is the incorrect argument that because the OECD aggregate current account balance is close to zero and stable the rest of the non-OECD world can be ignored. The authors fail to give any weight to the size, liquidity and attractiveness in the US

[4] A technology that decouples hardware and software — multiple operating systems can be used as virtual machines sharing resources of servers.
[5] See also Summers (2016), and Rachel and Smith (2015). The latter provides a useful survey.

bond market — the idea that the US market is disproportionately affected by world saving (including the non-OECD).

These issues are better understood in Bernanke (2005). In an influential speech the then President of the Federal Reserve focused on the '*global saving glut'* as a major factor in falling real returns in the US and a few other advanced countries (including the UK and Australia). He identifies the tech boom from 1996 to 2000 as a cause of large capital inflows (liabilities to foreign savers). US consumption rose (the wealth effect) and the dollar appreciated, which led to a sharp deterioration in the US current account. Subsequently, the tech bust led to lower policy interest rates, reducing the incentive to save in US households and increasing the incentive for investment in residential housing through cheap mortgages. This led to a further deterioration in the current account funded from foreign savings.

Bernanke suggests that the effect on the US is disproportionate to other countries because the bond market is the most attractive '*safe asset'* market (due to its size, liquidity and the reserve currency role of the dollar noted earlier). Other mainly Anglo-Saxon countries also had house price inflation and current account deteriorations like the United States. Germany and Japan, on the other hand, avoided these trends and moved further into current account surplus.

Bernanke points out that it is emerging market saving that has had the largest impact on the United States in this process. This he sees as a major problem. If the United States is ageing, then it should be the US that acquires net foreign assets by lending to developing countries to take advantage of higher returns there. If US savers and those of other advanced countries would like to see higher real returns, they should run current account surpluses (acquire net foreign assets) and invest in more productive capital at home (not housing).

Instead, this has been turned on its head with emerging Asia being a net acquirer of US assets. It will be argued below and in later chapters that the financial repression development model in Asia is in large part responsible for this Bernanke paradox.

The Contrarian Case for Rising Real Interest Rates

The role of global saving to date does not mean that real interest rates are doomed to decline forever. Global competition for funds may intensify. Supply of bonds following recent fiscal policy deficits may run into more limited emerging market saving. This case is made in a wide-ranging piece by Goodhart and Pradhan (2017 and 2020). Noting that there is no link between local economic growth and real interest rates and that all these rates are correlated internationally, they favour a global framework for analysing real rates.

Until now global *ex ante* saving has far exceeded *ex ante* investment demand, requiring real interest rates to fall. China, they suggest, has played an important role in this excess saving. The world has arrived at a turning point, and the reversal of these same factors will begin to see a sustained rise in real interest rates in the future.

They offer five reasons for this. First, China is beginning to age more quickly, so that the '*saving glut*' from this source will diminish. Second, social safety nets are strong in the West, and are being introduced more in developing countries. This will act to offset the impact of rising longevity on saving. Third, increased longevity and obesity in the West will cause healthcare expenditures to rise, reducing saving resources available for retirement. Fourth, the saving and recycling from petro-countries will decline, as these assets become increasingly stranded and fossil fuel demand falls. Fifth, investment will decline by less than saving (excess investment emerges). Their reasoning here is that the shrinking of the working age population will see real wages begin to rise while capital goods prices remain low. Capital-labour ratios will rise via corporate investment. At the same time housing demand will remain firm, since longer-lived older persons keep their homes for longer so younger people will have to build more new places. An inflationary environment is likely to return forcing central banks to tighten and making it difficult to cut budget deficits.

The authors rebut four counter risks to this 'rising-rate' view: social safety nets being withdrawn; India and other developing countries replicating the role of China; rising participation rates; and the high level of debt that will 'tie the hands' of monetary policy. They argue that political factors will prevent the withdrawal of safety nets. They discount the idea that India and/or other developing countries can produce more saving to offset China's decline. They also reject the idea of rising participation rates 'saving the day'. Sound social safety nets lower the participation of over 65s and these must be supported by taxing younger households reducing their ability to save. Finally, with respect to the high level of debt, the authors argue that the inflation tax won't be an option and interest rates will rise with any inflation risk, increasing the difficulty of cutting budget deficits.

Aside from some quibbles about safety nets and participation rates[6], one confusing aspect of Goodhart and Pradhan is their contradiction with standard economic theory: that substitution away from labour towards capital (due to higher wages) would normally cause the MPK to fall. This would be associated with falling real interest rates. Caballero et al. (2017) may provide some way out of this apparent anomaly by focusing on changing 'rents' in interest rate spreads between safe and risky assets. In the period prior to 2000, there was demand for both safe and risky assets causing returns to fall in both. The global saving glut emerged in the period 2000-2008 with Chinese foreign reserves accumulation which, following the Asia crisis of the late 1990s, was associated with a preference for the global safe asset. This caused yields of the latter to fall relative to risky assets. After the GFC, re-regulation forced banks to hold more safe assets, while the supply of the latter fell as European governments faced increasing risks of default. A shortage of safe assets emerged. Demand for US bonds surged, forcing the rate towards zero. The Fed's holdings of the safe asset through Quantitative Easing (QE) policies also rose after the GFC and following COVID-19, reinforcing this process.

[6] Reduced pension promises and/or enforced longer vesting periods for retirement income are very much on the policy agenda, since people are living longer. Such policies are economically sensible, if not politically palatable, and could well keep upward pressure on saving in the future.

If these mechanisms were to reverse (via the increased supply of safe assets caused by higher budget deficits, falling demand for US Treasuries and rising demand for risk assets) the real yield on the global safe asset could rise relative to risk assets (reconciling the above dilemma).

The US Bond Market and The Foreign '*Saving Glut*'

The work of Bernanke, Goodhart and Pradhan, and Caballero et al., is consistent with the analysis of the lead up to the GFC and the aftermath found in Blundell-Wignall et al. (2018), and the earlier papers on which it was based. The broad philosophy of the line of thinking in these works forms the basis for modelling and projecting real interest rates on government bonds in this study.

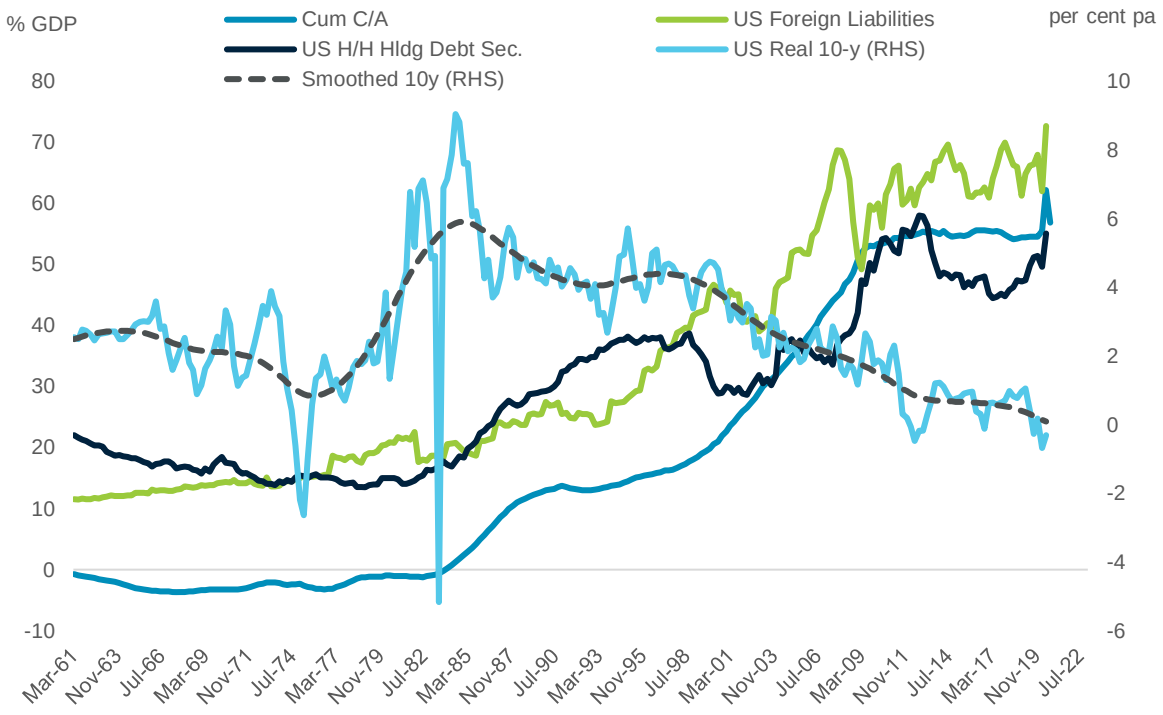
Chart 5 compares real rates from 1960 with the US cumulated current account as a share of GDP (net liabilities), gross foreign liabilities, the US government's liabilities. This data illustrates the Bernanke (2005) argument quite well and extends the data for more recent developments.

The current account mechanism was already evident during the 1980s, when expansionary fiscal policy, tight money and the overall attractiveness of the US bond market led to capital inflow causing an appreciation of the dollar.[7] The net foreign liability position moved up in line with domestic holdings of debt securities and is associated with the first major turning point of US real interest rates. The two episodes described by Bernanke follow from the mid-1990s. The rise in net foreign liabilities far outweighs any movement of the holdings of debt securities (directly and indirectly) by US households, which are flat to lower before the global crisis in 2008.

Over the full period 1960 to 2020, US household holdings of debt securities rises from 20 per cent of GDP to 48 per cent of GDP, while the cumulated current account rises from 0 per cent to 62 per cent. These are quite massive shifts, and their links with US real interest rate turning points in the deregulated period are clear in the chart.

[7] See Masson and Blundell-Wignall (1985).

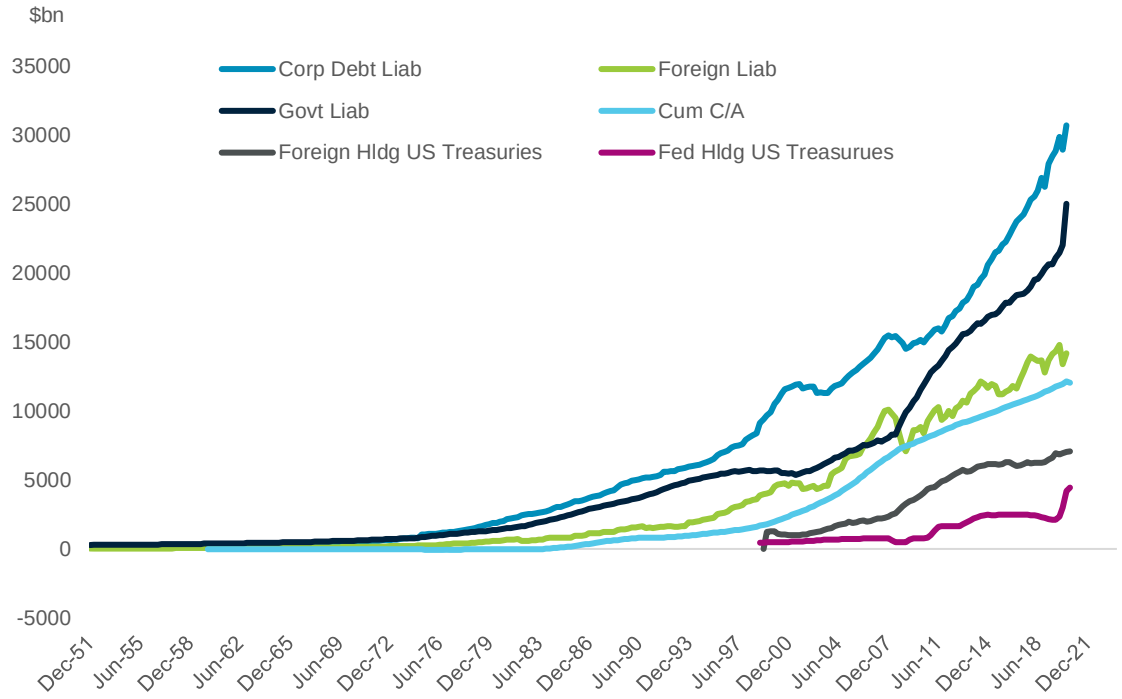
Chart 5 Foreign Liabilities vs US Holdings Securities and US Real Interest Rate



Source: Thomson Reuters.

Chart 6 shows the dollar amounts of US government liabilities, foreign liabilities, corporate liabilities, the cumulated current account, and foreign and US Federal Reserve holdings of US Treasuries.

Chart 6 Liabilities of US Economic Sectors



Source: Thomson Reuters, Federal Reserve, author calculations.

The US government issue of debt securities is satisfying not only the demand of its own savers, but also that of the rest of the world. The bulk of this foreign demand is for US Treasury securities: of US government liabilities of $25,013bn, $7,071bn is taken up by foreigners, some 28 per cent of the total, and the Fed holds $4,445bn, 18 per cent of the total. The other holders are US domestic residents (54 per cent of the total) including the US pension system. The main foreign holders of US Treasuries have been Japan and China, but since the GFC and the Eurozone crisis investors from other countries have been forced towards the global safe asset. The Basel rules forcing banks to hold liquid securities has also played a role in this process (the Liquidity Coverage Ratio).

In short, the US bond market is disproportionately affected by surplus-country saving and asset allocation shifts.

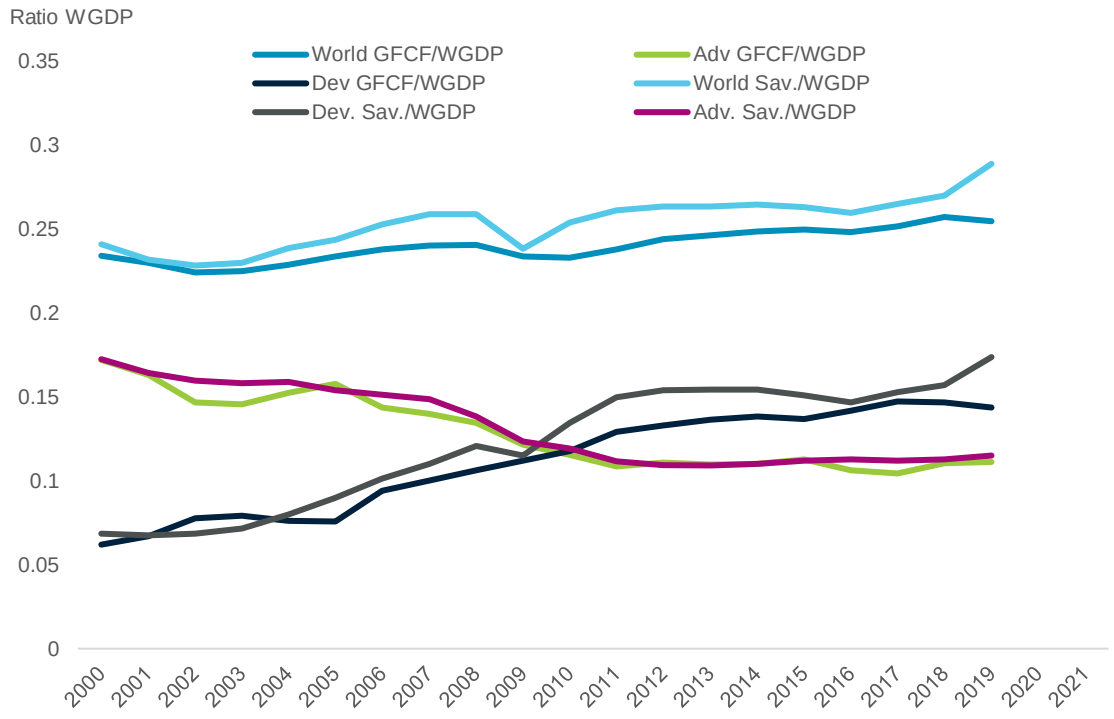
The United States has the largest and most liquid bond market in the world with exactly the right characteristics to attract foreign central banks, investment funds and sovereign-wealth funds. Other bond markets are priced versus the global safe asset.

Global Investment and Supply Chain Issues

On the investment side, global production and supply chains have shifted dramatically since 2000. Much of the investment to produce goods consumed in the West is now carried out in developing countries. Global Gross Fixed Capital Formation (GFCF) and Gross National Saving are shown in Chart 7 and broken down between advanced versus developing countries (all expressed as a share of world GDP). While investment appears to be weaker

in the West, this is largely because it has shifted to emerging markets with supply chains reflecting the trends in globalisation, automation and digitalisation via the internet. Our understanding of how saving and investment affects real interest rates has also to reflect these changes.

Chart 7 World Saving and Investment by Regions as Shares of World GDP



Source: Thomson Reuters. Advanced are the Anglo Saxon Countries, Europe and Japan. Developing are all the other countries, dominated by China and other BRI countries.

The US has taken advantage of global value chains with Asia to improve profitability and the return on investment, while heavy saving and investment in Asia, particularly where state actors are involved, is driving down the productivity of capital there. Furthermore, as Autor et al. (2016) point out in detail, US wages and job prospects of lower-educated workers had been falling, not rising, as a consequence of import penetration from China. Factor pricing has been behaving exactly as one would expect with the outsourcing of both capital and labour towards Asia.

A key policy issue will be to understand the paradox mentioned by Bernanke. The US and other advanced countries are ageing and should be running current account surpluses, acquiring assets of emerging countries with younger populations and better growth prospects. Instead, exactly the opposite has been taking place as excess saving emerged in Asia. This has significant consequences for advanced country bond markets, including Australia.

The following chapter will use a tractable empirical approach that incorporates these main themes, for the United States and the Australian bond markets, which are linked.

2. Empirical Analysis of Real Interest Rates

Chapter highlights

US potential growth is estimated to be 1.85 per cent, and there is some evidence to suggest the real interest rate reverts towards trend growth in the long run. Projections of the real 10-year bond rate to 2061 are based on a model of cointegration with domestic (household) and foreign saving (proxied by the cumulated current account). Unlike the smooth trend in capital-for-labour substitution explanations of the fall in real rates, the model picks up the major turning points in the benchmark 10-year real rate.

The central projection is a convergence in the long run to a 1.85 per cent real bond rate. This is based on a probability-weighted average of a number alternative scenarios for global and domestic influences that lie within a 0.85 per cent to 3.1 per cent range. The reasoning for the different scenarios and weights used for the central projection are discussed in Chapter 3.

Australia's potential growth model is projected out to 2061. Growth declines moderately from 2.5 per cent currently to 2.1 per cent by 2061. There is no evidence that the real interest rate is cointegrated with potential growth (due to mining boom distortions in the 2000s).

The Australian real bond model is based on interest rate parity and an exchange rate model. The projection is therefore linked to the US real rate and scenarios, using the same scenario weights. The Australian real rate converges to 2.1 per cent (within a range of 1.1 per cent to 3.4 per cent). A model based on domestic and foreign saving is used to cross-check the interest parity model and supports the 2.1 per cent estimate.

The terms-of-trade has a major influence on the Australian dollar but has a minor impact on the bond rate. The exchange rate is undervalued in late 2020. Its future path will depend on outcomes for the terms-of-trade which will be affected by: (a) emerging market growth and the extent to which demand can be re-orientated towards consumption; and (b) the extent to which China's Belt and Road Initiative causes diversification-away-from-Australian resources. Whether increased growth in India can offset any slowing in China is an important issue.

Introduction

A basic issue facing government borrowing over the long term is whether the world is facing 'secular stagnation' — weak long-term growth in economies which operate at or below capacity and are characterised by falling real interest rates with subdued inflation.

Various explanations of the declining real interest rate from around 2000 were surveyed in Chapter 1, including a decline in potential growth; demographic factors that affect both growth and saving (population growth, participation rates, ageing, longevity, dependency

ratios); falling capital goods prices, saving flows from the non-OECD economies (the 'saving glut'); and a switch of global supply chains and investment towards Asia.

Some of these papers try to pull various influences together in general equilibrium models where the real interest rate is endogenous to saving behaviour and capital goods pricing. Estimated parameters from other studies are brought in to calibrate the models. Explanatory power in an econometric sense is missing. Typically, they are backward-looking studies and evidence is along the lines that: "real rates fell by X per cent and this type of model can explain Y per cent of it."[8]

When growth and demographic models are tested in large panel studies, as in Borio et al. (2017) (who tested productivity and population growth, the dependency ratio, the relative price of capital, and inequality), the presumed causal variables do not find ready support in the data. The approach of imposing parameters on models that generate theoretical outcomes risks calibrating an outcome that time-series and panel data estimation would not support.

Most variables that might explain the real interest rate in the long run (40 years in this study) are endogenous because the latter affects exchange rates, investment and saving. Not even labour supply is exogenous, because the participation rate and fertility are influenced by the trend and cycle in the economy. In trying to nail down scenarios for the real interest rates in this study a more tractable empirical approach is taken based on cointegration models.

Cointegration seeks to establish whether there are long term equilibrium relationships between selected 'trended' variables, even where two-way causality between the variables may be present. The chapter also uses an exchange rate model and the interest parity condition to explore scenarios for Australia based on what might happen to US interest rates and the terms of trade.

Forty years is a very long time, and much can happen on the way to 2061. For this reason, the methodology of hypothesising a wide range of scenarios for domestic and foreign saving was chosen — reflecting these great uncertainties. Projections using the cointegration models for each scenario can carried out, and then multiple scenarios can be probability weighted to provide a single projection for policy planning purposes.

