Long-term Fiscal Projections: Reassessing Assumptions, Testing New Perspectives

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Abstract

Early in 2013, the New Zealand Treasury will publish the next long-term fiscal statement. The report will test fiscal sustainability over the next 40 years through a series of projections, capturing trends, risks and uncertainties flowing from population ageing and other drivers. It will also examine policy options to address sustainability, and their possible effects on living standards. The present paper lays out the modelling approach, the assumptions behind the projections, and the sensitivities around those assumptions. This is work under development and we are keen to test our approach and early results with a larger audience.

JEL CLASSIFICATION JEL classification codes:

H00 - Public economics

H50 - National government expenditures and related policies

J00 – Labour and demographic economics

KEYWORDS Key words: Public economics; government expenditure; labour economic; demographic economics

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1 Introduction

> "*The goal of forecasting is not to predict the future but to tell you what you need to know to take meaningful action in the present."* - Paul Saffo
>
> *"I don't try to describe the future. I try to prevent it."* - Ray Bradbury

For the past 15 years or so, many countries around the world have examined the implications of current spending and revenue programmes (pensions, health, education, personal and corporate taxes, and so on) on the future fiscal position, given the expected demographic changes, likely trends for economic growth, and other drivers. The outcomes of these projections show the potential future effects of policy choices made by governments of the past and present. To change the possible longer-term fiscal position will require current and future governments to make policy choices.

In New Zealand, the Treasury has produced long-term fiscal projections from the mid-1990s for one purpose or another. The Treasury has published "official" statements of the possible future fiscal position twice before, in 2006 and 2009, as required by the Public Finance Act (under the 2004 amendment). The 2006 statement attracted relatively little attention. The second, incorporating the effects of a domestic recession and the 2008 global financial crisis, and resulting in a more dire picture, produced a wider debate about what choices could be made to prevent the projected debt position (New Zealand Treasury, 2006, 2009).

Picking up lessons from the first two statements, and from the 2010 Tax Working Group process, the Treasury has embarked on a wider and more open public process to prepare the next statement this time. We have commissioned external experts to provide research on various policy settings and choices that could be made. Some are considering what could be learned from the past, both from programmes and policy-making processes that have had long-lasting results. Other important topics include fiscal sustainability, and approaches to intergenerational equity.

In addition to externally commissioned research, the Treasury has set up an expert panel to challenge our work and provide suggestions to improve our analysis. The panel will be chaired by Professor Bob Buckle from Victoria University of Wellington. A summary of the panel's deliberations will be made public after each of the four sessions between August

and November. This will be followed in early December by a public conference hosted jointly by the Treasury and Victoria University Chair of Public Finance. The conference will incorporate our work and that of the external experts. Publication of the next Long-term Fiscal Statement will follow in March 2013.

We have prepared a series of papers covering our early thinking and results for the 2012 NZAE Conference (including Bell, 2012; Buckle and Cruickshank, 2012). We a hope this work elicits a good discussion during the conference.

Part of our work is this paper, which re-assesses our modelling process and assumptions. The appendix contains a summary of our base assumptions along with alternatives to test the affects of changes to our assumptions in future work.

The paper is structured as follows. Section 2 explains at a high level what our model does and doesn't do, dual ways of presenting projections, and how we will reflect uncertainty. Section 3 discusses the base demographic projection assumptions. This is followed by Section 4 explaining the choices behind the economic assumptions. Section 5 examines how base tax assumptions were arrived at, while Section 6 lays out the assumptions behind our base spending projections for New Zealand Superannuation, welfare benefits, health and long-term care, education, and the rest. Section 7 deals with assumptions needed to frame fiscal sustainability such as the long-term debt ratio and how long to use current policy forecasts before moving to trend projections more based on historical averages. Section 8 concludes.

The thinking in this paper draws on the paper on fiscal sustainability (Buckle and Cruickshank, 2012) and is incorporated in the paper on our preliminary economic and fiscal projections (Bell, 2012).

2 Long-term Fiscal Model primer and approaches to projections

This section takes a high-level look at how the Treasury's spreadsheet-based Long-term Fiscal Model (LTFM) produces projections. Before embarking on that, we need to explain the language we use to describe two different approaches to looking at the future.

The term "forecast" is a best shot at predicting the result of the key interactions of the economy to produce a forecast of the business cycle over the near-term future. For example, a surge in exports lifts the demand for workers, driving down unemployment, and eventually wages and inflation rise, producing a monetary policy response to slow economic growth. We use the New Zealand Treasury Model (NZTM), a macro econometric model, with estimated coefficients to capture such behavioural linkages between variables, to do the Budget Update macro forecasts (going out five years).

A "projection," in contrast, involves relatively few interactions, few drivers, and relatively few assumptions; it is more likely to follow smooth trends rather than the ebbs and flows of the business cycle. It can be used to show the effects of a change and answer a question: "What if this assumption was higher or lower?" It is not an attempt to forecast the future in the way described above. It is a much more mechanical exercise. One view of the success of a projection is that it provokes a discussion leading to changes that avoids the projected outcome.

2.1.1 How the Long-term Fiscal Model works

The LTFM was developed in the mid-1990s to examine possible longer-term effects of current fiscal policy settings. Today, the general idea is still the same: take the medium-term economic and fiscal forecasts from the NZTM as a starting point and then grow out these economic projections for several decades beyond that. Couple this with fiscal projections, using the last year of the fiscal forecasts as the launch point for projections of taxes, spending on government services, transfers, and changes to assets and liabilities.

The long-term fiscal team is weighing up the pros and cons of at which point it is best to switch from the forecasting methodology to projections: One approach is to go directly from history to projections, another to go to projections after the next expected election, and a third to wait the traditional five years before moving to projections. This discussion will be taken up in Section 7.

The model therefore uses a high-level macro background to project the government's financial accounts - financial performance (flows of revenue, spending including on the costs of servicing the existing debt and on government investment, for the core crown and wider total crown), and the financial position (the balance sheet, assets and liabilities, including various measures of debt).

In more detail, the macroeconomic forecasts (GDP, employment, interest and exchange rates, government spending and revenue) are produced by NZTM. The macro modellers put in a set of assumptions describing the long-term trend behaviour of the NZ economy. The model then produces a quarterly track that describes a path from the end of actual outturns until it reaches the medium-term trend. The expenditure forecasts use estimates made by spending departments for the first year, based on budget tax and expenditure decisions, with total spending extended out by the operating allowances (unallocated new programme spending or tax changes) in the following years. Revenue forecasts are derived from the macroeconomic forecasts and some micro data from the Inland Revenue Department.

The economic projections (post-forecast) use a population projection and participation rate assumptions to project the labour force (of those employed or unemployed and actively seeking work). The labour force projection is then combined with assumptions about average hours worked and the growth of average output per hour worked to arrive at a projection of real GDP. This is coupled with an assumption about inflation to produce a projection of nominal GDP. If the gap between the forecast of real GDP growth and potential or trend growth has not closed by the end of the forecast period, the first few years of the projection period are used to close the gap.

Projections for taxes on wages (source deductions) allow fiscal drag to operate for about five years into the projection period. After that, this tax grows with nominal GDP. Corporate tax grows with GDP generally from the first projection year (although growth could be held back for a year or two if businesses are still working through accessible losses). All other taxes (GST, excises and so on) grow with GDP in the projection period.

Government spending on services ("G" in the standard macro identity) is grown using costs by population (weighted by age and gender for the major health groupings) or just age (education) or just GDP (for many of the other functional spending areas), estimates of wage growth, public sector productivity growth, and inflation.

As for the transfers, spending on New Zealand Superannuation is grown by the projected growth of the average wage net of taxation and the numbers of people 65 years and

older. The main social welfare transfers are grown by CPI inflation and the proportions of five-year age groups receiving each of the benefits (these remain fixed through the projection period). We assume that supplementary benefits are grown from the end of the forecast base by inflation and numbers of people 15 years and older.

Revenue and spending (on goods and services and on transfers) produce estimates of projected primary balances. In the first projection year, the balance reduces the previous year's debt (if it's a surplus) and the finance cost of the resulting debt is added to current spending. The balance for that year is then added to the previous year's debt, producing a projection for the debt path.