The US case is discussed first and outcomes there are used as inputs for the Australian interest rate parity scenarios.

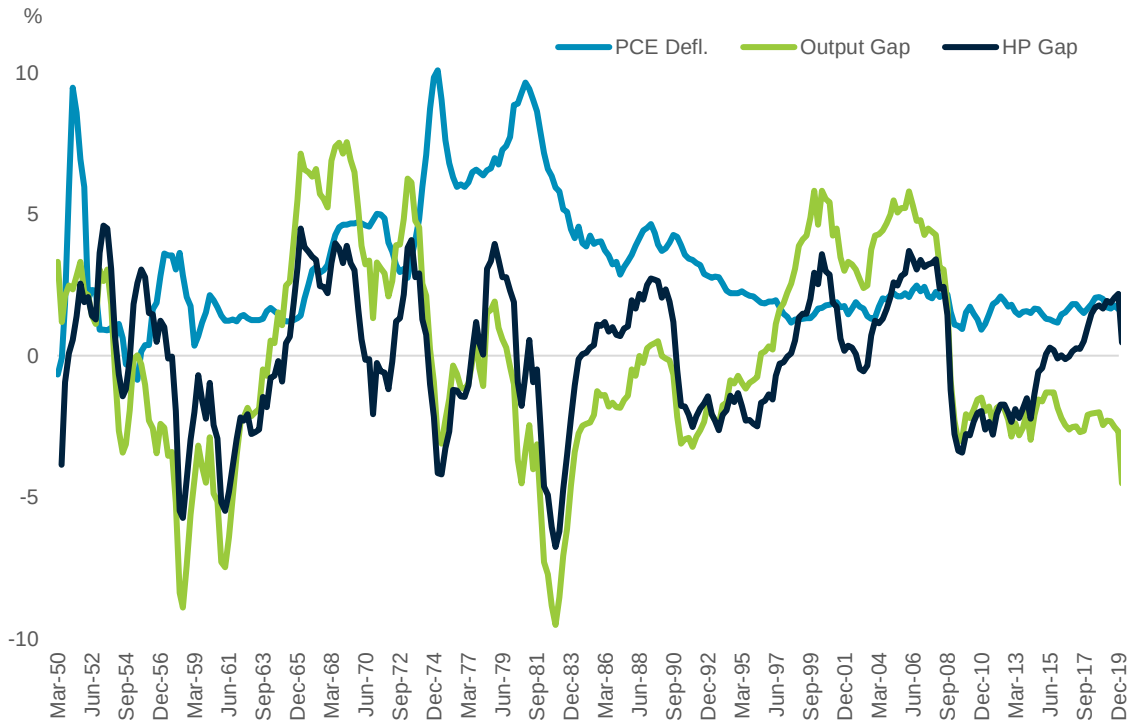
[8] Examples include Carvalho, Ferrero, Nechio (2016), Thwaites (2015), and Rachel and Smith (2015).

United States Real Bond Rate Scenarios

Potential Growth, the Output Gap and Inflation

A Cobb-Douglas production function is used to define potential output, as opposed to filtering out the cycle with smoothing techniques (this is set out in Box 1 at the end of this chapter). Chart 8 shows the PCE deflator measure of inflation versus the GDP output-gap measured against production function potential output and the alternative Hodrick-Prescott filter representation.

Chart 8 Output Gaps and Inflation 1950-2020



Source: Thomson Reuters

For most of the period these 'gaps' track each other, except for the last 5 years, when excess capacity versus potential has not been closed — consistent with continuing deflation pressure in recent years. Sustained excess capacity since the 2008 crisis appears to be consistent with concerns about secular stagnation.

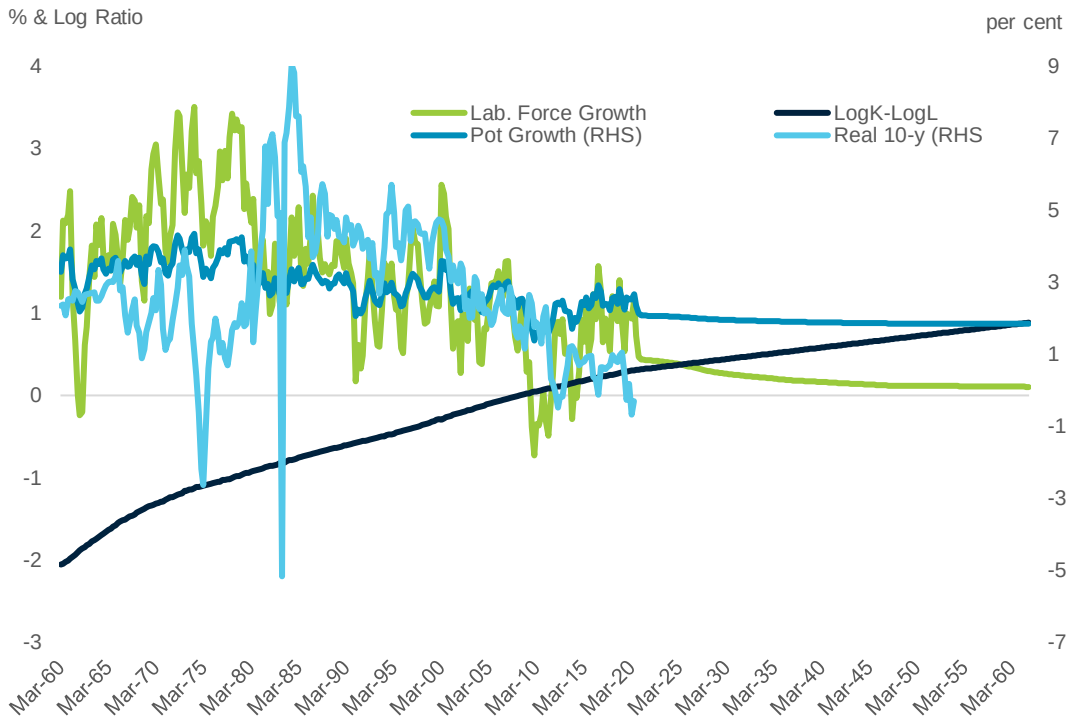
The inputs for the potential growth scenario are shown in Chart 9.

- The labour input is US working age population (16+) multiplied by the participation rate. This is projected forward using population growth and the participation rates from the World Bank and the Bureau of Labour Market Statistics (BLS), respectively.
- The capital stock is cumulated gross fixed capital formation less consumption of fixed capital. The projections of the capital stock are based on the above labour force

growth, where capital-for-labour substitution is assumed to continue at the (slightly reduced) rate observable from 2010 to 2019.

The potential GDP growth calculations to December 2061 based on the above assumptions are also shown in Chart 9.

Chart 9 US Potential Growth, Production Function and Hodrick-Prescott



Source: Thomson Reuters, BLS, World Bank, author calculations.

Trend growth on this basis has shifted down.

- Potential growth was in the 3.5 - 3.75 per cent range prior to 1979, fell into the 2.5 - 3 per cent range until 2001. From 2002 to 2019 potential growth lies in the range of 1.5 - 2.5 per cent.
- Potential growth to 2061, based on the capital and labour inputs describer earlier, converges to 1.85 per cent.

This evidence is also consistent with the above definition of secular stagnation: the US economy is currently operating below full capacity, and in the absence of new policies potential growth remains at its post-crisis lower rate of potential growth for a long time.

It is worth noting that explanations of the fall in real interest rates from 2002 that rely on capital-for-labour substitution caused by the declining relative price of capital goods (discussed in Chapter 1) stretch plausibility.[9] This smooth process has been going on for a

[9] This process tends to be a smooth one, with investment and participation rate changes at any point in time having small effects compared to the huge stock of capital and labour.

very long time and has gotten slower over time (Chart 9). The fall in the real interest rate from 2000 is much more abrupt than that. Alternative explanations would appear to be required.

The US Real Bond Rate Drivers and Projections

Real bond rates could gravitate towards the longer run 1.85 per cent potential growth rate, based on the discussion in Chapter 1. Tests for cointegration between the declining potential growth rate and real interest rates are provided in Box 2. These show that the variables are indeed cointegrated, and the error correction model implies some degree of causality. The real rate would move towards declining trend growth with a mean lag of around 20 quarters.

These results suggest a 'potential-growth-driven case' for this study of a 1.85 per cent equilibrium real bond rate for the United States over the long term.

However, the decline in the US real rate after 2000 is greater than can be explained by potential growth developments in the past 20 years. Real interest rates sat above trend growth from 1980 to 2000 (Chart 9) and moved down well below the 1.85 per cent potential growth rate in recent years. The major downward move since 2000 requires more explanation. The trend shifts of domestic and foreign saving variables seems to be more closely related to the US real bond rate in the last two decades.

Saving Behaviour

Both domestic and foreign investors fund the US bond market. The cumulated current account is the net cumulation of US assets by foreign investors (central banks, and sovereign wealth, pension, and mutual funds). The level of this variable is influenced by the global '*saving glut*', with significant amounts due to China, Germany, NAFTA and Japan. Foreign saver preferences for US assets have been strong, driving the US dollar and current account outcomes.

Of the net acquisition of US assets, a large amount is invested in the US Treasury market — for size and liquidity reasons. Foreigners held $7,083bn in US Treasury securities in August 2020 (some 33 per cent of US GDP). Higher (and more broadly held) US assets in foreign portfolios reduces the risk premium on US securities. The flows in this process also exert upward pressure on the dollar and widen the current account deficit. These net flows have exerted downward pressure on US real interest rates (as noted by Bernanke).[10]

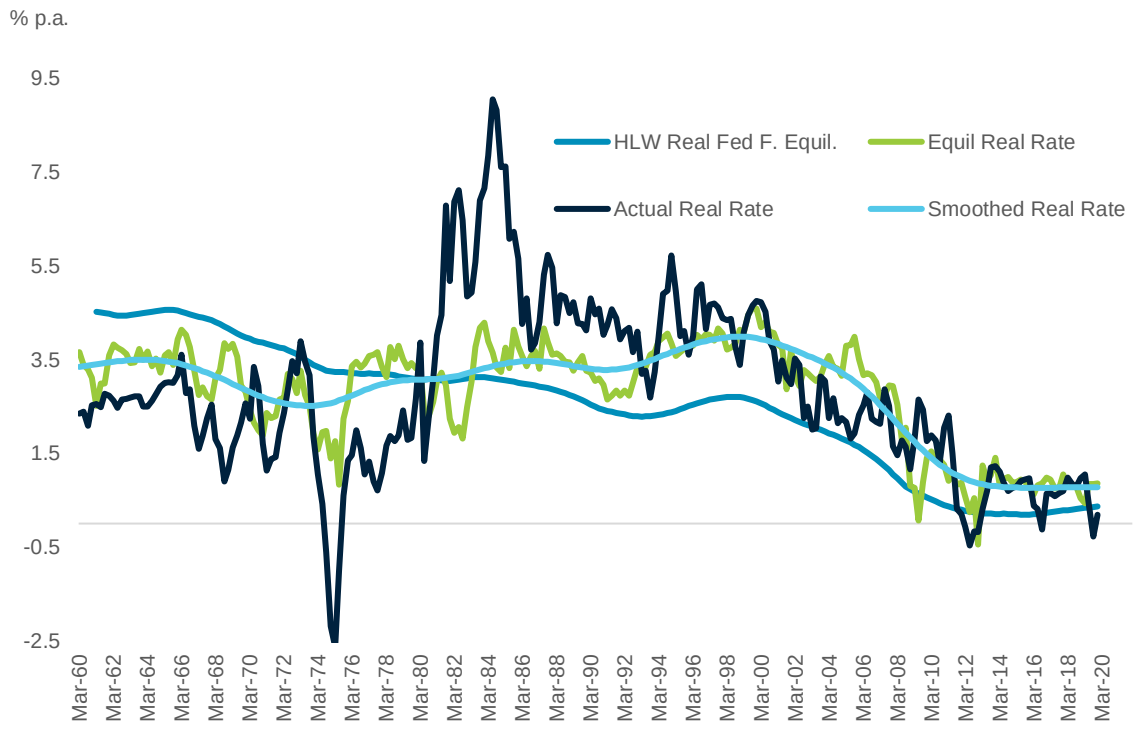
Lower domestic saving related to demographic ageing factors and pension policies and concerns should act in the opposite direction. This occurred up until the global crisis, but subsequently household saving began to rise, reversing in part the longer-term down trend.

[10] Despite the size of these net liabilities, the US does not have net property income flows to the rest of the world. In essence, the foreign holders of US assets earn a small and declining return as the size of these net assets rises, while US earnings on gross foreign assets earns a higher return. This spread reflects in a sense the return for the 'dollar reserve currency service' the US provides to the rest of the world. As the cumulated current account continues to rise, and more net dollar assets are included in international portfolios, the risk premium on these dollar assets declines.

The broad cointegration relationship between the real US 10-year bond rate, domestic household saving, the cumulated current account deficit and a stationary cyclical growth variable is set out in Box 2 at the end of this chapter. The trended variables appear to be cointegrated — they have a unique relationship in long-run equilibrium. Further, in the narrow econometric sense from the error correction results, the causality appears to run from domestic and foreign saving to the real bond rate.

The US equilibrium real rate calculated on this basis is shown in Chart 10. The Holston-Laubach-Williams (HLW) Fed calculation for the shorter-term real Fed Funds Rate is also shown. The US real 10-year rate consistent with the saving variables moves upwards during the period of deregulation after 1974 (capital controls removed) and the early 1980s (interest rate ceilings eliminated), reaching a peak of around 4 per cent by 2000. This makes sense given the better growth and profitability expectations generated by deregulation. However, the rate then begins a marked decline after 2000, levelling out at around 0.75 per cent from 2013. US potential growth picks up moderately from 2013, in the opposite direction to bonds (Chart 9). This 2000 turning point is also reflected in the Fed calculation of the neutral real Fed Funds rate — it is adjusted for consistency with underlying saving variables.

Chart 10 Equilibrium Real Bond Rate Compared to Fed Fund Model (HLW)



Source: Thomson Reuters, Federal Reserve Board, author calculations.

Saving Scenarios

Domestic and foreign savings variables are found to be key driving variables of the US real interest rate. Shifts in foreign preferences for US assets (related to foreign demographics, investment opportunities, official policies, etc.) drive the exchange rate and the current

account, which can move by large shares of GDP compared to domestic saving (see Chart 5). A rise of preferences for US assets would be associated with a stronger dollar, a deteriorating current account and greater use of foreign saving in funding US investment. Downward pressure on US interest rates would be associated with more consumption (less domestic saving) and/or increased investment for consumption in future years (movements along the saving and investment curves). A shift in preference against the US would have the opposite effects. The US saving curve too can shift, due to demographics and policy shifts. In the long run different combinations are possible.

The bottom panel of Chart 11 shows the behaviour of the two saving variables: the decline and partial reversal of household saving and the spectacular rise of the foreign saving variable. Some hypothetical scenarios for these variables for the 40-year 2020-2061 period are also shown. Shifts in these variables may push the equilibrium US real interest rate above or below trend growth for sustained periods.

- The US population is ageing, so one scenario is that US domestic saving resumes a downward trend in the future, assuming it only rose for temporary precautionary reasons after the 2008 crisis. However, as set out in Chapter 3, US demographic trends (fertility and immigration) differ from other OECD countries and may imply a continued upward creep in personal saving. Pension concerns and policies may also push in this direction. An intermediate case is that the end-2019 saving level remains unchanged.
- The foreign saving downside case is that China, Japan, Europe and the Asian Tiger countries are ageing, so that preferences for holding US assets declines. This assumes that 'younger countries' don't offset these trends fully. Official policies may also influence preferences against US assets (e.g. foreign exchange intervention to prevent depreciation versus the dollar, capital controls, or pension rules and policies). The reverse case for increasing foreign preferences for US assets is that: developing countries with better demographics for saving (notably India) outweigh the ageing countries; there are official policies to encourage capital outflows; central banks intervene to prevent currency appreciation; pension diversification rules are imposed; and/or global risk concerns rise.

Over 40 years to 2061, there is no way to forecast these policies and demographic effects across all countries that affect their preferences for US assets. Consequently, alternative combinations of hypothetical outcomes are chosen in the bottom panel of Chart 11. These are selected with reference to both the range of shifts that have been observed in history of these variables and some forward-looking issues discussed in Chapter 3.

The top panel of Chart 11 shows the associated shifts in the equilibrium real bond rate associated with these scenarios. The main US real bond rate scenario from 2020 to 2061 will be the probability-weighted average of the scenarios considered.

Scenario 1, Domestic Saving Rate Falls to Pre-Crisis Level, Foreign Saving Rise (20 per cent weight): If the rise in household saving after 2008 was precautionary, those concerns could dissipate over time. If household saving returns gradually to its pre-crisis level (4 per cent of household income) while preferences for foreign savers shifts in favour of US assets (for the above sorts of reasons) by 5 per cent of US GDP, the real rate would rise

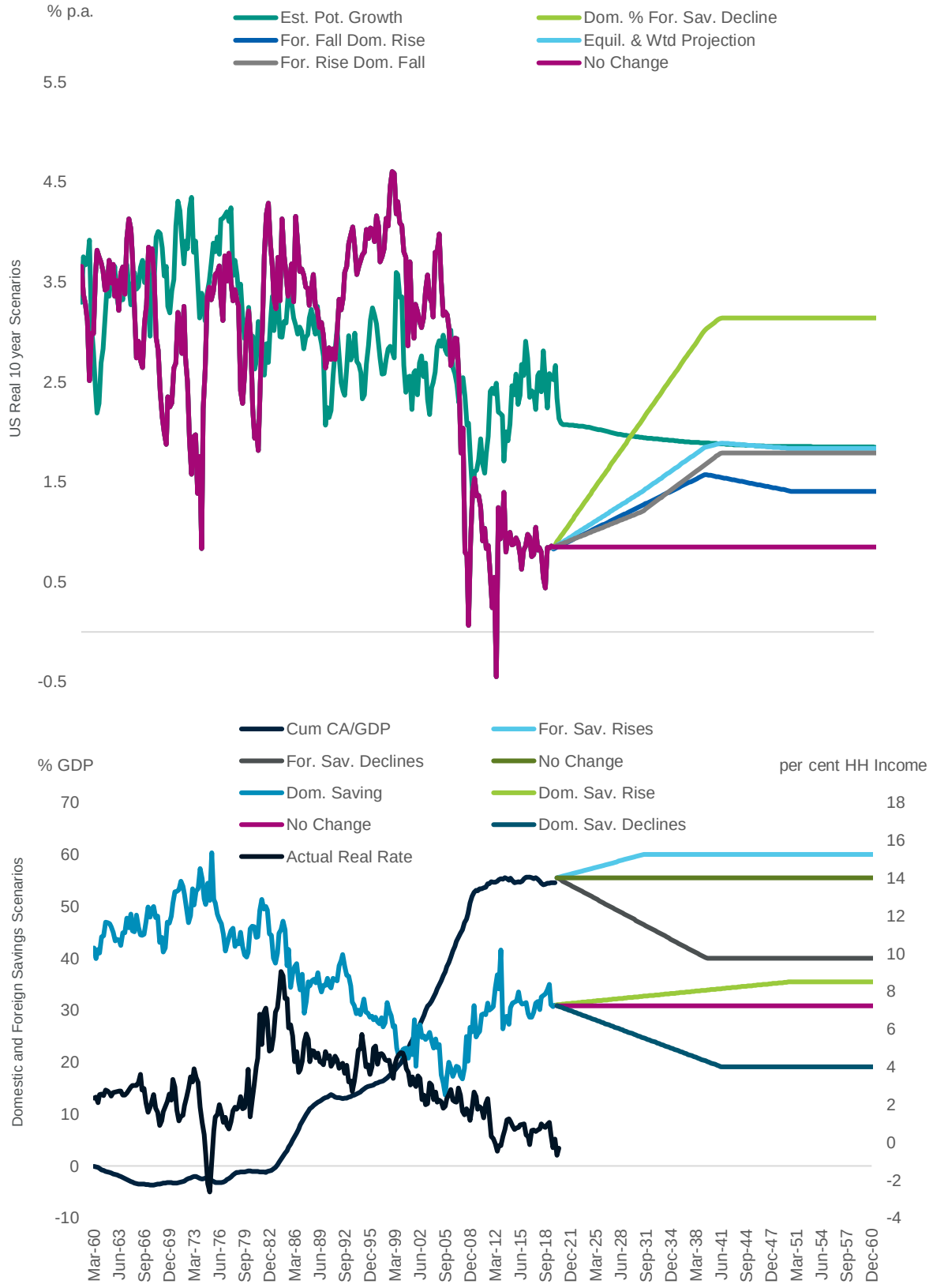
to 1.79 per cent. The rise in real rates due to the fall in domestic saving would be offset by capital inflows, exchange rate appreciation and a deterioration in the current account (foreign saving rise). This is shown in the top panel by the grey line labelled "*For. Rise Dom. Fall.*" This case is given a 20 per cent weight.