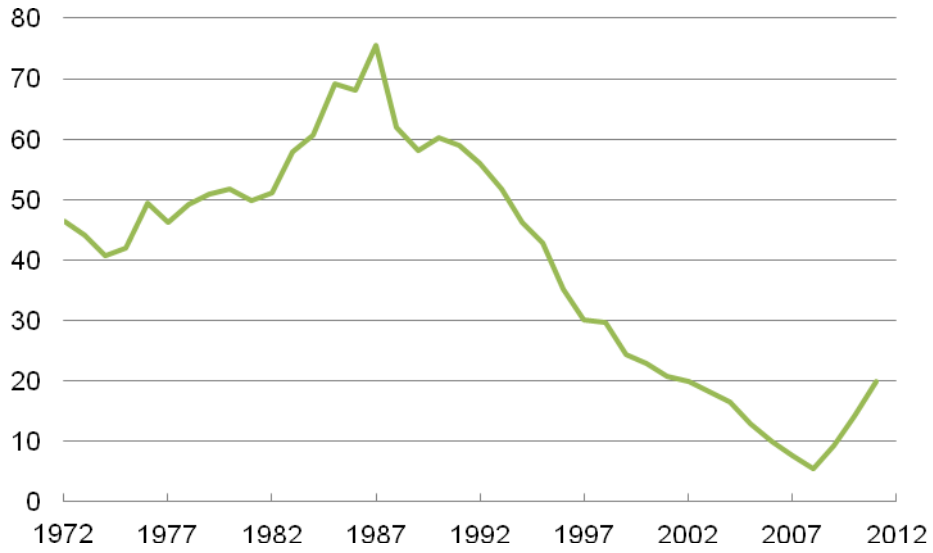
The new spending on capital is allocated to property, plant and equipment and then the stock is projected out using the growth of nominal GDP.

In summary, projections from the LTFM are not based on econometric modelling. Rather, they use plausible growth drivers, often drawing on current policy parameters or calibrations from history.

2.1.2 Two ways of presenting LTFM projections

For most of the period from the early 1990s to 2008, successive governments made adjustments to their initial budgetary decisions in the light of potential longer-term trends towards maintaining prudent debt levels, as formalised in the Fiscal Responsibility Act 1994 (and subsumed into the Public Finance Act in 2004). The result was that the ratio of debt to GDP fell through this period. So for nearly two decades, spending was generally constrained by governments keeping the debt ratio to "prudent" levels over the long term. What was "prudent" was announced in advance by successive governments.

Figure 1 – Core Crown net debt (% of GDP)



Source: The Treasury. Note this is IFRS-GAAP-consistent only from 1997 onwards.

In the first two reports on the long-term fiscal situation, growing fiscal pressures eventually produced a series of primary[1] deficits (it took several years in the 2006 report,

[1] A primary balance (surplus or deficit) is the government's fiscal balance (revenue less spending) excluding payments to finance debt and excluding interest income from financial assets.

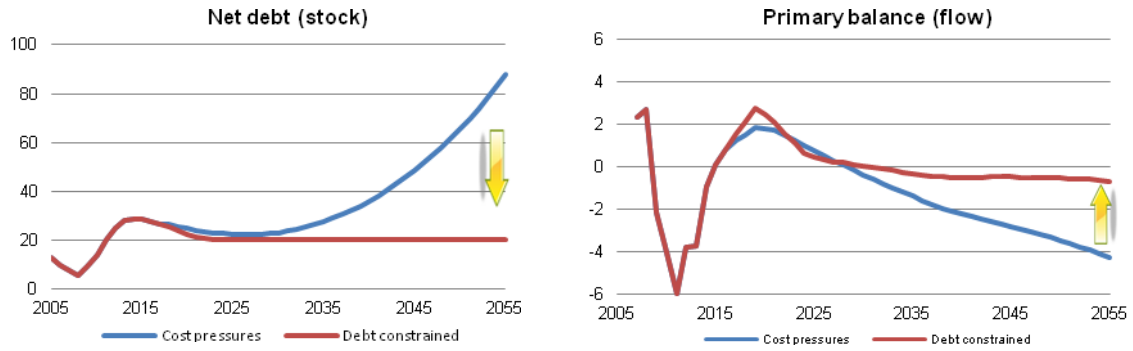
but happened immediately in 2009). These deficits fed into growing spending compounded by spending to finance the growing debt. So while this was the debt ratio picture in the two statements (reaching 106% of GDP in 2050 for the 2006 report and an eye-watering 223% for the 2009 report), long strings of deficits don't reflect the behaviour of governments between 1994 and 2008.