Scenario 2, Foreign Saving Fall, Domestic Saving Rise (40 per cent weight): This case is shown by dark blue line labelled "*For. Fall Dom. Rise.*" If the cumulated current account to were fall from its current level of 55 per cent of US GDP in 2019 to 40 per cent (back to its 2006 level) while domestic saving rises to 8.5 per cent of disposable income (in line with the trend since the 2008 crisis) the equilibrium real rate would rise to around 1.4 per cent. This would be associated with net capital outflows, downward pressure on the US dollar and current account improvement. Rates rise because the increase in domestic saving doesn't fully offset the bigger swing in foreign saving.

Scenario 3, Both Domestic and Foreign Saving Decline (25 per cent weight): If US household saving resumes its decline (as per scenario 1), while the foreign saving variable falls as per scenario 2, the real equilibrium rate would rise to 3.1 per cent. This case is shown as the green line labelled "*Dom. per cent For. Sav. Decline.*"

Scenario 4, No Change (15 per cent weight): This case is shown in the top panel of Chart 11 by the purple line labelled "*No Change.*"

Chart 11 Domestic and Foreign Saving Scenarios



Source: Source: Thomson Reuters, Federal Reserve Board, World Bank, author calculations.

The Central US Scenario: The world is a very unpredictable place looking out to 2061. All the above scenarios could be plausible under different geo-political and economic developments. Hence for the purposes of Australian bond and exchange rate scenarios, the weighted average of the above four scenarios is taken to be the central case for the equilibrium real US bond rate. This stabilises in 2040 at 1.85 per cent and remains at that level subsequently. This is shown by the light blue line labelled "*Equil & Wtd Av Projection*" (in line with the potential growth estimate of around 1.85 per cent).[11]

The Australian Bond Rate Scenarios

The Australian bond rate scenarios will be approached in three ways: (a) potential growth; (b) the interest rate parity approach for Australia as a small economy price taker with bond pricing linked to the US markets; and (c) saving pattern trends (as for the US model).

Australian Potential Growth

The end of the mining boom investment followed by the COVID-19 events in 2020 will permanently reduce the level of output (compared to what it would otherwise have been) and reduce potential growth compared to the 2000-2013 period. The high frequency noise of investment and labour supply data affected by COVID-19 during 2020 is abstracted from. Australia has done a better job than other countries in keeping the virus out, there is good news on vaccines, and the capital stock remains in place. Nor has there been a financial crisis.

The labour force used in the Australian production function is working age civilian population (aged 15+), from the Australian Bureau of Statistics (ABS), multiplied by the participation rate. The projections for the population series were kindly provided by the NSW Treasury.[12] The participation rate is held constant at its end of 2019 level (ignoring the volatility associated COVID-19 in Q1 and Q2 2020).

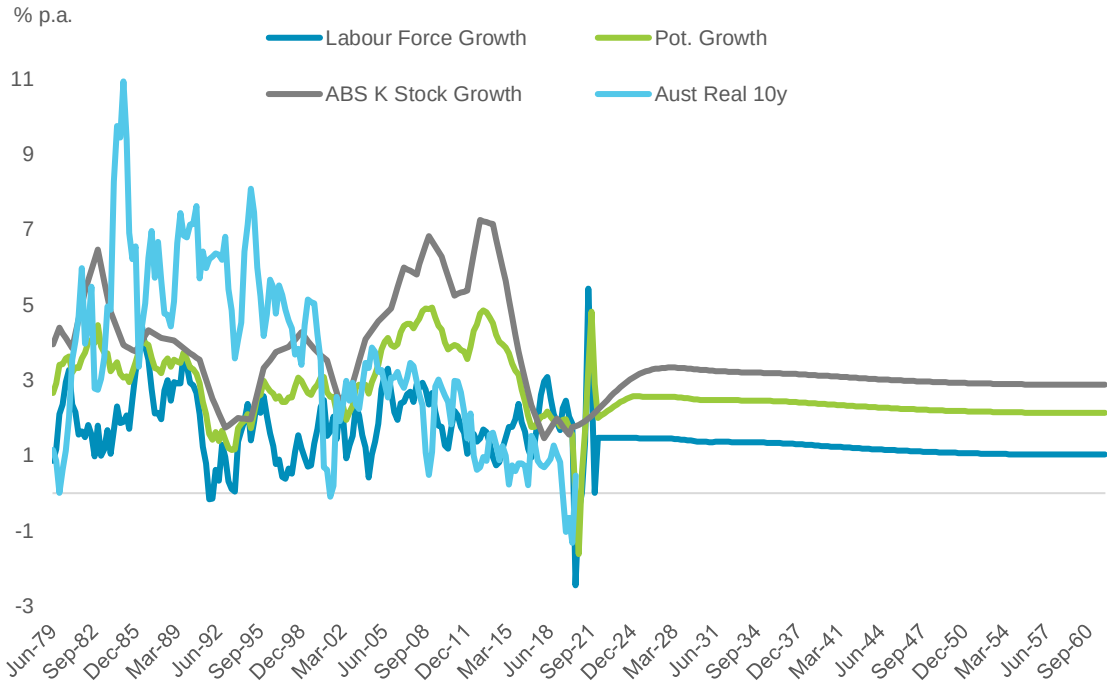
The capital stock is the annual ABS series, interpolated for the quarterly data used here. The capital stock is projected forward using the labour force growth data noted earlier, and capital-for-labour substitution assumptions. The commodity super cycle is assumed to be over and capital investment will return to the more 'normal' rates prior to and after the mining boom years. There are three reasons for this discussed in Chapter 3:

- A secular slowdown in China's growth will occur over the next 40 years.
- The Belt and Road Initiative will succeed in diversifying its resource and energy supplies; and
- Non-mining States (like NSW) will carry out policies supportive of investment in the face of some reduced demand from mining states.

[11] An equal weighting of these scenarios comes out slightly lower at 1.79 per cent.
[12] See also McMenamin and Maguire (2020).

Hence, following the COVID-19 interruptions to the economy in 2020, it is assumed that there is a gradual improvement in capital for labour substitution, building back to the average pace after the peak of the mining boom after the end of 2013 (see Chart 12).

Chart 12 Australian Capital Stock, Labour Force & Potential GDP Growth



Source: Thomson Reuters, NSW Treasury, ABS, author calculations

Trend growth combines capital and labour with a Cobb-Douglas production, constrained in estimation to the constant-returns-to-scale case (the estimated capital parameter is 0.6). Capital, labour and potential growth are shown in Chart 12. Potential growth builds back to 2.5 per cent by 2025, and then slows to around 2.1 per cent by 2061 due to the labour supply projections.[13] Given labour supply, trend productivity growth is 1.1 per cent p.a. for the scenario period.

Australian potential growth does not display the same tendency to slow down as in other countries prior to 2013-14, because it was a direct beneficiary of the China growth boom. However, since 2014 it is beginning to experience slowing growth due to weak investment. The reason for the slower capital-for-labour substitution assumption going forward should be readily evident from the chart. From 2001 the China 'super cycle' for Australian resources required massive investment (see the grey line for the capital stock growth in Chart 12) to 2013. Projections account for this 'super cycle' not being repeated.

[13] The projection starts at Q1 2020, even though Q1 and Q2 preliminary actual data is available. This is due to unusual volatility from the Covid-19 crisis.

The participation rate and the rate of capital-for-labour substitution are parameters that could be influenced by policy in the future. Policies that raised participation, for example, would improve potential growth and require more investment. Support for physical and social infrastructure would likewise help 'post-super-cycle' investment and the quality of labour (discussed in Chapters 3). Hence the move towards 2.1 per cent potential growth is not locked-in if there were to be pro-active policies.

The NSW government can play an important role in such policies, as Australia's largest state. Mining states like Western Australia (WA) are likely to playing a less-prominent role over the next 40 years.

Australia's real 10-year bond rate is quite divorced from the shape of potential growth since the early 1980s (also shown in Chart 12). While potential growth was rising due to the investment boom, the real bond rate was in trend decline. From an average of around 5.3 per cent from 1979 to 2000, it fell after 2000 to be around zero by 2019.

Current real bond rates are well below the potential growth of estimate to 2061. However, due to the mining distortion no within-sample cointegrating relationship could be found between real interest rate and potential growth. An alternative approach based on interest parity conditions is more fruitful. A model based on domestic and foreign saving patterns will also be estimated as a cross-check on the interest parity approach.

Interest Rate Parity and US Bond Scenario Implications for Australian Bonds

Australia as a small open economy is a price taker in interest rate and exchange rate outcomes in global markets. In practice, Australian bonds price with reference to the US Treasury market, the global '*safe asset*'.[14] Interest rate parity for the Australian real bond rate would require it to be equal to the US real bond rate (except for a country risk premium) plus the expected appreciation of the Australian real exchange rate. The expected real exchange rate appreciation aspect of the work here is based on the model of Blundell-Wignall et al. (1987 and 1993), and details of the current model and data definitions are presented in Box 3.

The Australian real bond equilibrium rate, as defined by the real exchange rate model and the interest rate parity condition, is shown (within sample estimate and the weighted average projection) by the purple line in Chart 13. At the end of 2019, the interest parity level for the real bond rate is 0.7 per cent.

[14] See Blundell-Wignall and Tarditi (1999) for early empirical analysis of this issue. This is widely understood in financial markets.

Chart 13 Australian 10-year Bond Rate, Interest Parity & Scenarios With USA

Source: Thomson Reuters, author calculations.

The four US real bond rate scenarios are run through the interest parity model assuming the terms of trade remains constant (the latter is a big driver of the exchange rate but with only small direct effects on the Australian bond rate). The benchmark projection is taken to be the weighted average of the four scenarios (using the corresponding US scenario weights).

US Scenario 1, Domestic Saving Rate Falls to Pre-Crisis Level, Foreign Saving Rise (20 per cent weight): The US equilibrium rate rises from 0.85 per cent in 2019 to 1.79 per cent, as the domestic saving decline is partially offset by a further deterioration in the US current account. The linked Australian 10-year equilibrium rate will move up from 0.7 per cent in December 2019 towards 2 per cent in the long run (labelled "*US For. Sav. Rise Dom. Fall*" in Chart 13).[15]

US Scenario 2, Foreign Saving Fall, Domestic Saving Rise (40 per cent weight): In the case where the US equilibrium rate rises from 0.85 per cent to 1.41 per cent per cent (due to a falling preference for US-dollar assets and rising domestic saving), the Australian 10-year equilibrium rate would gravitate towards 1.65 per cent (Chart 13 labelled "*US For. Sav. Fall Dom. Rise*"). A higher probability is put on this case (explained in Chapter 3) mainly because India and other 'young' countries are unlikely to be able to offset the group of ageing

[15] There is a country risk premium versus the US rate.

countries, while the 'echo' of the baby boom and immigration boosted fertility in the US from the mid-1980s.

US Scenario 3, Both Domestic and Foreign Saving Decline (25 per cent weight): In the case where the US equilibrium rate rises from 0.85 per cent to 3.1 per cent (due to falling preference for US assets and domestic saving resuming its decline), the Australian 10-year equilibrium rate would shift upward from 0.7 per cent to 3.4 per cent in the long run (Chart 13 labelled "*US For & Dom Sav Fall*").

US Scenario 4, No Change (15 per cent weight): The US equilibrium real rate remains at 0.85 per cent and the Australian 10-year rate rises from 0.7 per cent in 2019 to 1.2 per cent by 2061 (shown by the black dashed line labelled "*US For. & Dom. Sav. Flat*").

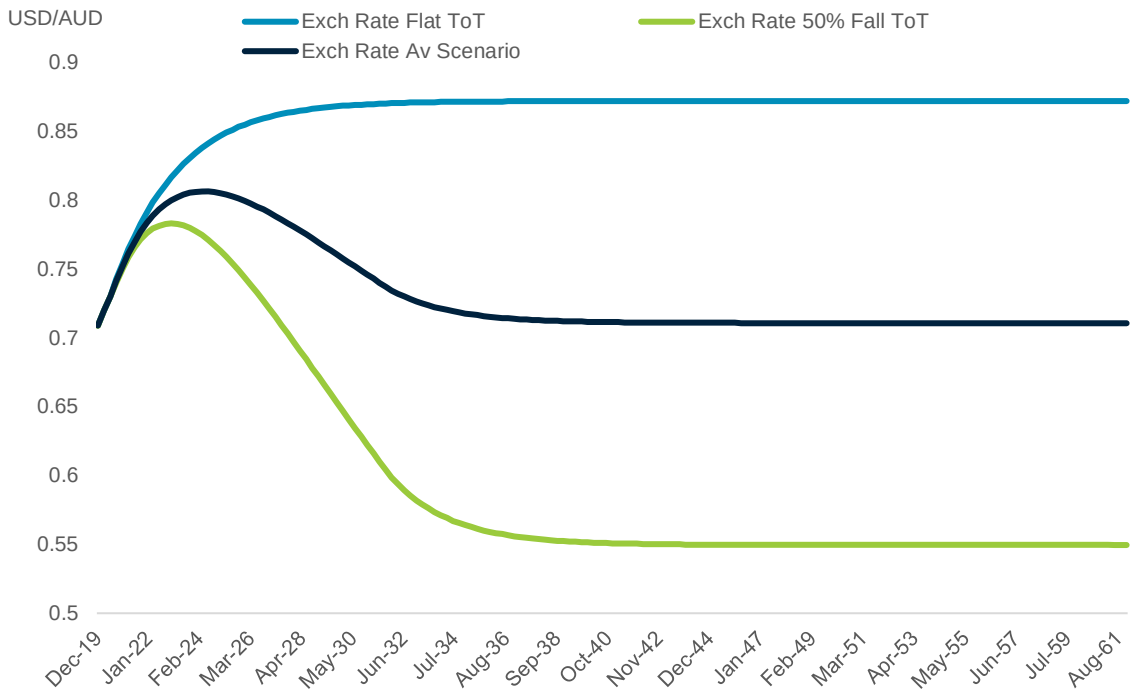
Weighted Average Central Projection: Combining the different scenarios with the attached weights leads to a central projection of 2.1 per cent in the long run, but this is arrived at from lower levels in the earlier years (due to the influence of low US rates), in Chart 13 labelled "*Est. Equil. & Wtd Projection.*" The 2.1 per cent rate in the long run is consistent with the potential growth projection in the out years, but the real bond rate equilibrium is well beneath potential growth prior to 2040.

Australia's Terms of Trade Shifts

Australia is a price taker in commodity markets and shifts in Australia's terms of trade have far-reaching effects on the economy and the equilibrium real exchange rate. Changes in the terms of trade have only a small impact of the real bond rate because it is mainly the exchange rate that adjusts to maintain interest parity.

The impact on the equilibrium real bond yield is very small (see the model in Box 3). The long-run equilibrium real exchange rate adjusts quickly, and the actual exchange rate moves to maintain the interest rate parity condition. Illustrative scenarios are shown in Chart 14.

Chart 14 The Exchange Rate and the Terms of Trade



Source: author calculations.

Three cases are shown. In the first, the terms of trade in held constant. The level of the Australian dollar at 65 cents in June 2020 is undervalued given the high level of the terms-of-trade at 107. It would appreciate in real terms, over the longer run, towards 87 cents. The second case considers the unlikely fall in Australia's terms of trade from its current level of 107 until it reaches its past extreme of 54.5 (the December 1986 currency crisis level). The dollar would fall towards 55 cents. The third (and more likely) case is the average between these two extremes, which see the dollar move to an equilibrium of 71 cents.[16] The case is more likely because China will slow. The Belt and Road Initiative (BRI) also will either succeed in diversifying sources of resource supply (a negative for Australian resources) or increase financial problems for China due to over capitalisation with debt finance at home spreading to its exposure to BRI countries that are unable to service debts. This alternative is also a negative for Australia.

The exchange rate is an important issue for NSW and for Australia. First, a move up in the commodity cycle boosts Australia's prospects leading to capital inflows and a rising exchange rate: asset prices would rise. This affects NSW government revenue through stamp duty and other taxes. The prospect of a serious decline in the commodity cycle would have the opposite effect. Second, hedging decisions need to be taken with respect to the buying and selling of goods affected by currency movements. Third, NSW might choose

[16] Working in real terms avoids a focus on inflation. It is assumed Australian and US inflation run at 2 per cent pa over the long run.

foreign currency (US dollar, euro and yen) denominations if the Australian dollar expected to appreciate over time, since the servicing cost would fall. Australian dollar issues might better suit a weakening exchange rate.

Cointegration of Australian Real 10-year Bond with Key Saving Drivers

A second approach to modelling the real 10-year with cointegration techniques follows that used for the United States focusing on domestic and foreign saving drivers. Both domestic and foreign investors fund the Australian financial markets, but the latter are more important. [17] The long-run trends in both the cumulated current account and domestic personal saving are co-integrated with the Australian 10-year real bond rate (see the top panel Box 3). [18] Furthermore, the error-correction model reported in the Box implies a degree of causality (in the econometric sense) from these variables to the real interest rate.

Household saving was declining prior to the GFC, in part due to the rise of compulsory superannuation contributing to retirement benefits of households. Falling household saving would offset some of the contribution to national saving via the super guarantee charge.[19] Following the GFC, however, household saving rose. This reinforced the increased foreign saving contribution in pushing down real interest rates. The estimated equilibrium rate via this approach at the end of 2019 is 2.2 per cent (the dark blue line), well above the actual rate and the interest parity model estimate (also shown for comparison purposes with the light green line labelled “The Int. Rate Parity Est” in the top panel of Chart 15).

The bottom panel of Chart 15 shows four scenarios for the domestic and foreign savings variables. The net cumulation of Australian assets by foreign investors funds does not derive from the same mechanisms as for the United States (the reserve currency and global safe asset role). However, the global saving pool is large. While Australia is small in comparison, it attracts foreign investment partly as a play on resources. Compared to domestic saving, swings in the cumulated current account are large and have s stronger effect on the real bond rate. This series has been dominated by current account deficits, and very large accumulations of Australian asset in foreign portfolios. [20]

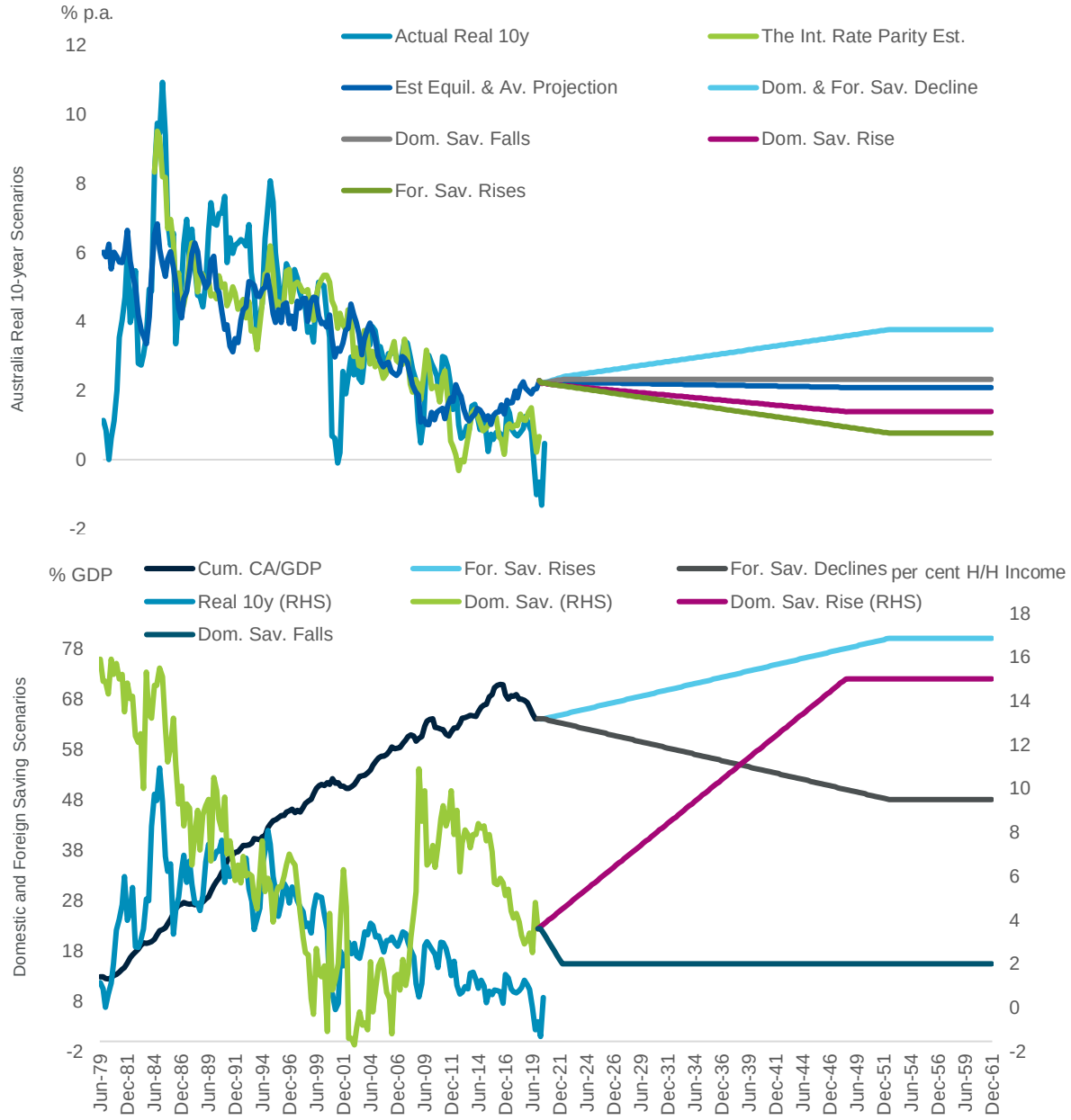
[17] The vast public and private investment projects in Australian should not be expected to be funded by state savers. For example, the vast resource boom in WA could not be funded by West Australian savers. Similar issues apply to NSW and other States. The Federal Government and the States are in competition with each other and with the private sector for savings. When investment demands exceed *ex ante* saving in Australia the current account adjusts. If Australia were a closed economy real interest rates would be very much higher than those seen since deregulation and the removal of capital controls in the early 1980s.