Allowing debt to grow with no corrective policy reaction assumes that future governments will abandon past "prudent" behaviour. As an alternative, we assume that future governments will manage their budget decisions so that net debt is maintained in the long run at around 20% of GDP. To incorporate this in the modelling, we maintain the demographic and economic assumptions and the current fiscal settings, and set the model to back-solve for the change in the primary balance needed to reach and then maintain the debt limit. Bell (2012) shows that this requires a rise in tax and/or a reduction in spending amounting to 4%-5% of GDP in 2060.

So we have two ways of presenting the likely fiscal challenge future governments might face. In the past, we, and nearly every other country, have concentrated on the debt ratio as an indicator of the sustainability of current fiscal settings. We are calling this presentation the "cost pressures" scenario. This is very sensitive to the starting position. As noted above, New Zealand went from a projection of the 2050 (net) debt ratio of over 100% of GDP in the 2006 statement to over 220% three years later. What had changed? There were some spending policy changes and tax cuts, but the main change was the contracting economy in 2008 and the need to support people through the worst of the recession. In 2009, commentators tended to concentrate on the projected level of debt at the end of the projection, rather than on policy choices needed earlier on to stabilise the debt ratio and ease back on financing costs.

For the 2013 statement, we have decided to shift the emphasis towards changes in the primary balance needed to control net debt as a share of GDP. The presentation using the debt anchor is called the "debt constrained" scenario. The focus is then more directly on a stream of decisions around spending and taxation and these seem more real and amenable to change than frighteningly large piles of debt, although they are in fact duals of each other.

Figure 2 – A change in emphasis from stocks to flows (% of GDP)



Source: The Treasury (indicative)

3 Demographics

We now turn to the assumptions we are making for this preliminary round of population projections. The population projections and labour force projections to be published by Statistics New Zealand in July and August 2012 will be different from those issued in the past. Until these are available, we are basing our discussion on Series 5 (2009-base), the mid-range projection released by Statistics New Zealand in October 2009.

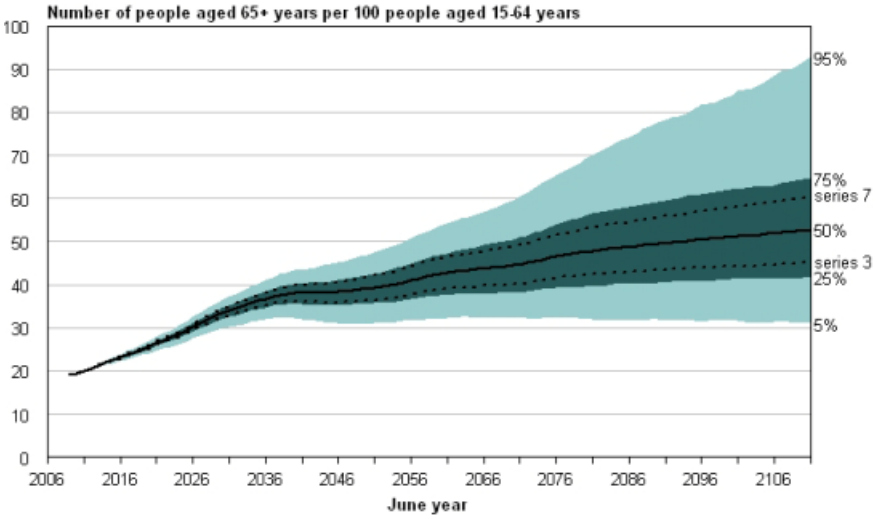
3.1 New approach to quantifying uncertainty

The new 2012 projections will have a greater emphasis on quantifying the uncertainty. For the main demographic statistics, SNZ will produce percentiles (eg5th, 10th, 25th, 50th, 75th, 90th and 95th) to give an indication of uncertainty. These uncertainty fans will come from 1,000 stochastic scenarios, say, based on sampled values of distributions of the major input assumptions derived from historical observed spreads. The 50th percentile (or median), for example, is an indication of where the actual value has a 50% chance of being higher than the projected value, and a 50% chance of being below the actual value . The background to this approach is contained in Dunstan (2011), building on his earlier work and that of Creedy and Scobie (2002), Leonova and McLellan (2005), and Wilson (2005).