[18] Any other stationary influences are assumed to be captured by the constant term.

[19] See Connolly and Kohler (2004).

[20] There has been a trend move down in the spread to US rate as the cumulated current account has risen. The greater the net stock of Australian assets held abroad the deeper become NSW (and other Australian) securities markets and the lower is the risk premium.

Chart 15 Australian Real 10-year Bond Projections Based on Saving



Source: Thomson Reuters, NSW Treasury, author calculations.

Plausible ranges for future trends in these variables based on historical comparisons are set, and their impact on the real bond rate is projected to 2061, shown in the top panel. The central scenario is a simple average of the cases chosen. This secondary approach is used to cross check the plausibility with the interest parity approach. The projections start from 2019, abstracting from the noise of COVID-19 events in 2020.

- Scenario (1): The combination of current account improvements and falling domestic saving. A falling currency, poor global conditions and policy and behavioural changes that reduce the incentive for domestic saving, such as better safety nets in pension and superannuation arrangements. The real rate rises to 3.8 per cent. This is shown by the line labelled "*Dom. & For. Sav. Decline*" in the top panel of Chart 15.
- Scenario (2): Foreign saving increases while domestic saving remains flat (for example, a strong currency, current account deterioration, and no changes in policy or public concerns about superannuation and pensions). This leads to a lower real rate in the long term of 0.77 per cent. This case is shown by the line labelled "*For. Sav. Rises*" in the top panel of Chart 15.
- Scenario (3): Domestic savings fall to just 2 per cent of disposable income while foreign saving is flat. This is associated with a slightly higher real bond rate of 2.3 per cent, recalling the in-sample estimate at the end of 2019 of 2.2 per cent is already much higher than the actual rate. The scope for a downwards shift in personal saving in Australia is limited because saving is already very low. This case is shown by the line entitled "*Dom. Sav. Fall*" in the top panel of Chart 15.
- Scenario (4): Domestic saving rises to its late 1970s peak, because pension/super rules changes encourage more voluntary saving (such as a later retirement ages), increased longevity and concern about pension adequacy rise. The cumulated current account is flat in this scenario (the deficit grows in line with GDP). The real bond rate falls to 1.4 per cent. This case is shown by the line labelled "*Dom. Sav. Rise*" in the top panel of Chart 15.

The equal weighted average of the four above cases sits at 2.1 per cent. This is shown by the dark blue line labelled "*Est. Equil & Av Projection*" in the top panel of Chart 15 This is consistent in the long run with the interest parity model, but the estimate is higher in the first 20 years of the projection.

Conclusion

A cointegration approach allows global and domestic factors to be brought to bear on the modelling of the real interest rate and projections. As the world has become an unusually uncertain place on many fronts a variety of outcomes is possible for the next 40 years. Amongst these are included the evolution of the Chinese economy, the Asian Tigers and trends in countries with younger populations. Future policy and private behaviour are also difficult to foresee including: foreign demographic trends; pension rules and policies abroad; the unwinding of QE and super-low interest rate distortions; superannuation rules in Australia; the generosity of the pension safety net under future governments; retirement age; income and wealth; longevity; and concerns at home and abroad about whether future retirement 'promises' can be kept.

The forty years of this project is a very long time, and much can happen on the way to 2061. Forty years ago, real rates were at their peaks during the Volcker disinflation, and no one could have predicted the current nexus of deflation, close to zero or negative real rates and secular stagnation concerns in 2020.

For this reason, the methodology of hypothesising a wide range of scenarios for domestic and foreign saving was chosen — reflecting these great uncertainties. These can then be probability weighted to provide a single projection for policy planning based on multiple possibilities. On this basis over the next 40 years, the US equilibrium real 10-year rate is estimated to converge towards 1.85 per cent, and that for Australia towards 2.1 per cent.

Global issues related to these uncertainties are discussed in Chapter 3, and policy issues for NSW and Australia are the focus of Chapter 4.

Box 1 US Potential Output 1950-2020

Potential output is specified as the Cobb-Douglas form with Hicks-neutral technical progress over the post-war period:

$Y(t)^* = AK(t)^{\alpha}L(t)^{\beta}e^{\lambda(t)}$

Where K is the capital stock, L is the labour force, t is time.

Dependent Variable Log Y				
	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	0.294	0.450	0.654	0.514
Log K	0.068	0.006	11.872	0.000
Log L	0.632	0.042	14.885	0.000
Time	0.004	0.000	26.766	0.000
Adj, R-sq	0.997	Std. Error	0.0361	Nobs: 281

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Dependent Variable DlogY, Error Correction				
	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	0.375	0.081	4.621	0.000
Resid (-1)	-3.370	1.403	-2.403	0.017
Dlog y(-1)	0.341	0.058	5.925	0.000
Dlog K(-1)	3.021	1.104	2.736	0.007
Adj, R-sq	0.179	Std. Error	0.818	Nobs: 281

Source: Author estimates

Box 2 US Real 10-year Bond Model

The US equilibrium real 10-year bond rate is investigated assuming it has a cointegrating relationship with potential growth (percent change), domestic household saving as a share of disposable income (per cent) and net foreign saving, represented by the cumulated current account, as a percentage of US GDP.

The first panel shows the cointegrating relationship between the real bond rate and potential growth calculated from the output of the production function. The error-correction term indicates cointegration. If this were the only relationship that mattered, a one percentage point rise in potential growth (a big move) would be associated with a 0.2 per cent rise of the real equilibrium rate in the longer run (roughly five years, other things given).

US Real 10-year Bond per cent, Cointegration with Pot. Growth, Mar 1960-Dec 2019				
	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	2.234	0.594	3.760	0.000
Pot. Growth	0.195	0.196	0.993	0.322
R-sq	0.064	Std. Error	1.85	Nobs: 240

Dependent Variable Change in Real Rate, Error Correction				
	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	-0.008	0.040	-0.214	0.831
Resid (-1)	-0.052	0.021	-2.408	0.017
R-sq	0.155	Std. Error	0.613	Nobs: 239

Source: Author calculations.

When potential growth is combined with the two saving variables, it takes on the wrong sign and can be discarded from the cointegrating vector without cost. Instead, actual growth less potential growth is included. If growth accelerates versus potential, investment might be expected to rise and vice versa. The variable also helps deal with autocorrelation of residuals.

The second panel shows the simple cointegrating relationship between these three variables. The error-correction term, significant at the 1 per cent level accepts the hypothesis of cointegration.

US 10-year Bond per cent, Cointegrating Relationship Mar 1960-Dec 2019				
	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	7.387	0.552	13.381	0.000
HH Saving/Income	-0.385	0.051	-7.510	0.000
Cum.CA/GDP	0.159	0.048	3.319	0.001
Growth Deviation	-0.068	0.007	-10.210	0.000
R-sq	0.6	Std. Error	1.49	Nobs: 240

D 10-year Bond, Error Correction				
	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	-0.006	0.047	-0.135	0.892
Resid(-1)	-0.087	0.027	-3.232	0.001
D HH Sav.(-1)	0.028	0.052	0.541	0.589
D Cum.CA(-1)	-0.006	0.107	-0.060	0.952
D Growth	0.043	0.035	1.212	0.227
R-sq	0.223	Std. Error	0.61	Nobs: 238

Source: Author calculations.

Box 3 Australian 10-year Bond Cointegrating Relationships

Estimated results for the two alternative ways of calculating the equilibrium real bond rate via interest parity and saving variable cointegration are set out below.

The Interest Rate Parity Approach

The interest rate parity condition for Australian real interest rates versus those for the USA are given by:

$(\log E^{e}(t)-\log E(t-1))*100 = R^{a}(t)-R^{us}(t)$

(1) Where: E is the real exchange rate for Australia, $(\$US/\$A)(t)*P^{a}(t)/P^{us}(t)$; superscript "e" refers to expectations; R^{a} is the Australian real rate defined as the current 10-year bond rate minus core CPI inflation over the preceding year (regressive expectations), and R^{us} is the similarly defined US real rate.

Following Blundell-Wignall et al. (1987 and 1993), the equilibrium real rate is defined in terms of Australia's terms of trade, and the expected exchange rate appreciation with respect to 10-year bond differentials adjusts partially with a lag.

$(\log E^{e}(t)-\log E(t-1)) = \lambda(\log E^{hat}(t)-\log E(t-1))$; where $\log E^{hat} = \alpha + \beta(\log ToT(t))$, and ToT is the

Australian terms of trade. The backed out Australian real rate consistent with the given US rate is:

$R^{a}(t) = R^{us}(t)+\lambda[\alpha+\beta \log ToT(t)]-\lambda E(t-1)$

(2) The estimated parameters for the co-integrating relationship and speed of adjustment of exchange rate expectations based on the assumptions of this model are shown in the flowing table.

Australian, Cointegrating Relationship Real Exchange Rate, Mar 1984-Jun 2020				
	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	-3.518	0.157	-22.413	0.000
Terms of Trade	0.722	0.036	20.025	0.000
R-sq	0.858	Std. Error	0.108	Nobs: 146

D Real Exchange Rate, Error Correction				
	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	0.001	0.004	0.128	0.898
Resid(-1)	0.095	0.047	2.032	0.044
R-sq	0.168	Std. Error	0.048	Nobs: 144

Source: Author calculations.

The Savings Relationships Approach

This approach is identical to that adopted for the United States, see Box 2.

Australian 10-year Bond per cent, Cointegrating Relationship Jun 1979-Dec 2019				
	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	8.234	0.745	11.047	0.000
HH Saving/Income	-0.090	0.011	-8.161	0.000
Cum.CA/GDP	-0.072	0.043	-1.651	0.101
Growth Deviation	0.336	0.078	4.303	0.000
R-sq	0.673	Std. Error	1.777	Nobs: 163

D Real Exchange Rate, Error Correction				
	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	-0.009	0.068	-0.128	0.898
Resid(-1)	-0.128	0.039	-3.287	0.001
R-sq	0.251	Std. Error	0.868	Nobs: 162

Source: Author calculations.

3. Global Issues That Will Affect NSW and Australia

Chapter highlights

Forty years for a real interest rate projection scenario is a very long time, and it is a mistake to give undue weight to the recent past of very low rates. Demographic trends and consistent national saving ratios are presented which are used to support the choice of scenarios, their weightings, and the higher real rate projection.

Global savings are likely to flatten out and begin a moderate decline as a share of world GDP. European and Japanese national saving ratios continue to decline, while that for China levels out and begins to move down. US national saving continues to rise since its trough around the time of the global crisis. But this together with increases in India and other emerging countries is not enough to offset countries with declining saving ratios.

Household, corporate and government debt levels are reasonable in the US and are unlikely to constrain growth. But this is not the case in Japan, China and Europe. Debt and banking headwinds in these countries are consistent with the expectation that growth will be moderate and associated with a decline in national saving. China, in particular, has relevant influence through its excess saving, which affects US interest rates, and its direct influence on commodity prices.

China (like Japan before it) may be over-capitalising its economy (falling returns) and that, together with rising debt, will likely cause growth to follow a similar pattern to Japan 30 years before. The Belt and Road Initiative (BRI) may exacerbate these problems for China in countries that are high credit risks. Growth might slow to 2.7 per cent p.a. by 2050 if China manages to avoid banking crises. Use of capital controls and other restrictions will be removed only slowly, so any rise in consumption as a share of its GDP will also be limited.

Australia's commodity prices can be impacted by foreign trade strategies that include diversification in sourcing mineral resources. If the BRI slows due to foreign debt crises, it is unlikely to help, as Chinese growth would be even slower (closer to Japan's experience). While undervalued at present, the equilibrium for the Australian real exchange rate is likely to be flat to down over the long run (as in Chapter 2).

Monetary policy does not affect the long-run real interest rate projections. But as the saving glut and excess capacity unwind, it is likely that inflation pressure will return, and policy rates will move up to contain it and to maintain consistency with the path of real interest rates determined by underlying saving and investment imbalances.

Introduction

The scenarios in this report extend out to 2061. Forty years is a very long time, and there is a risk amongst economists to give recent history an excessive weight. Forty years ago was the period of the Volcker disinflation and a peak in US real rates. At that time no one foresaw

the global crisis and the arrival of the China supply shock, disinflation and zero real rates. The analysis in Chapter 2 arrived at a weighted average of US scenarios for the real 10-year rate converging to 1.85 per cent, (within a scenario range of 0.85 per cent to 3.1 per cent real). The Australian weighted conditional projection is 2.1 per cent.

This chapter looks global saving trends, demographics, debt levels, the long-run Chinese growth outlook, and monetary policy to support the higher-rates view in Chapter 2. Broad rationales for the choice of probability weightings there are presented.

Demographics and '*Saving Glut*' Issues

Demographic trends have an important role, along with income levels, in driving saving. The probability-weighted rise in the equilibrium US real rate to 1.85 per cent over the next 40 years would be consistent with a levelling out of the global saving glut followed by a modest decline. A continued rise in the saving glut, on the other hand, would place downward pressure on world real interest rates with disproportionate effects on the USA, while a sharp fall would push rates up strongly.

A simple econometric model is used to see where World Bank demographic projections would take national saving trends (see Table 2). The saving proportion of income is assumed to be conditioned by fertility and the age-dependency ratio. There are of course many other potential variables, including inter alia: government macro policies; lifecycle cohorts dominating saving behaviour within the working age population; social security financial benefits for children; other safety nets; and immigration. Different combinations of such factors might affect the size and sign of the coefficients in different countries. Nevertheless, the exercise helps to dimension the broad trends for the scenarios and weightings considered in Chapter 2. Thus:

- From high levels, declining fertility in developing countries will see age dependency falling from the young end of the cohort distribution (0-15 moving into 16-44 without being fully replaced by births). Young families have relatively large numbers of children to care for but less resources to do so in the absence of meaningful social security payments. Data more dominated by these characteristics might see falling age dependency associated with falling saving out of income (a positive relationship). Controlling for falling fertility nevertheless should reduce the cost of child rearing gradually over time, adding to family resources and helping offset pressure to reduce saving (a negative sign on fertility). In Table 2 India and Latin America fit this broad description.
- In late stage of transition countries age dependency rises with old cohorts (over 64) dominating and saving falls (retirees run saving down). Saving would have a negative relationship with age dependency, as in Europe and Japan. In these richer countries with very strong social security there can be a positive relationship between saving and fertility as couples lose child financial support — generous family resources are reduced (in Japan's case on-going income support is even accompanied by generous payments for having children).

China is something of a special case due to its one-child policy and the financial restrictions associated with its strict saving-investment strategy after admission to WTO in 2001. After

allowing for this government saving policy with a dummy variable there is no relationship between age dependency and saving. Declining fertility with the one-child policy crushed fertility quickly compared to other countries and age dependency fell sharply from the young end. But instead of reducing saving as in India, state policy became the dominant impact pushing saving up. The decline in fertility too would add to family saving as with other developing countries.[21] The saving ratio has a negative relationship with fertility.

The United States results appear more like those of India or Latin America in Table 2 with respect to the positive coefficient for age dependency and the saving ratio (age dependency is falling over the sample period). The US is unique in three respects over the estimation period. First, immigration restrictions were relaxed in 1965 (restrictions applied from WW1 to 1965). Arrivals in the US, particularly from the south, are young and mainly low income. This is the opposite of Japan where immigration is absent and Europe where it is limited. Emerging countries are mainly suppliers of immigrants. Low-saving young-cohort arrivals delay the move to a dominating weight for the above-64 age cohort while always adding to the high-saving 45-64 cohort. Second, the US sits far behind Europe and Japan in financial support for children so saving is more likely to be negatively related to fertility. Third, the US has had an unusually high fertility rate compared to other advanced countries, also delaying the full onset of the US becoming a late transition economy like Japan.

Table 2 Saving/GDP ratios and Demographic Trends

DEPENDENT VARIABLE: (National Saving)/GDP						
	USA	**Japan**	**Eur. Union**	**China**	**India**	**Latin Am.**
Constant	-0.0315	0.2819	0.3128	0.4528	0.4238	0.1164
[t-value)	[-1.11]	[8.35]	[5.81]	[9.07]	[9.49]	[4.83]
Age Dep. Ratio	0.0054	-0.0039	-0.0024	-0.0005	0.0019	0.0026
[t-value)	[7.02]	[-8.90]	[-1.62]	[-0.45]	[1.59]	[3.75]
Fertility	-0.0278	0.1364	0.0454	-0.0201	-0.0857	-0.0250
[t-value)	[-3.12]	[11.36]	[2.44]	[-2.38]	[-8.99]	[-3.40]
China 2001-19 Dummy				0.0582		
				[2.76]		
Standard Error	0.0173	0.0201	0.0178	0.0439	0.0322	0.0168

Source: Author calculations. China includes a dummy variable equal to 1 from 2001 to 2019.

National saving as a share of world GDP for selected countries is shown in the top panel of Chart 16, and age dependency ratios (persons older than 64 years and younger than 15 as a share of working age population) are shown in the bottom panel. Projections to 2050 are

[21] Absence of social security support for having children would make the fertility impact more important, since there is no gain or loss of income from having children.

also shown.[22] Fertility, having fallen heavily in earlier years (especially in China), is flattening out in most places for the period ahead as shown in Chart 17.

World Bank age dependency and fertility projections, combined with assumptions about the slow speed of China's opening-up, are consistent with the saving glut levelling out globally and beginning a modest decline (Chart 16). The main features are that the Chinese national saving share peaks and declines modestly. This assumes China slowly phases out its regulated high saving strategy (by 2040).[23] European saving also continues a firm downward trend, while that for the US rises.

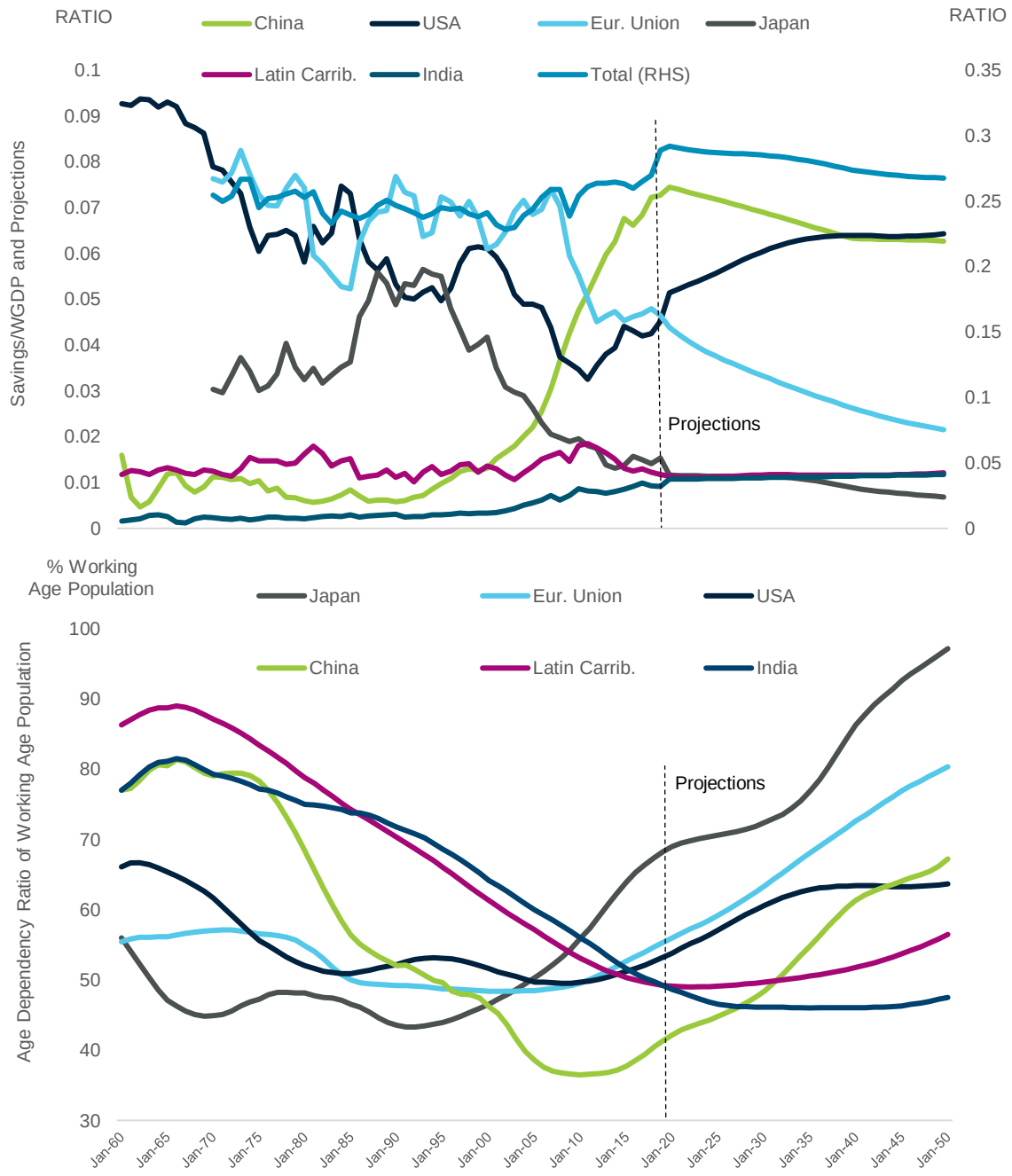
US fertility peaked in 2008 at 2.1 children per woman, above the replacement rate (and above that for Europe, Japan and China). This was essentially an echo of the US baby boom generation (having their own children). Fertility falls to 1.75 in the projection period (a positive for saving). Saving rises as younger cohorts move into that part of the working age population (45-64) that is high saving — before becoming late stage with old people dominating.

The rise in US saving, when combined with a small rise in India and Latin America and stability in other parts of the world is not enough to offset fully the decline in Europe, China and the ageing Asian Tigers (not shown). Total world saving levels out and declines moderately, suggesting that periods of further downward pressure on global real rates is less likely in the long run, once recent short-term cyclical pressures abate.

The highest probability, therefore, is that global saving as a share of world GDP declines moderately over the next 40 years, in the order of around 2.5 per cent of world GDP, while US national saving rises moderately (by 5.25 per cent of US GDP and 1.25 per cent of WGDP). A 40 per cent probability was given to this case in Chapter 2.

[22] The World Bank demographic projections used in this study come to an end in 2050.
[23] The Dummy variable moves slowly to zero by 2040.

Chart 16 Age Dependency Ratios and Saving, Illustrative Projections

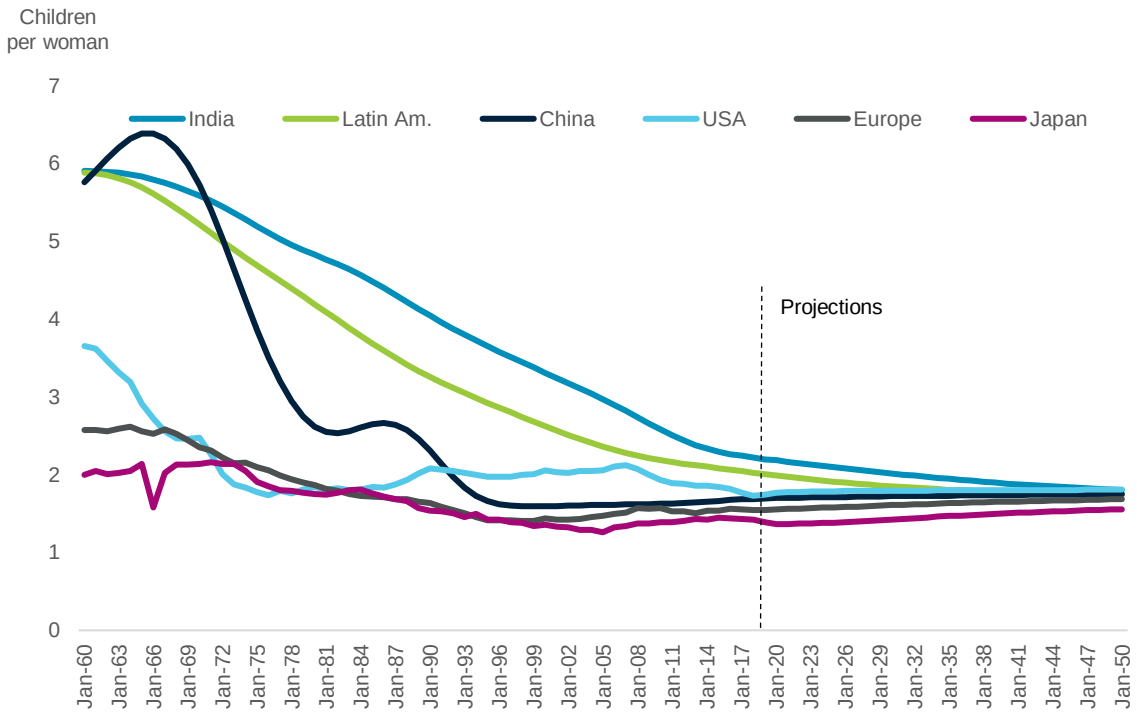


Source: World Bank, author calculations. The age-dependency ratio is persons over 64 years and under 15 years, divided by working age population. Saving refers to Gross National Saving, expressed as a share of World GDP (WGDP). Dynamic Asia: Malaysia, Indonesia, Thailand, Korea, Taiwan, Singapore, Hong Kong.

The lowest probability of 15 per cent is accorded to the case of foreign and domestic saving staying where they are in the face of demographic ageing trends. The other two cases lie between these probabilities. One has foreign saving continuing to rise but associated with falling US domestic saving, as was the case in the build up to the global financial crisis (a 20

per cent case).[24] The other has both US domestic and foreign saving falling moderately (a 25 per cent case). While other combinations are possible, they are considered less likely and are not considered.[25]

Chart 17 Trends in Global Fertility



Source: World Bank.

Global Debt Levels and Growth

Debt levels were considered in Chapter 1 as one of the possible causes of secular stagnation and low real rates. Chart 18 shows government, household, and corporate debt for major parts of the world economy. Excessive debt, especially associated with over capitalisation of countries, would be associated with weaker growth, lower real rates and less demand for energy and resources.

In terms of overall debt, the US does not look alarming, and its large corporate debt markets have meant that bank credit has played a lesser role. This makes economies more resilient to crises because banking is interconnected with all economic sectors and the payments system. Europe has a similar overall debt level to the US, but a much larger exposure to the banking system. Bad debt problems of banks are still being dealt with in Europe.

[24] And recalling they are financing substitutes for each other after all.
[25] For example, a rise in both US and foreign saving in the US. As these sources of financing US investment are partly substitutes for each other, unpredictable policy at home and abroad would need to override demographics to achieve this. Possible, but less likely.

Europe also has structural issues to deal with, including cumbersome cross-country governance issues and the one-size-fits-all currency and central banking arrangements.[26] Monetary union without fiscal union will continue to see Europe under-perform trend growth in the United States, with the European Central Bank trying to compensate as best it can by pushing interest rates down. There is reason to believe secular stagnation pressures will persist in Europe for some time and real interest rates will likely be lower than in the more resilient US economy.

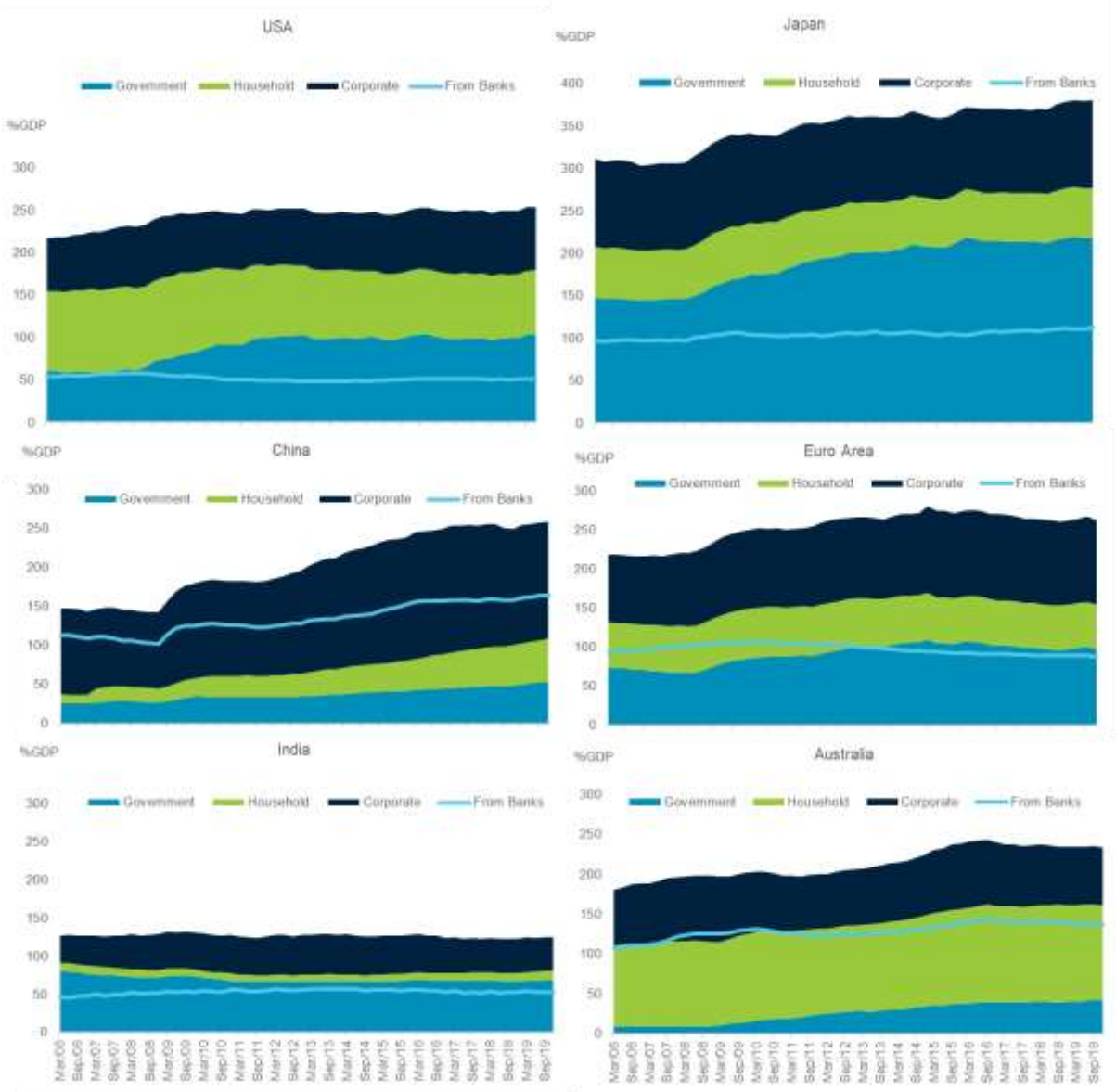
Japan and China are the greatest concern with respect to debt.

- Japan because the combined total level is so high at 381 per cent of GDP. Over the course of getting there, Japanese growth (which used to be in double digit territory) collapsed to very low levels during the lost decades.
- China because the trajectory of its combined debt has risen by around 100 per cent of GDP in the 10 years following the global financial crisis, to 259 per cent in 2019 (mainly via company debt). This is quite unprecedented. Indebtedness to banks (the gold dashed line) is 165 per cent of GDP. China's GDP per capita is barely 30 per cent of the USA, while its level of debt is already higher. The BRI strategy is also adding significantly to debts owed by foreign countries.

Chinese saving will likely follow that of Japan by declining, though less strongly if restrictive regulations and rules policies are persisted with for longer.

[26] See Blundell-Wignall (2012).

Chart 18 Government, Household and Corporate Debt as a Share of GDP



Source: BIS, author calculations.

India is sometimes thought of as a future China that may save and invest on a large scale which could maintain a '*saving glut*' and high commodity prices. After all, India's debt levels are very low and its demographics are more favourable.

Nevertheless, financial inclusion is poor in India and, as noted earlier, sharp increase in saving would require the adoption of the growth model used in the *'Japan-Asian Tigers-China'* approach. This seems unlikely with India's democracy, legal structure, and governance issues. It is unlikely that financial repression policies will change the saving projections based on income and demographic factors discussed earlier.

Economic Growth Issues for China

The study of US labour markets by Autor et al. (2016), focusing on details right down to local commuting areas where Chinese import penetration is greatest, is a convincing *tour de force*. This work shows that Chinese import penetration has cut into real wages, reduced the availability of lower value-added jobs for less skilled workers and increased the numbers of people looking for work but who lack the mobility to move to other communities. They find temporary positions with low job security even a decade after losing full-time work. These deflationary wage and job patterns have been matched in all advanced countries.[27] China is also a large contributor to the global '*saving glut*', a symptom of excess capacity through over capitalisation.

When countries do not consume enough of their own GDP, they must find export market outlets for their production.

A key issue for the US and Australia's long-run bond outlook is therefore the speed with which China's economic growth and saving levels decline. Demographic factors suggest a moderate decline. New government policies are unlikely to change that view very much. China will move only slowly towards greater trade and investment openness and consumption-led growth.

The Financial Repression Development Model

Most governments early in the process of economic development have used the 'financial repression' model, including OECD countries.[28] Financial repression involves maintaining foreign exchange and capital controls, fixing low interest rates on deposits (ceilings), restricting the provision of financial services other than banks, placing restrictions on the types of assets that banks can hold, and offering poor retirement support. This suppresses consumption and forces saving flows into the banking system, providing banks with low-cost funding for investment.[29]

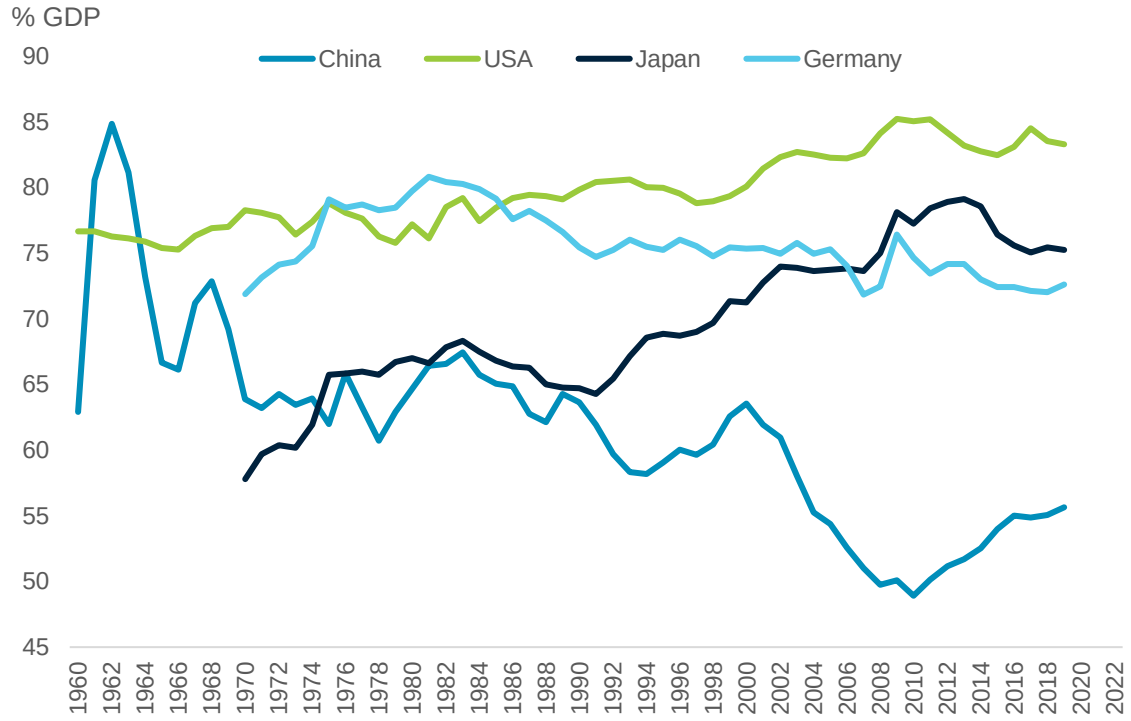
This tried-and-true development strategy was used in the West after the Great Depression. Japan also exploited it in the post-WWII period and the '*Asian Tigers'* followed suit. China has been the most recent adherent which, combined with the one-child policy and SOE reforms,[30] was a major driver of the rise in Chinese saving.

Chart 19 compares China's total consumption as a share of GDP to that of three advanced countries. The consumption share is 55 per cent of GDP, compared with the US, Japan and Germany in the 73 per cent to 83 per cent range.

[27] See Goos et al. (2014) and updates in Blundell-Wignall, Atkinson and Roulet (2018).
[28] McKinnon (1973).
[29] Saving for retirement, education, weddings etc requires high saving as returns on savings are too low. In recent years, maintaining this has required a Titanic struggle to control disintermediation through the shadow banking system from 2010, which was triggered by the government trying to reign in credit after the huge scale of investment and credit support provided to the economy following the 2008 crisis.
[30] Reforms in the 1980s and 1990s created redundant workers and greater uncertainty about retirement benefits.

A low domestic consumption share implies a dependence on exports, and a need to constrain imports (other than from commodity and energy suppliers). Implementing this has required quotas, regulations, and tariffs on imports, while keeping the exchange rate stable and consistent with the "*China Price*" needed to maintain market share in Western markets.[31] China moved quickly to become the world's largest exporter.

Chart 19 Comparisons of Consumption as a share of GDP



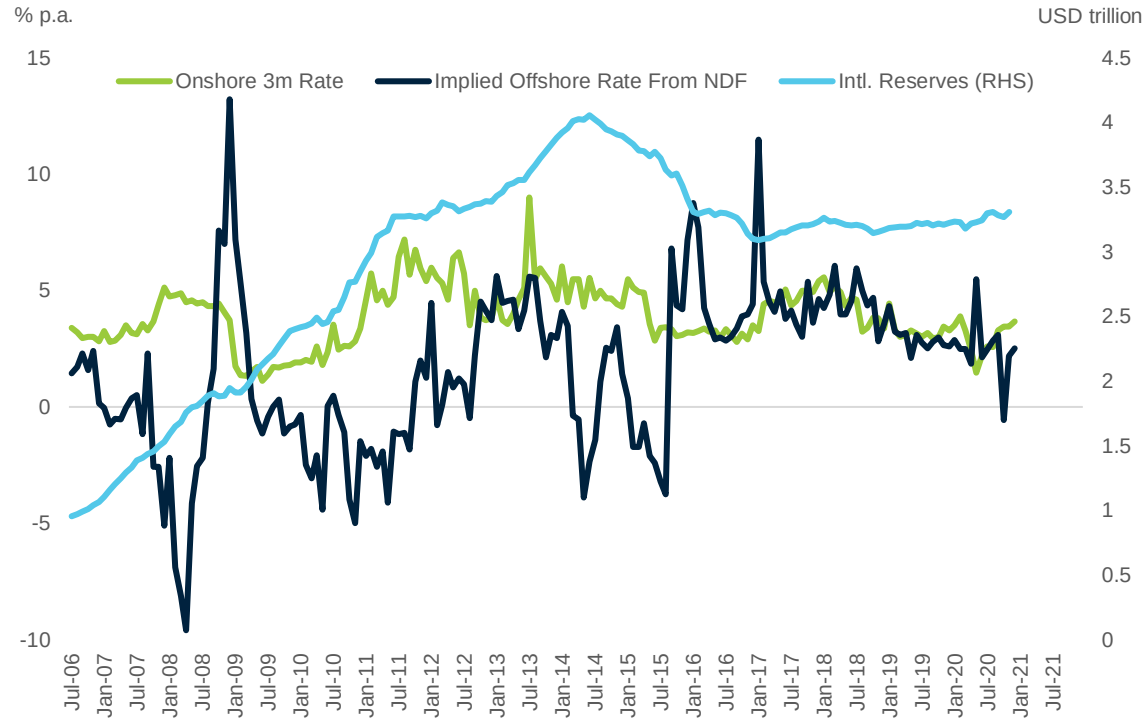
Source: Tomson Reuters, author calculations.

China Capital Controls

The evidence for China managing the capital account to promote export competitiveness is compelling. Chart 20 shows the onshore three-month interbank rate in the green line, and the interest rate implied by the non-deliverable forward (NDF) rate in the offshore market in the navy line.[32]

[31] See Blundell-Wignall et al. (2018) for a full description. Pricing to market share with variable mark-up pricing, and the market imperfections involved, is explained in Atkeson and Burstein (2008).
[32] The NDF market is an offshore market based in dollars that allows traders to mimic profit and loss outcomes that would arise were the yuan a fully convertible currency not subject to capital controls.

Chart 20 Non-Deliverable Forwards and International Reserves



Source: Thomson Reuters, author calculations.