In the 2009-base releases, and earlier, SNZ illustrated demographic uncertainty by producing, for example, eight other "official" deterministic projections made up from different combinations high, medium and low assumptions for fertility, mortality and (net) migration.

Below is an illustration of uncertainty around the mid-range projection of the ratio of people aged 65 and older to those between 15 and 64 (using Series 5 from 2009). This shows the 50th percentile value of this ratio is 42 in 2060 with the interquartile range (25th to 75th percentile) of 37.6-47.2. So half the stochastic projections had values for this ratio between these two values and half were outside this band. Of the official deterministic alternatives, Series 3 and 7 (with high and low mortality assumptions) track the interquartile range until 2060 or so, but fall well within this range over the longer term. We will have to decide whether this technique is helpful in conveying demographic uncertainty to our stakeholders.

Figure 3 – Projected 65+ dependency ratio probability distribution



Source: Experimental stochastic population projections, Statistics New Zealand Working Paper (Dunstan, 2011)

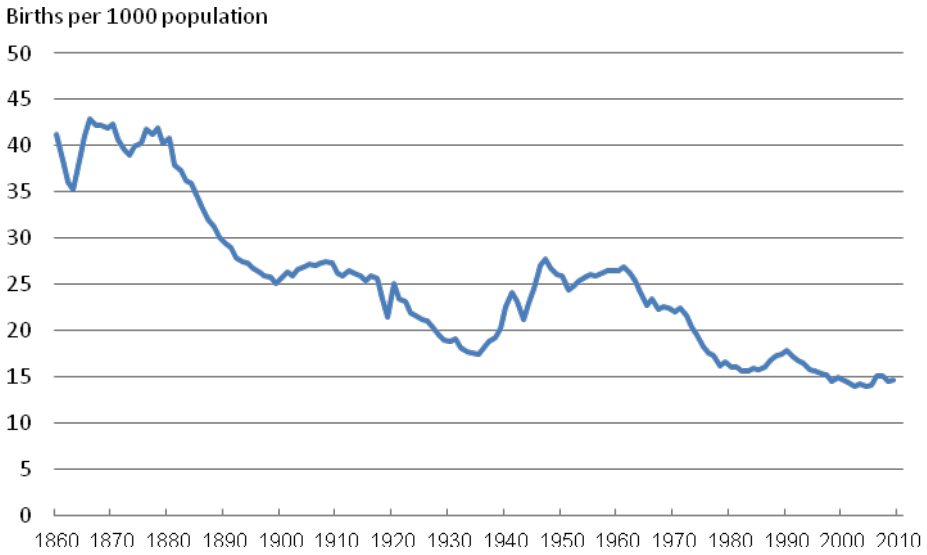
In reviewing our population projections, it is important to be comfortable with the assumptions that determine the mid-range projection. This comfort could come from reviewing historic trends, the social and economic pressures that may be changing those trends and looking at what is happening in comparable countries.

Then, because we live in an uncertain world, we should not rely on a single projection as our only guide to future trends. Before the arrival of stochastic projections, we used the official alternative projections for conveying uncertainty. Because we are trying to illustrate the risks to the fiscal position, deciding which alternative projections to use depends on the relative costs of an under-projection and an over-projection. To warn about where growth of public spending, for example, on health and New Zealand Superannuation might go (both areas are strongly affected by ageing), at present we could pick an alternative that has higher gains in life expectancy.

3.2 Fertility assumptions

One of the drivers of population ageing is a secular decline in average family size. The crude birth rate is the number of births per 1,000 people. Apart from a few wobbles now and then, the birth rate has generally fallen from around 40 births per 1,000 people 150 years ago to 15 per 1,000 now (put another way, from families averaging five to six children to families with two children). One of the largest of these wobbles was the rise in the birth rate after the Depression through to the late 1960s (the baby boom). Statistics New Zealand dates the baby boom from 1946 to 1965, although the birth rate was climbing from the mid-1930s and remained high until the 1970s.