Differences between these rates is a measure of the presence of effective capital controls. For most of the period, the implied rate sits well below the onshore interbank rate and, along with foreign exchange intervention (the rise in the light blue Reserves line in the chart), has acted to prevent more appreciation in the face of capital inflow pressure. [33] The China slowdown in 2015-16, led to net capital outflows, and downward pressure on the yuan. Intervention to support the yuan was used (falling reserves) and new capital controls on outflows were introduced — the implied offshore rate moves above the onshore rate in this period.[34]

In late 2015 a complex trading basket approach to managing the exchange rate was adopted, allowing depreciation against the dollar to achieve a basket index target.[35] By 2017, as the economy began to turn around, capital outflows abated, and a period of relative stability followed (onshore and offshore rates moved in line and less capital flow management was required). Outflows and downward pressure on the yuan resumed in mid-2018, capital controls on outflows were re-implemented, and the offshore implied rate rose.[36] Most recently in October 2020, yuan appreciation recommenced as economic

[33] The relationships are r=(F/s)(1+r$)-1, where 'r' is the onshore domestic 3-month rate, F is the forward exchange rate, 's' is the spot rate and r$ is the US 3-month rate. In the presence of capital controls this becomes i=(NDF/s)(1+r$)-1, where NDF is the non-deliverable forward rate, and 'i' is the implied domestic rate in the offshore NDF market. The implied 'i' can be very different from the onshore China 3-month rate 'r'.
[34] Including a 20 per cent reserve requirement on bank forward transaction, making it costly to trade.
[35] The China Foreign Exchange Trading System (CFETS) basket index. Something like a crawling basket peg.
[36] A 20 per cent reserve requirement on banks forward transactions was included.

recovery (as the COVID-19 crisis seemed to abate) got under way. Controls on outflows were dropped and measures to reduce appreciation led to a sharp drop in the implied offshore rate.[37]

A Slow Approach to Consumption-led Growth

China has frequently stated a desire to move to a consumption-led approach to growth, as in other large countries before it. But this requires deregulation and a willingness to see trade surpluses turn to deficits, as the exchange rate is permitted find its own level in response to free net capital inflow.

Thus far China is adopting a very partial and slow approach to opening-up its economy and moving towards consumption-led growth, as shown in Chart 19. In the November 2020 Plenary for the next Five-Year Plan, there is a new focus on 2035 (as opposed to 2049) for China to become a high-income country. The emphasis is on becoming an advanced technology country. There is nothing really new other than a reference to a new development pattern with: *"the domestic cycle as the main body and the domestic and international dual cycles mutually promoting each other*".[38] The domestic cycle appears to reflect more focus on domestic demand, but for domestic production (as opposed to imports for the West). The international cycle reinforcing this appears to be focused on the BRI.

This would be consistent with all that has come before.[39] Each time a new crisis emerges the favoured tool of policy-makers is to expand credit through state-owned banks, cut bank reserve requirements, and directly intervene in equity and foreign exchange markets (as opposed to speeding up market-based reforms).

Remaining with the strategy of state-directed goals funded by state-owned banks is likely to create headwinds for Chinese growth in the years ahead. It is assumed therefore that this strategy will be reduced, but in small steps. The 2035 objectives are a sign in this direction. The savings trend model used earlier for the projections of world saving specifically assumes that China will achieve these goals by 2040.

China Growth Headwinds

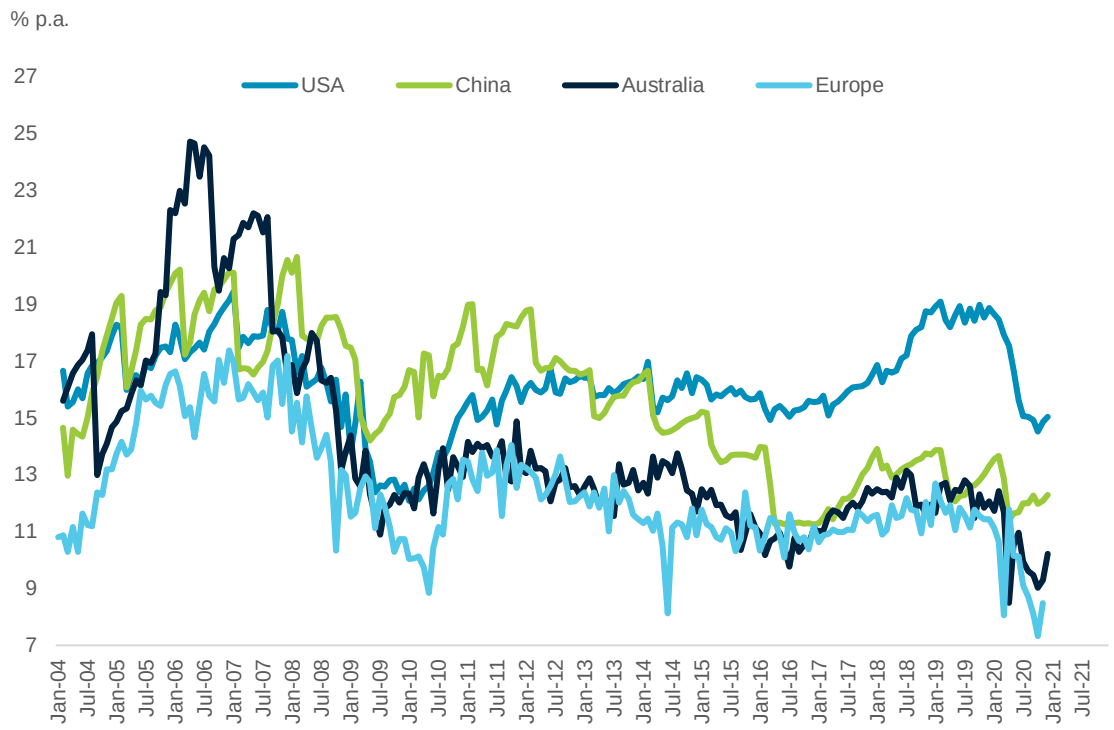
Structural headwinds to growth noted earlier include China's ageing population and the build-up in company debt owed mainly to state-owned banks. Another major headwind is the declining returns to the state-driven investment arising from over-capitalisation of the economy.

Excess investment financed by debt is the most common cause of financial crises, as Japan found out to its cost. The US market-based growth model has found ways to use global value chains to avoid heavy capital-for-labour substitution and falling corporate returns at home. Chart 21 shows that the US return on equity (ROE) has remained high (in complete

[37] The 20 per cent reserve requirement on forward rate transaction was dropped to zero.
[38] See http://www.xinhuanet.com/politics/2020-10/29/c_1126674147.htm .
[39] See OECD (2018).

contrast to interest rates on government debt) — even leaving aside the most recent rise in the ROE related to the Trump tax cut and the COVID-related retracement.[40]

Chart 21 ROEs in the USA, China, Australia and Europe



Source: Thomson Reuters, author calculations.

Heavy-investing China, on the other hand, has seen the listed sector ROE decline following its strong investment response to the 2008 crisis, though it has held up better in 2020 due to its handling of the COVID-19 crisis. The Australian and European ROEs have also declined, which is suggestive of structural issues and misallocated investment. Australia's excess investment in mining booms comes to mind, which is linked to China excess investment and its demand for resources.

In sum, the financial repression development model is likely to be maintained in China for some time yet, as it attempts to reconcile sometimes conflicting national objectives. Failure to open to the West, while favouring trade and investment with BRI countries (see below), will likely slow Chinese economic growth, as declining investment returns, ageing and the need to reduce the growth of bank credit begins to bite even if a financial crisis is avoided. Nevertheless, this risk is also present, since overcapitalisation of an economy based on high levels of debt is a pre-condition for banking crises as Japan discovered.

[40] The ROE strength in the United States is likely due to the productivity of IT producing and IT using sectors, as pointed out in Gordon (2012) and Jorgenson et al. (2014) and use of global value chains.

The Japan Lessons for Future Chinese Growth

Japan's development model was very different to the quicker move to a more laissez faire approach in Western countries, where market discipline punishes poor decisions. Its early 'miracle' growth became a model for the '*Asian Tigers'* and was also thoroughly studied by China.[41] The state played a key role in Japan, with the Fiscal Investment and Loan Program (FILP). State-owned development banks (the 'main bank system') were closely linked to companies; and financial repression measures were used to boost saving and lock it into Japanese investment.

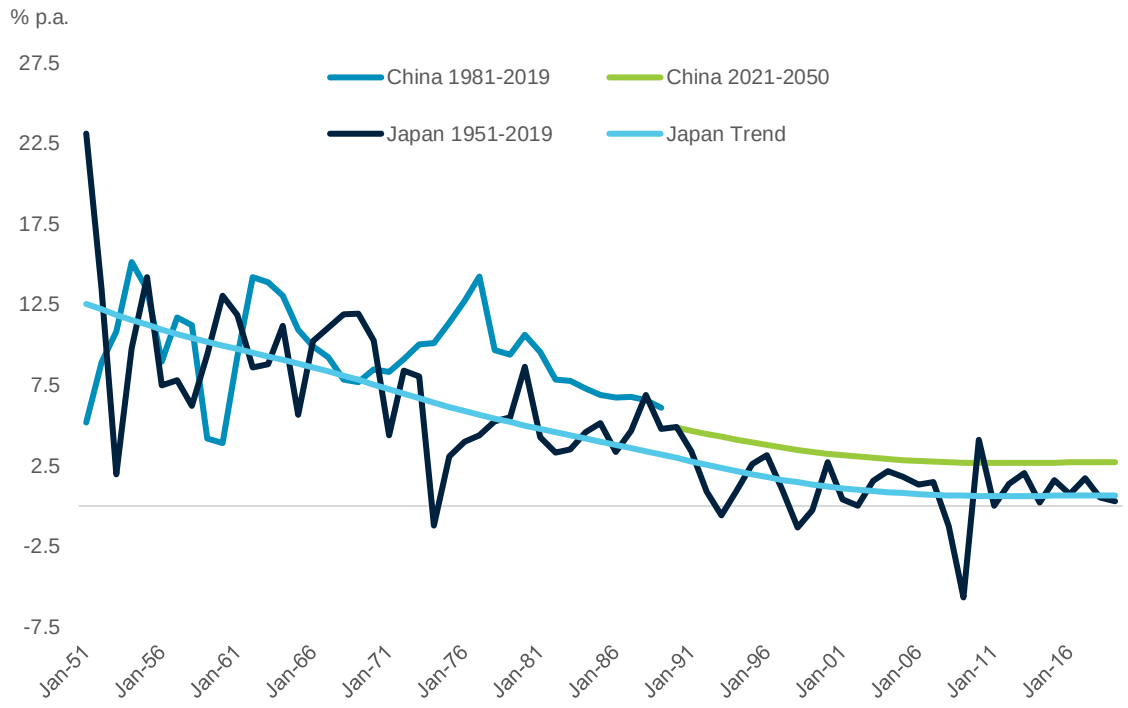
Capital controls were used to engineer a lower exchange rate for export success.[42] Saving was rising in Japan to 1995 to support this investment. Subsequently, banking crises, the 'lost decades' fiscal deficits, the building up of debt, and rising age-dependency collapsed economic growth and reversed the savings trend.

Japan's debt levels now sit at 381 per cent of GDP. China's debt is rising at a faster pace than was the case in Japan. It will need to stop well before it catches up to Japan, and this need for constraints will slow economic growth.

Chart 22 offers a highly speculative picture for China's growth to 2050 (the green line), based on what happened to Japan. Both countries used the financial repression development model, and China faces similar ageing and debt issues. It is assumed for the chart that China will succeed better than Japan, having learned some of the lessons to avoid a major banking crisis. A plausible picture is that Chinese trend growth might slow to 2.7 per cent by 2050, if a major banking crisis can be avoided. This cannot be ruled out however, and a downside case might resemble more closely the picture for Japan.

[41] See Johnson (1982); Stiglitz and Yusuf (2001).
[42] See Fukao (1990).

Chart 22 Japan-Based Speculation on Chinese Growth for the Next 30 Years



Source: Thomson Reuters, author calculations. The way to read the chart is to see China's growth today aligned with that of Japan in 1991, just before the financial crises were to begin. The end point for China becomes 2051.

Outcomes anything like the Japan slowing raise concerns for Australia's future growth strategy. This analysis supports the idea that capital/labour substitution in Australia in the period ahead (feeding into the potential growth calculation in Chapter 2) will not repeat the super-cycle investment boom. It also suggests a downside case to Australia's terms-of-trade (Chapter 2) is plausible.

Implications of the Belt and Road (BRI) Initiative for Australia

The BRI compounds the problem of the potential slowing of Chinese growth for Australia. The BRI involves building connectivity through infrastructure investment to ensure China can diversify and secure its sources of supply for resources, energy and food. The BRI consists mainly of non-aligned countries. There are six main economic corridors.

- New Eurasia Land Bridge: involving rail to Europe via Kazakhstan, Russia, Belarus, and Poland. Within Jiangsu and Xinjiang are most linked with this corridor.
- China, Mongolia Russia Economic Corridor: including rail links and the steppe road — this will link with the Eurasia Land Bridge.
- China, Central Asia, West Asia Economic Corridor: linking to Kazakhstan, Kyrgyztan, Tajikistan, Uzbekistan, Turkmenistan, Iran, and Turkey.
- China Indochina Peninsula Economic Corridor: Vietnam, Thailand, Laos, Cambodia, Myanmar, and Malaysia. Yunnan and Guangxi are the most linked provinces.
- China Pakistan Economic Corridor: linking to Xinjiang Province. This important project connects Kashgar city (free economic zone) in landlocked Xinjiang with the

Pakistan port of Gwadar, a deep-water port used for commercial and military purposes.
- China, Bangladesh, India, Myanmar Economic Corridor: This is likely to move more slowly due to mistrust over security issues between India and China.

The main goals of the BRI

The main goals of the BRI are:

- To shift excess capacity in low-technology industries which cause air pollution (steel and energy), away from Beijing and towards the poorer Western Provinces, Mongolia, and other parts of the 'Silk Road'.
- To move to higher-value-added production, with China at the centre of a '*Digital Belt and Road'*. This is seen to require a rapid transfer technology from advanced countries, including inter alia via mergers and acquisitions and by joint ventures where patents can be understood and absorbed quickly.
- To have Chinese technology used as the default technology in BRI countries, to cement economic interdependence for the future.
- To create trading and investment zones with BRI countries that adhere to the Bandung Principles of non-alignment and non-interference in domestic economic and political affairs.
- To deepen cultural exchanges and cement the strategy via scholarship programs for BRI students to study in China; the hosting of business fairs; and investing in the spread of Confucius Institute networks.

The strategy isn't new. President Xi's BRI announcement and subsequent speeches has simply brought it more into the open:

"We should promote land, maritime, air and cyberspace connectivity, concentrate our efforts on key passageways, cities and projects and connect networks of highways, railways and seaports. The goal of building six major economic corridors under the Belt and Road Initiative has been set, and we should endeavour to meet it".

"We will actively engage in negotiations with countries and regions along the routes of the Belt and Road Initiative on the building of free trade areas".

"We will strengthen international co-operation on energy and resources and production chains, and increase local processing and conversion."

Table 3 shows where China builds connectivity infrastructure (roads, railroad, shipping ports and energy grids) and where it invests in companies for technology transfer. The deals included here are only large ones (above USD100m) — so the figures are an underestimate of the total due to the vast number of smaller deals. For construction, most of the investment allocation is to BRI resource suppliers, with a preference for BRI countries (USD470.6bn of the total of USD849.1bn). There is a clear preference for Western countries when it comes to buying higher technology companies (USD931.4bn of the total of USD1,213.2bn).

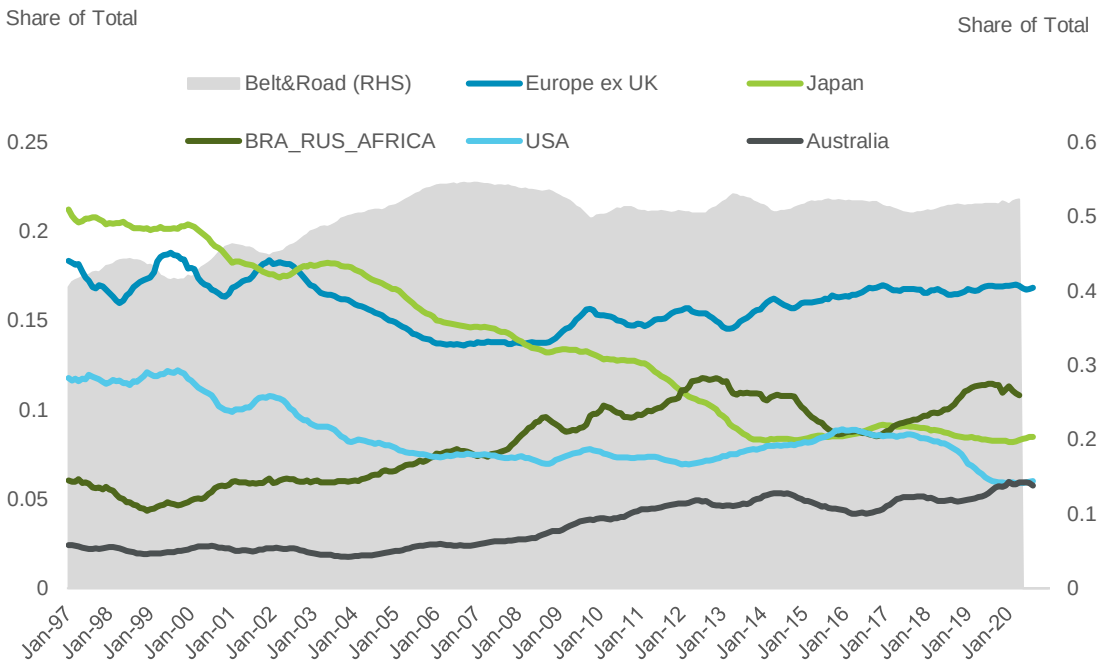
Table 3 Building Infrastructure vs Buying Companies, 2005 to 2020(H1)

	Construction Contracts ($m)	Investment in Companies ($)
BRI	470,580	281,740
MENA (ex-BRI)	69,530	24,430
Sub-Saharan Africa (ex BRI)	90,950	56,710
South America (ex BRI)	39,480	88,870
United States	4,310	182,550
Europe (ex-BRI)	26,640	306,420
East Asia (ex-BRI)	48,900	51,770
West Asia (ex-BRI)	76,650	61,940
Australia	17,970	98,010
Other non-BRI	4,060	60,740
TOTAL	**849,070**	**1,213,180**

Source: AEI, author calculations. These deals only include those of $100m or higher.

Diversifying sources of supply for resources and energy while favouring BRI countries is already evident in China's import data shown in Chart 23. Japan and the US have been the biggest losers in the share of imports.

Chart 23: China Import Shares Favour the BRI Group



Source: Thomson Reuters, author calculations.

Australia has been protected to date, due mainly to iron ore and metallurgical coal. The tailings dam collapse in Brazil in January 2019 and poor COVID-19 management has delayed the diversification in iron ore supply from that country. But Brazil will come back fully into production and mine development is proceeding in Africa. China, Brazil and a number of African countries are becoming more competitive with Australia in transporting bulk commodities. An illustrative example: 'Chinamax' vessels (400k tonnage) and deep-water port construction to support them are under way in China and the new supplier countries. The dark green line in Chart 23 shows the progress being made by these competitors.

Conclusion on the BRI

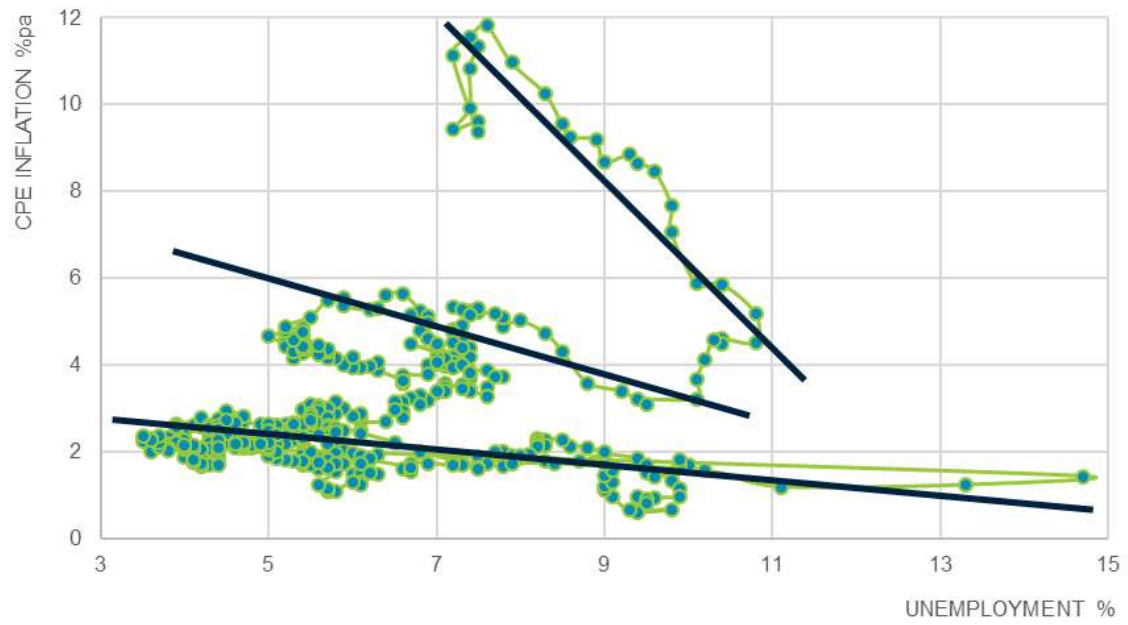
There is evidence that the BRI is already getting into difficulty for the same reasons as in China itself: overcapitalisation in infrastructure financed by excessive debt. In 2020 the latest data for the above table on investments shows a sharp slowing. Client countries are having trouble servicing debts, which has been exacerbated by COVID-19. But even if this vast connectivity infrastructure project being taken to the world is in difficulty for these reasons, it can still impact Australian mining through greater demand-side risk. That is, the risk of a financial crisis in China would be higher and the trajectory for its growth lower.