Figure 4 – Birth rates have been generally falling through time



Source: Statistics New Zealand

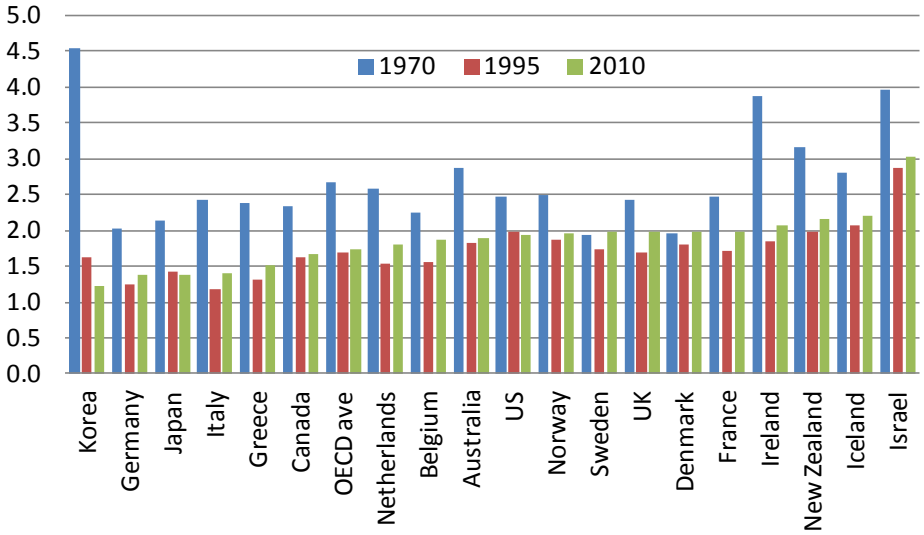
Another measure of fertility is the sum of the age-specific fertility rates for females between 12 and 49 in a particular year. This summary measure is the "total fertility rate" (period measure for that year) and can be interpreted as the average number of live births that a woman would have during her life if she experienced the same age-specific fertility rates from that point onwards. It is a measure used by SNZ in making fertility assumptions in its projections.

SNZ assumes that we will not see another large baby boom in the future, because social and economic conditions have changed from those prevailing in the two decades after the Second World War. Contraception is more reliable, women are participating more in tertiary education, and in the labour market, and are having their children later in life than they did a decade or two ago. All these factors have led to a lower fertility rate. At this stage, it is not clear that the higher fertility rates of Māori and Pasifika groups are converging towards Pākehā rates. From 2002 to 2009, Māori births were a growing percentage of the total and the average age for Māori childbirth could be rising.[2]

SNZ's medium assumption is that the fertility rate will gradually settle back a little from where we are now (at around the replacement rate of 2.1 babies per woman) and then stay at the long-term assumption rate of 1.9 from 2026 onwards. This assumption is based on an analysis of the NZ period and cohort fertility rates, rates of childlessness, and ethnic fertility patterns, as well as international comparisons. It also is close to the fertility rates we have seen since 1977 (1.9-2.2). The New Zealand fertility rate and the long-term assumption are both near the top of the OECD in 2010.

[2] In 2006, fertility rate for the total population was 2.05 babies per woman (2.14 in 2009). For Māori, it was 2.7 (2.8 in 2009); Pasifika, 2.95; Asian, 1.52 and European, 1.92. A rising average age for Māori births could indicate greater participation in the labour market or tertiary education and could indicate a fall in the fertility rate and birth numbers (Te Puni Kōkori, 2011).

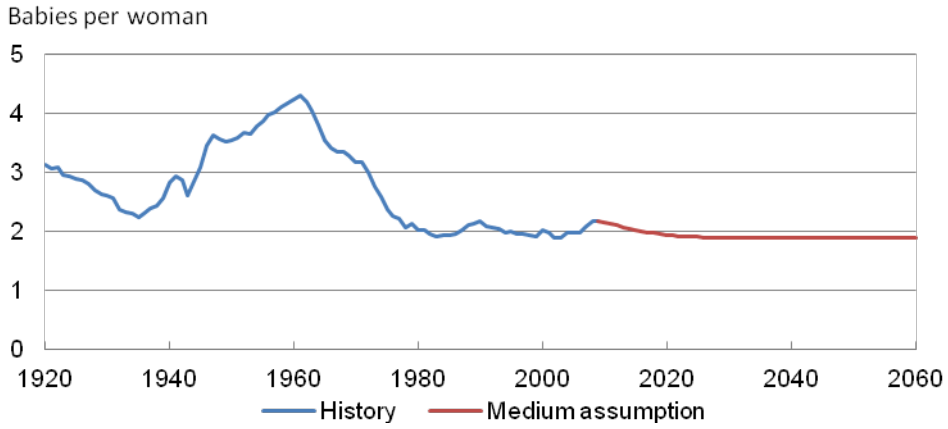
Figure 5 – TFR for selected OECD countries (1970, 1995, 2010)



Source: OECD (2011), OECD Family Database

The long-term rate of 1.9 babies per woman has been our assumption since the 2009 statement. At this point, it seems a plausible "middle" assumption. Upside risk occurs if non-European groups do not converge as fast as it is assumed in the background (but this has some advantages for the fiscal position). Downside risk occurs if Māori and Pasifika converge quickly to European and Asian fertility rates.[3] This would have the opposite effects on public spending.

Figure 6 – New Zealand's total fertility rate, 1920-2060



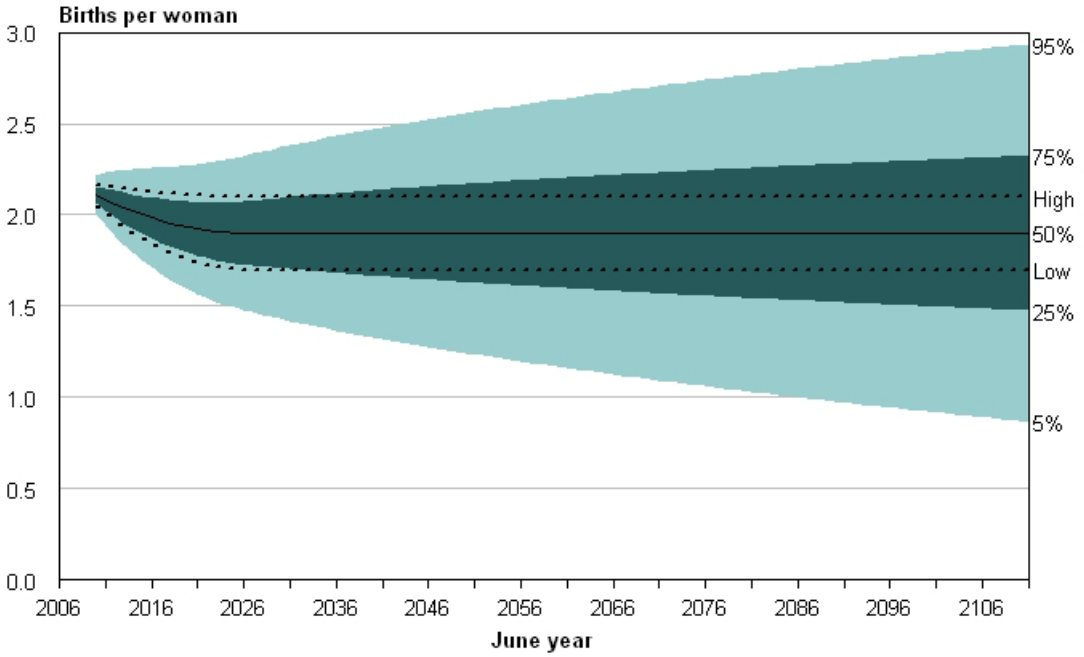
Source: Statistics New Zealand

Dunstan (2011) shows that the high (2.1) and low (1.7) long-term assumptions for fertility produce projections of total fertility that roughly agree (up to 2060) with the 25 and 75 percentiles of stochastic projections. This uses random sampling from a normal distribution with a standard deviation derived from the history of fertility between 1977 and 2009 and shifted so that the 1.9 fertility case is at the 50 percentile. Encompassing

[3] Although there are many more factors that could affect future fertility rates other than ethnic composition. Moreover, convergence of ethnic fertility patterns is not a necessary requirement for the 'mid-range assumption.

almost half of the fertility outcomes is probably a broad enough spread to illustrate uncertainty.