Inflation and Monetary Policy

The risk of asset and goods price inflation due to the extreme stance of monetary policy across most Western countries is always present and could lead to short-run fluctuations in

nominal and real interest rates. For the moment, the globalisation of supply chains and the emergence of China as the factory for the world has led to excess supply and downward pressure on prices (other than commodity prices). There is a significant output gap globally, and this has resulted in a flattening of Phillips Curve considered at the national level, as shown in Chart 24 for the United States.

Chart 24 Globalisation and the Global Phillips Curve Effect on the US



Source Thomson Reuters, author calculations.

In the chart, the Phillips Curve trade-off has been on a journey from a steeper more vertical curve discussed by Milton Friedman in the 1980s, to a trade-off today which is flat. Since 2000 US inflation has remained in a 1 per cent-3 per cent range, while the unemployment rate has shifted between 3 per cent and 15 per cent, without much impact on inflation. The Phillips Curve has become global.

The '*China shock'* has been important in this shift. Heavy import penetration leading to deteriorating employment conditions for less educated workers in all advanced countries and falling real wages keep inflation low and causes inequality to rise.

Monetary policy has tried to push inflation up at the national level but has had little lasting impact in the current environment. During the 2008 and (subsequent) Euro crises, monetary policy was the outcome of liquidity support on a massive scale. But subsequently it has developed into a situation where central banks have essentially 'nationalised' the interbank markets around the world. There seems to be a fear that pulling back on this huge liquidity support now would hurt financial markets and the real economy at a time of stress for other reasons.

This lock-in effect may be unavoidable policy for now and is unlikely to cause inflation immediately with current global supply chains and excess capacity. However, some combination of the following four ingredients would lead to a future rise in goods price inflation:

- A peak in global saving and a reversal consistent with dissaving in late demographic transition economies. A global shift towards more consumption and a recalibration of global supply chains and current account imbalances.
- A bifurcation in world trade between OECD and the BRI group countries (supply becomes more constrained).
- A continuation of easy policy for too long leading to asset price inflation and wealth effects.
- Central bank financing of large fiscal expansions, which would transform liquidity locked up in the interbank system to money in the hands of households and companies who would spend it.

Over the 40-year horizon of this outlook, all these elements are possible. The main one, a peak in global saving and a partial reversal, is accepted as likely in this report. Interest rate will move up due to underlying saving-investment trends and inflation pressure will be reduced as central banks move policy rates in line.

An important near-term risk is that monetary policy will lead to asset price inflation and excess leverage, which are important contributions to financial crises. It has been argued throughout this report that monetary policy should provide a nominal anchor for the economy but in the long run it needs to keep real rates as close as possible to those warranted by underlying saving and investment fundamentals. Asset inflation and leverage risks are elevated right now, and some questionable comfort is present in most central banks because inflation is low and withdrawing support would hurt fragile growth and weak employment.

The size and timing and size of asset price distortions and the emergence of actual inflation are difficult to predict. This report looks past the current COVID-19 crisis and related policy, a temporary situation, and focusses on real bond rates in the long run when monetary policy should be neutral, and all rates move higher.

Conclusion

It is important not to place too much weight on very low real rates in recent years when thinking about rates over very long horizons. Chapter 3 has discussed issues and risks to the long-term global outlook affecting real interest rates for the US and Australia and their bilateral real exchange rate. This discussion has helped to explain the weightings for the average scenarios resulting in rising real rates over the long run, (to 1.85 per cent for the US and 2.1 per cent for Australia). The discussion of global trends in this chapter is consistent with these higher-rate outcomes as the saving glut levels out and begins moderately to decline.

Monetary policy will also lift interest rates to offset inflation pressure as global excess capacity declines. This occurs as policy must keep rates consistent with the underlying real factors.

China and other BRI country's resource demand has been the main influence on the commodity price cycle affecting Australia. Chinese demand is likely to weaken going forward. The BRI will either diversify China's sources of supply or contribute to financial problems that slow growth. This view is consistent with the long-term flat-to-down range for the real exchange rate in Chapter 2.

4. Some Policy Issues for New South Wales and Australia

Chapter Highlights

Australian productivity growth has under-performed the high-productivity level US economy. NSW has under-performed Australia. Both have also under-performed Sweden, a similar size to the NSW economy that also doesn't depend on mining. The Australian economy is excessively weighted to resources and finance. NSW is more dominated by finance than other parts of Australia.

Productivity growth in mining did much better in the 1980s and 1990s, when growth in the world economy was more synchronised and mining was less dependent on a single large export partner. This matters to NSW because the rest of Australia is its main trading partner. Mining productivity growth was volatile and negative in the 2000-2012 period, due to a succession of economic shocks. Mining is cyclical while mining investment requires long-term certainty. Australia cannot rely on mining for the next 40 years.

Finance is also based on soft foundations. Financial services are already a larger share of the economy than the US, which is a global financial centre. Household debt and bank credit are larger than other OECD economies.

Productivity growth of sectors excluding mining and finance (on which a better future will depend) is also poor. Education has a low share of the economy, and larger sectors (e.g. professional, scientific and technical), have failed to deliver.

The evidence on what drives productivity in other successful countries is discussed and elements that should be included in a plan for NSW are presented. Such plans require government support for economic and social infrastructure, and that entails borrowing. The outlook for growth and the real interest rate scenarios from Chapter 2 are currently favourable to such a strategy looking out 40 years.

Nevertheless, governments will need to be careful not to give too much weight to current distorted low interest rates when setting the hurdle rates for individual projects. This is because real rates will rise over time.

Introduction

In previous chapters, the origins of the global saving glut, excess capacity, deflation and extreme low interest rates were outlined. Low interest rates and excessive borrowing in the West contributed to a global financial crisis in 2008, followed by the related European debt and banking crises two years later. China's strong investment and credit reflation response to the global crisis introduced its own cyclicality into growth, and its withdrawal resulted in an extreme slowing of the economy in 2015-2016.

The initial phase of the '*commodity super cycle'* led to great optimism for resources and mining in Australia. A boom in longer-horizon infrastructure investment not well suited to this cyclicality followed, risking over capitalisation and falling returns in the future. NSW is heavily exposed to the risk here since the rest of Australia is its main trading partner.

Australia also has an over-sized financial sector, and this is even more pronounced in NSW. This is a sector that should intermediate flows between savers and investors that do real things. It should not be thought of as a growth sector.

A sensible plan for Australia and NSW would look to reduce dependence on these soft foundations for growth in the period ahead while encouraging an environment supportive of digitalisation and industries serving global markets with Australian value added in goods and services — as other smaller economies have managed to do. The mining and finance focus may have delayed policies supportive of other sectors.

A long-run economic plan to achieve such an outcome will require government support for investment, with the state and federal governments working together. This does not mean government overreach in picking and running businesses. Rather, it is about an economic and market environment that provides the right physical and social infrastructure needed to move towards higher-value-added activities. Caution will be required with respect to future borrowing costs and the choice of discount rate for choosing projects.

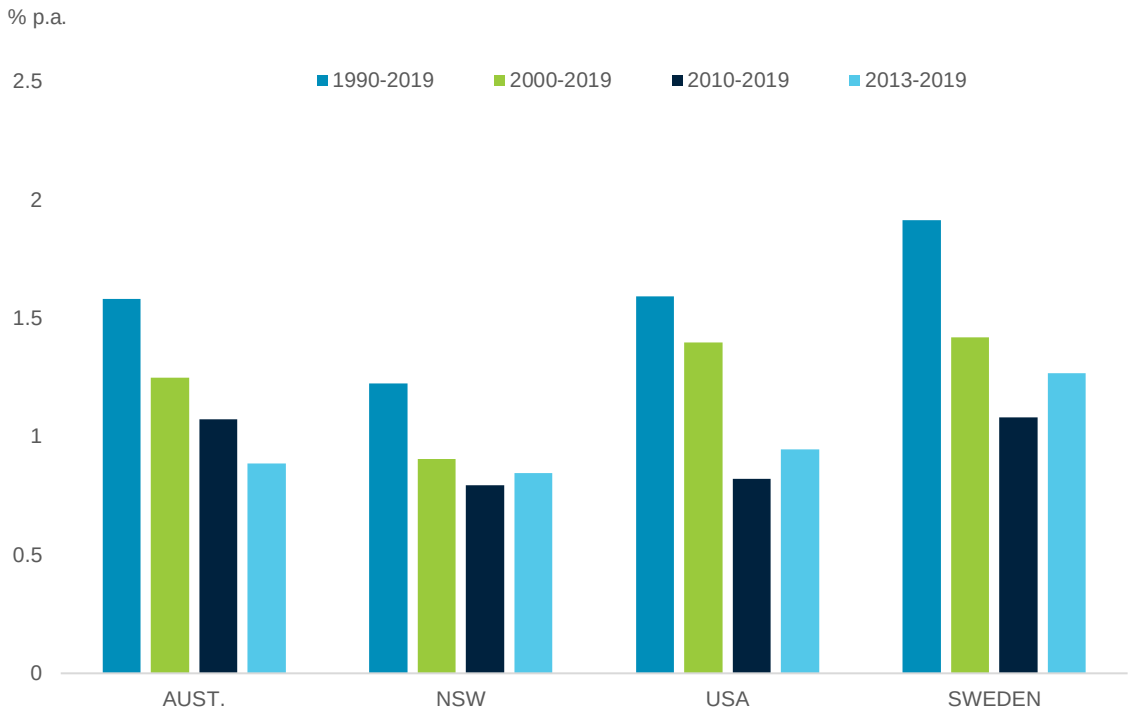
This final chapter looks briefly at three issues: (a) the poor performance of Australia and NSW in compared to other countries, particularly when the two at risk sectors are removed; (b) what elements of an economic plan have the best chances of success; and (c) how the outlook for interest rates affect the ability of NSW to support such a plan.

The Poor Performance of Australia and NSW Productivity Growth

Chart 25 compares Australia and NSW productivity growth with that of the USA and Sweden for selected sub-periods from 1990-2019.[43]

[43] 2020 is excluded due to COVID-19 volatility distortion.

Chart 25 Australia's Productivity Compared to the US, The UK and Sweden



Source: Thomson Reuters, ABS, author calculations. The figures relate to GDP and hours (employment multiplied by hours per worker).

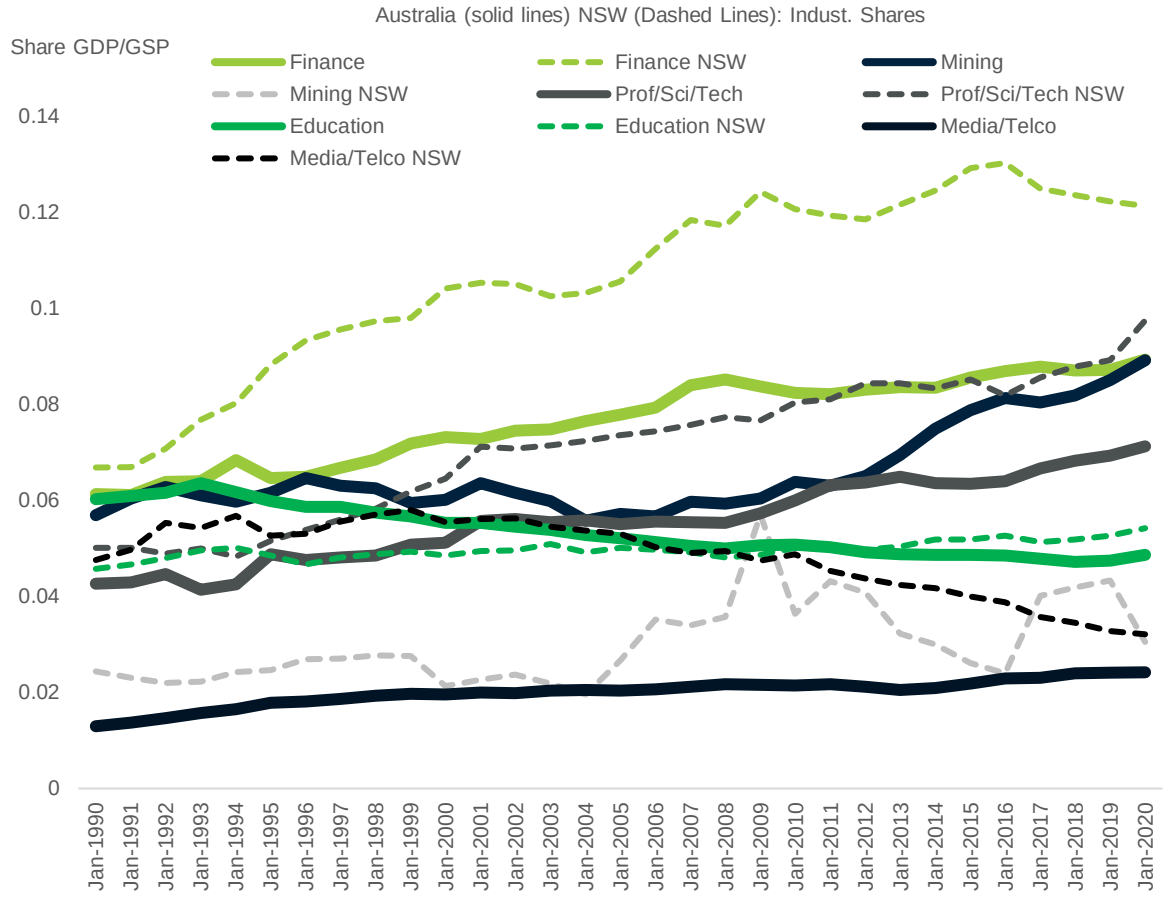
The USA has the highest level of productivity in the world, where it becomes increasingly difficult to maintain high growth rates, yet Australia and NSW from lower levels did not manage to keep up. For the full period 1990-2019 US productivity grew at 1.6 per cent, and at 1.4 per cent for the sub period since 2000. Sweden is chosen for comparison because it is a similar size to NSW, has little in the way of resources, and yet has one of the best productivity performances in the OECD. Swedish productivity grew at 1.9 per cent for the full period and 1.4 per cent since 2000. Comparable data for Australia are 1.6 per cent and 1.25 per cent, under-performing significantly in the 2000-2019 period. The rebound in Swedish productivity since 2013 has been amongst the most impressive of any country in the OECD. Australia, on the other hand, continued to deteriorate in the two more recent periods (1.1 per cent and 0.9 per cent).

NSW has under-performed Australia's poor performance: for 1990-2019 1.22 per cent pa and since 2000 at 0.9 per cent pa. There has been little evidence of a rebound in the more recent years.

Chart 26 shows a comparison of industry shares for NSW versus Australia for six sectors where changes in trend have been pronounced.[44] Australia is shown by the solid lines and NSW by dashed lines (coordinated in colour).

[44] See also McMenamin and Maguire (2020) for a useful discussion of productivity in NSW.

Chart 26 A Comparison of NSW and Australia in Six Critical Sectors



Source: ABS, author calculations.

Manufacturing (not shown) collapsed from 12 per cent of the economy in 1990 to 5.6 per cent by 2019, as Asia became the factory of the world. NSW had a steeper decline from a 14 per cent share of GSP in 1990. The gap was taken up mainly by the mining and finance sectors for Australia, while finance and professional/scientific/technical showed strong increases in NSW.

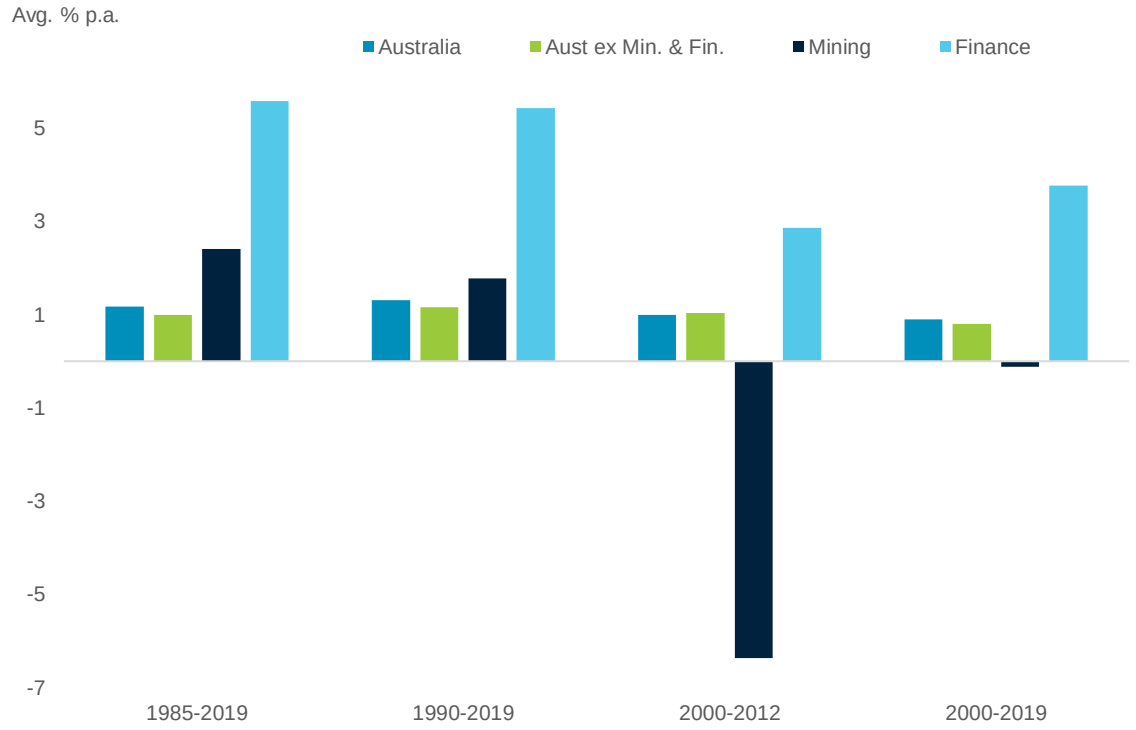
- Mining is notably smaller in NSW than for Australia. For the country (led by WA) the share of mining rose as the '*commodity super cycle'* got under way in the early 2000s.
- Finance exploded upwards after deregulation in the 1980s and the introduction of compulsory super. NSW had an even more dominant increase from 6.7 per cent in 1990 to 12.2 per cent of GSP in 2019.
- NSW also has a strong and rising share in the *Professional/Scientific and Technical sector* (to around 9.7 per cent by 2019) well ahead of that for the whole country.
- Education is often associated with fast growing innovative economies. Australia has a low and slightly declining share of GDP in this sector. NSW is doing better with a moderate rise in the share (crossing above Australia by 2010). It is interesting to note that spending on education in strong-productivity Sweden was 5.4 per cent in 1990

and rose in most years to be 7.6 per cent in 2019, compared to NSW at 5.4 per cent of GSP.

- The share of '*Media and Telecommunications'* is associated with 'new economy' growth in advanced economies. NSW has at a higher share that in the rest of Australia but it has been declining since 2000 (a 3.2 per cent share in 2020).

Chart 27 shows growth in output per worker for Australia, for mining, finance and for GDP excluding these sectors. From 1985 to 2019, this grew at 1.2 per cent pa, and mining and finance both had strong average productivity performance on this measure. When these sectors are excluded output per worker grew by only 1 per cent for this period. A similar picture presents for the period 1990 to 2019.

Chart 27 Contributions of Mining and Finance to Growth in Australia



Source: ABS, Thomson Reuters, ABS.

However, these longer-run averages disguise a fundamental problem for Australia. Mining and finance were extremely good in the 1980s and 1990s, but since 2000 there has been a significant deterioration.[45] The average level of productivity growth fell sharply for mining for the 2000-2012 period, with the average annual percent change in output per worker running at -6.4 per cent pa. That for finance also declined compared to other periods. For the first time productivity growth with and without these 2 sectors were in line with each other, but at low 1 per cent pa. The performance of the Australian economy without these two sectors

[45] See Connolly and Orsmond (2011) for a discussion of mining in this period.

once the 1980s and 1990s are dropped off is very mediocre. Yet it is this major part of the Australian economy upon which a future growth strategy would need to be based.

The collapse of mining productivity growth in the 2000-2012 period was due to extreme global demand volatility for which the long-term investments in mining capacity is not well suited. The decade began with the dotcom bust. The US sub-prime crisis followed in 2008 and two years later the European banking and government debt crisis emerged. China boosted investment and credit in 2009, but it wasn't of long enough duration to lift mining productivity into positive territory. It was forced to rein in credit, slowing the economy. When the years after 2012 are added (2000-2019 in the chart) mining improves, due to the strong reflation in China after the 2015-2016 growth scare. However, this is only sufficient to push the average back toward zero for the 19-year period.

The lesson for Australia from mining is that it is an unreliable foundation for growth. Investment with long lead times is best served by stable synchronised growth in the global economy with a strong focus of costs, like the 1990s. It is less well suited to a single large client which will continue to be subject to declining and volatile growth and diversification strategies in its supply chains. NSW has a high stake in this issue because Australia is its main trading partner. Being one third of the Australian economy, NSW will have to play a key role in lifting productivity, and this will require a strategy aligned with a similar resolve from the Federal government.

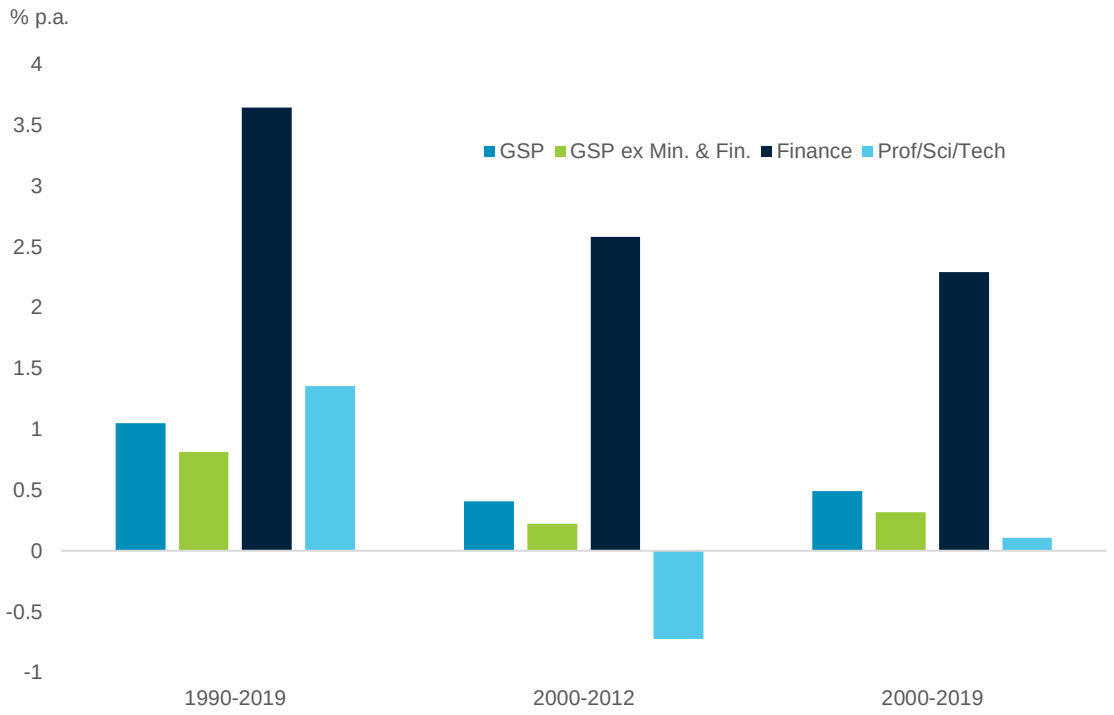
The size of the finance sector is equally problematic. The numbers for finance in Chart 27 do not look as bad at first glance, and finance for much of the period shown benefitted from deregulation in the 1980s and compulsory super. This may seem to be a positive for NSW. But there are two problems with this view. First, measuring the finance sector is thwart with difficulty. Financial services are not observable and are instead calculated as an implicit measure. Essentially an interest rate spread is combined with an activity indicator, like bank credit or asset aggregates. Monetary policy in the age of QE and super low interest rates affects interest received and interest paid directly. Second, however large the measurement problems, finance is likely to have limited potential as a future growth engine.

Australian household debt is 119.5 per cent of GDP, double that of Japan and Europe, and 68 per cent higher than the USA. Overall indebtedness to banks is 137 per cent of GDP, compared with 51 per cent for the USA, 113 per cent for Japan, and 89 per cent for the Euro Area. Banking is a mature industry in Australia. While one-off gains might be made through technology platform shifts, global tech companies with their broad eco systems of selling to consumers and building information about them are moving into payment systems and credit facilities. It is unclear as to how this will play out and what leakage there will be to global conglomerates over the next 40 years. Nor is it clear that constructing a huge industry based on compulsory super helps productivity growth.

NSW

Chart 28 shows the performance of NSW GSP per employee compared with NSW finance, the 'professional scientific and technical sector', and the economy without mining and finance.[46]

Chart 28 NSW GSP per Employee, With & Without Mining & Finance



Source: ABS, author calculations.

Over the period 1990-2019 GSP/employee grew at 1 per cent (1.3 per cent for Australia), a little below the hours-based measure in Chart 25 (hours per worker have fallen in NSW). Without mining and finance it is 0.72 per cent (1.15 per cent for Australia). The poor performance of NSW in the 2000-2013 period is certainly partly associated with a deterioration for mining in Australia due to its consequences for the whole country. But much of the problem sits within the ex-mining and finance sector, the very areas where it should be expected to be an Australia leader. NSW is one-third of Australia, and if it does not address the problem of low productivity growth it is hard to see how Australia can improve.

As an example of the issue, the 'professional, scientific and technical sector' output per worker growth is also shown in Chart 28. Over the full period 1990-2019 it grows at 1.4 per cent. Over the 2000-2013 period it is negative (-0.7 per cent) and for the 2000-2019 period it is slightly positive at 0.17 per cent.

[46] Mining is not shown as it is comparable to that for Australia over these periods.

NSW needs to improve the performance of sectors where it will need to compete globally. Countries like Sweden are not dependent on mining either, yet their companies manage to compete successfully in diversified offshore markets.

Elements of an Economic Plan for NSW

What Sort of Firms Succeed?

There is a myth often heard in Australia that the future of growth lies with small businesses that succeed and expand rapidly. This is not consistent with research in this area. OECD work suggests that firms at the global productivity frontier have very robust growth, regardless of what the aggregate GDP data says — countries like the US and Sweden simply have more of these firms. The most productive firms are: "*larger, more profitable, younger and more likely to patent and be part of a multinational group than other firms*".[47]

Consistently, other studies show that small firms over the years (most of which employ no one or only family members) have increased their share of employment, but not their share of output. Detailed analysis shows that the largest contributions to productivity are external restructuring (entry and exit) and internal learning and organisational change in larger firms.[48]

Micro based research presented in *The OECD Business and Finance Outlook 2016*, and in Blundell-Wignall, Atkinson and Roulet (2018) find that domestic demand is typically too small to support the scale economies needed for productivity growth in higher-value-added industries. Successful companies are those that can expand into foreign markets. Sweden, chosen for comparison in this study, has companies that have developed global brands with strong offshore revenue growth and outperforming stock prices than are not banks or resource companies.[49] The importance of these firms comes through in the above productivity numbers.

Small firms lack capital and resources to carry out meaningful R&D and to launch products that innovate based on this research. They need M&A activity and joint ventures to succeed. Fast growing firms are always characterised by high levels of R&D expenditure. But R&D is a huge cost activity. It requires participation with larger companies with barriers to the appropriation of their IP by others, and which have access to external finance — particularly equity finance (not banking) — essential for risk taking.

[47] Andrews et al. (2015).
[48] A useful survey is found in Nightingale et al. (2013).
[49] Swedish companies with these characteristics include, inter alia: Astra Zenica, Alfa Laval, Atlas Copco, Autoliv, Beijer, Boliden, Electrolux, Elekta, Fenix Outdoor, Millicom International Cellular, Nolato, Hexagon, H&M, Sandvik, Saab, Scania, Swedish Match, and more. All with strong offshore markets.

Elements of a Plan for NSW

A comprehensive economic plan to transition Australia away from excessive dependence on being the iron ore and coal supplier to the world, while relying on finance and construction at home, should be a major priority of current and future governments.

If Australia and NSW are to transition towards higher-value-added activities and greater self-sufficiency in industries essential to national security, it will require more emphasis on different forms of investment compared to the past. It will also require strong coordination between state and federal governments.

Support for investment does not mean Government overreach that arises with '*picking winners*' and the direct involvement of governments running businesses. Rather it is about an economic and market environment that provides the right physical and social infrastructure needed to move towards higher-value-added activities:

- More R&D encouraged by a supportive tax and social security framework. Blanket tax deductibility has a poor record. It is not specific to research activity, and firms can claim anything they care to label as '*research*' for the bottom line. In Sweden, governments focus more on specific 'content'. For example, by paying the social security/pension contributions made by firms for the staff engaged in specific commercial R&D activities.
- Education output is central to future productivity growth, yet Australia's education sector is a declining share of GDP. NSW is doing a little better, but well below successful countries like Sweden. Investing in schools and universities is important. Sweden has a large proportion of technical universities, and their graduates populate a high percentage of the top management of successful Swedish firms. [50]
- Retraining facilities that provide new skills for workers displaced by globalisation and the entry and exit of new and old domestic firms. These need to provide serious content courses supported by the state. This process also needs to envisage financial support for persons transitioning between jobs, including childcare facilities for such persons. Sweden is very strong in this area.[51]
- Investment in better hospitals, pharmaceutical supply, healthcare workers and testing facilities. The COVID-19 pandemic has underlined the need for this as well as company cooperation and networking with the healthcare sector. A healthy workforce is important to the continuity of production and the provision of essential services to the economy.
- Infrastructure to support digitalisation throughout the business and household sectors — which may involve production of devices and software and/or support for the diffusion and utilisation of such technologies.
- Investing to abate climate change, ensuring carbon-price certainty, and dissuading investments in what will certainly become stranded assets over the next 40 years — coal mining and coal-fired power stations for example.

[50] Even Sweden is not satisfied. Its high proportion of technical engineering universities is unique, but it faces a shortage of teachers in the school system in these areas.
[51] NSW might be encouraged to send more teams to Sweden to explore all of the elements on which their success is based.

- Reducing barriers to domestic and cross-border M&A (clarity on legal, environment and other regulatory issues to reduce time and costs).

There are many such ideas that need to be considered at the level of government going well beyond the remit of this report. Inevitably costs are involved, and this gives rise to the need for both project assessment and borrowing programs.[52]

NSW Fiscal and Debt Considerations

Current low real interest rates suggest that there has never been a more opportune time to borrow to support a plan for NSW and Australia over the long run. However, low rates also pose important risks:

- Governments may borrow now but face higher rolling costs in the future if maturity structures are misaligned.
- In project assessment poor-returning investments may be selected by using hurdle rates which are too low; '*zombie*' businesses emerge.

With that proviso in mind, the NSW government is in a reasonable position for borrowing to support a plan such as that set out above.

The 2020-21 NSW Budget

Following the COVID-19 crisis, and in line with other states, NSW has incurred budget deficits and the need for borrowing rising further in 2020-2021 and then reducing gradually to 2021-2024 (see Table 4). The table also shows a measure of the primary budget surplus, that net of interest payments.

[52] McKibbin and Triggs (2019) in a global analysis of productivity trends, point to the urgent need for flexibility reforms and R&D measures to move countries towards the technology frontier.

Table 4 NSW Budget Estimates and the Primary Surplus (Deficit)

F/YEAR	Net Lending ($m) Budget Surplus (negative means borrowing)	Int paid ($m)	Int recd ($m)	Balance Sheet Borrowing (Amt. Cost) ($m)	Primary Surplus ($m)
2019	-9280	1,812	491	37,656	-7959
2020	-22061	2,084	364	67,885	-20341
2021	-30819	2,549	302	98,174	-28572
2022	-21574	2,673	322	121,128	-19223
2023	-13601	2,869	337	140,259	-11069
2024	-10216	3,079	350	157,166	-7487

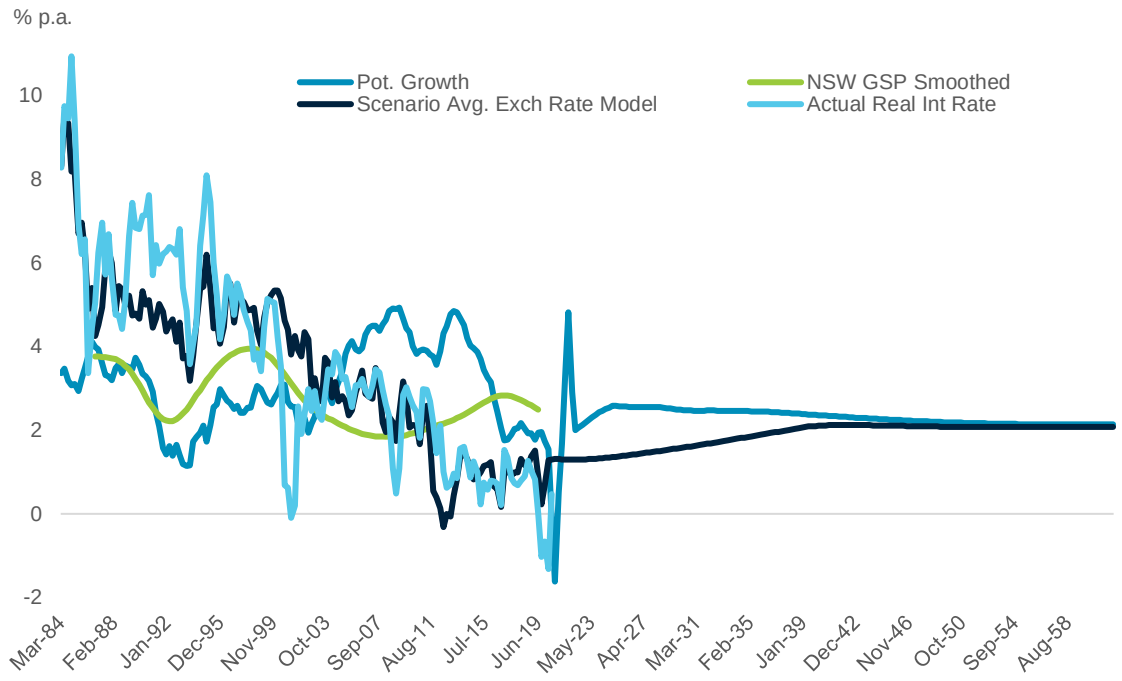
Source: https://www.budget.nsw.gov.au/budget-detail/nsw-budget-2020-21-open-data, and author calculations.

Chapter 2 estimates for potential growth and the equilibrium real interest rate for the next 40 years can be used to project scenarios for the stock of NSW borrowings as a share of GSP (the share of GSP reflecting a measure of affordability). The basic arithmetic is that the change in debt as a share of GSP in the current period is approximately equal to the primary deficit (negative surplus) as a share of GSP, plus the real interest rate minus the potential growth rate multiplied by debt as a share of GSP in the preceding period. The real interest rate versus the growth rate is therefore an important variable. If growth is above the interest rate then (other things given) the debt burden will fall, and vice versa.

This is good news for Australia and NSW, since current real interest rates are below potential growth as shown in Chart 29. Potential growth moves down slowly in line with population growth and more normal[53] capital-labour substitution (from 2.5 per cent to 2.1 per cent) while the equilibrium real rate rises from a lower level from (0.9 per cent towards 2.1 per cent). A smoothed calculation of NSW GSP growth is also shown in the chart. There appears to be no reason why NSW should not be able to lock immediately onto the potential growth estimate for Australia in the 'post-super-cycle era' that Australia now faces.

[53] Not the excess capitalisation of the Australian economy through the mining investment boom in the 2000s.

Chart 29 Projections of Potential Growth and Real Interest Rates for Chapter 2



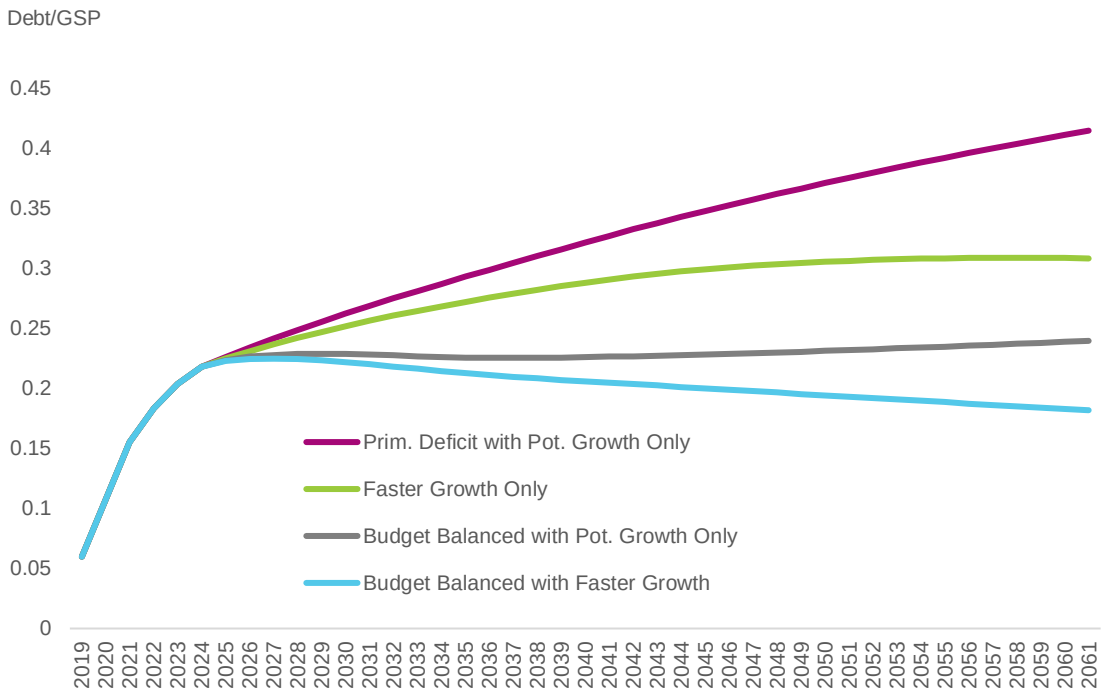
Source: Thomson Reuters and author calculations.

The gap between potential growth and the real interest rate is very beneficial for containing debt until around 2040.

Chart 30 shows four simple hypothetical scenarios — not forecasts — to illustrate some of the trade-offs involved.

- The purple line labelled "*Prim. Deficit with Pot. Growth Only*" assumes the unlikely case where NSW leaves the primary deficit (that net of interest) at the 2023-2024 level and allows the debt dynamics to take their course. The primary deficit would be too large for the growth/interest trade off (recalling that NSW pays a small premium to the Australian interest rate) if economic growth doesn't improve. Debt would continue to rise as a share of GSP.
- The light green line labelled "*Faster Growth Only*" assumes the government does no further work on cutting the dollar primary deficit after 2024 but carries out a suit of reforms and policies to push NSW growth to 3 per cent while *price-taking* the bond rate for Australia. This is a nice scenario for NSW because it takes the growth rate above the Australian bond rate plus the NSW premium. The primary deficit as a share of GSP gradually falls due to faster growth. Debt stabilises at 30 per cent of GSP. This is not a high number, and it is important to remember debt does not have to be repaid. It is replaced as it matures, which appears reasonable at the interest rates projected in this study.

Chart 30 Sensitivity analysis of NSW long-term Net Debt to GSP



Source: NSW Treasury for budget estimates, and author calculations.

- The grey line labelled "*Budget Balanced with Pot. Growth Only*" leaves potential growth where it is but cuts the dollar primary deficit to zero by 2028. This has the benefit of keeping debt as a share GSP at just over 20 per cent. However, there is a marginal creep upwards as the scenario moves towards 2061 due to the small interest premium assumed for NSW bonds.[54]
- Finally, the light blue line labelled "*Budget Balanced with Faster Growth*" assumes NSW policies that push the growth rate to 3 per cent and cut the primary surplus to zero by 2028. In this case, after its COVID-19 initial rise, the Debt/GSP ratio continually falls (back to its 2022 level by 2061).

Of course, there are an infinite number of other policy combinations that will lower the debt ratio more quickly by moving to budget surpluses. But this is wholly unnecessary and may cut against a program to transform productivity outlined earlier. In the above scenarios the two involving better potential growth are much more advantageous than the others.

The faster growth scenarios would presumably require the proportion of spending allocated to well-considered capital expenditure programs to be raised and that for current spending reduced. The well-managed starting point for NSW gives ample scope to move this way.

[54] Recall trend growth moves to 2.1 per cent in line with the real interest rate for Australia, but NSW pays a little more.

The Need for Caution on Low Borrowing Costs and Hurdle Rates

It is a great advantage for NSW that debt levels are relatively low. The need for physical and social infrastructure investment in NSW to improve potential growth is feasible and, given the poor productivity growth noted earlier, is necessary to improve performance in future growth areas. Investment consistent with such policies requires economic returns that outweigh the '*hurdle rate of return'*. Rising debt to support consumption or for poor-returning investments would be damaging for the future of NSW.

A long-run equilibrium real rate of 2.1 per cent for Australia and slightly higher for NSW should be the starting point for an appropriate '*hurdle rate'*. To these *safe asset* real yields must be added a premium related to uncertainty. There is uncertainty about investment projects that will inevitably involve private-public partnerships (PPP), and these require an allowance for project-specific risks. There is also uncertainty about the global scenarios and the weightings applied in Chapter 2 to arrive at the 2.1 per cent long-term real interest rate for the safe asset. The government bond rate could turn out higher. The weighted cost of capital combining these elements would need to be higher.[55]

The worst mistake that governments can make is to extrapolate the current extreme lows of real bond rate and allow weaker returning projects to slip through the selection processes.

[55] For example, the weighted cost of capital for projects receiving government support with equal debt and equity funding would need to be in excess of 4 per cent real. The safe asset estimate in this study is 2.1 per cent real. The current cost of equity for Australia is around 6.7 per cent real. A 50 per cent debt equity split, as an example, would imply a weighted cost of capital for Australia of 4.4 per cent real for PPP investments matching this structure.

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