Figure 7 – TFR interquartile spread broadly agrees with high and low assumptions to 2040



Source: Experimental stochastic population projections, Statistics New Zealand Working Paper (Dunstan, 2011)

3.3 Mortality (life expectancy) assumptions

Life expectancy is an area we should test carefully in setting assumptions for our long-term fiscal projections. Life expectancy assumptions have generally been progressively lifted internationally as recorded increases have been sustained.

Another tendency is to slow down gains in life expectancy when looking ahead.[4]

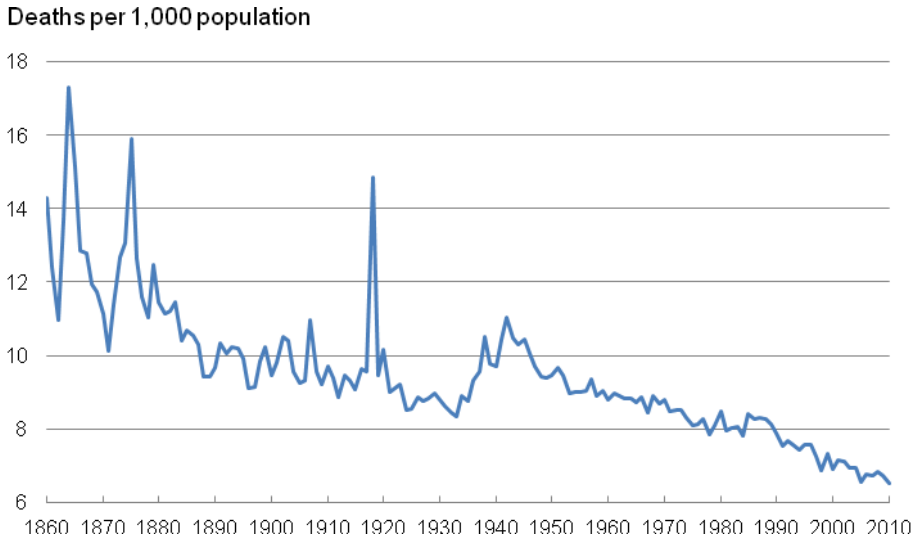
Recently, the IMF (2012) warned that governments and managers of private funds are likely to be underestimating the life expectancy of ageing populations, a risk that could further threaten their fiscal positions and increase risks to financial and fiscal stability.[5] The IMF analysis showed that if individuals lived three years longer than expected, which was in line with under-estimations in the past, the already large costs of ageing to governments could increase by another 50%. Longevity risk affects financial stability by threatening fiscal sustainability and weakening private sector balance sheets, adding to existing vulnerabilities in the current environment.

[4] Oeppen and Vaupel (2002) found a linear relationship through time for the growth in record life expectancy around the world. Despite this pattern, demographers continued to announce limits to life expectancy which would be surpassed within a few years. US demographer Tuljapurkar (2005a, b) has analysed the burden of disease and potential health innovations from nanotechnology and believes that average life expectancy in the US in 2050 could reach 100 years.

[5] These messages have been repeated in June 2012 by the Financial Services Council: they say medium life expectancy assumptions are too low and that taxes will need to go up to cover NZS costs.

The crude death rate in New Zealand (deaths per 1,000 mean population) has been trending downwards for the past 150 years, apart from wars (and their consequences) and epidemics (eg, the 1918 Spanish influenza epidemic is evident in the sharp spike).

Figure 8 – Death rates have been generally falling through time



Source: Statistics New Zealand

Age-specific mortality rates in a particular year are converted into a summary measure called life expectancy at birth for that period via life table calculations. Life expectancy (at birth) is defined as the average number of years that a person could expect to live if he/she experienced the age-specific mortality rates prevalent in a particular year (period measure) throughout her life. It does not, therefore, include the effect of any future decline in age-specific mortality rates. If rates continue to fall through life, as we have generally seen since the mid-1940s, that person is likely to live longer (this is captured by the cohort measure of life expectancy).

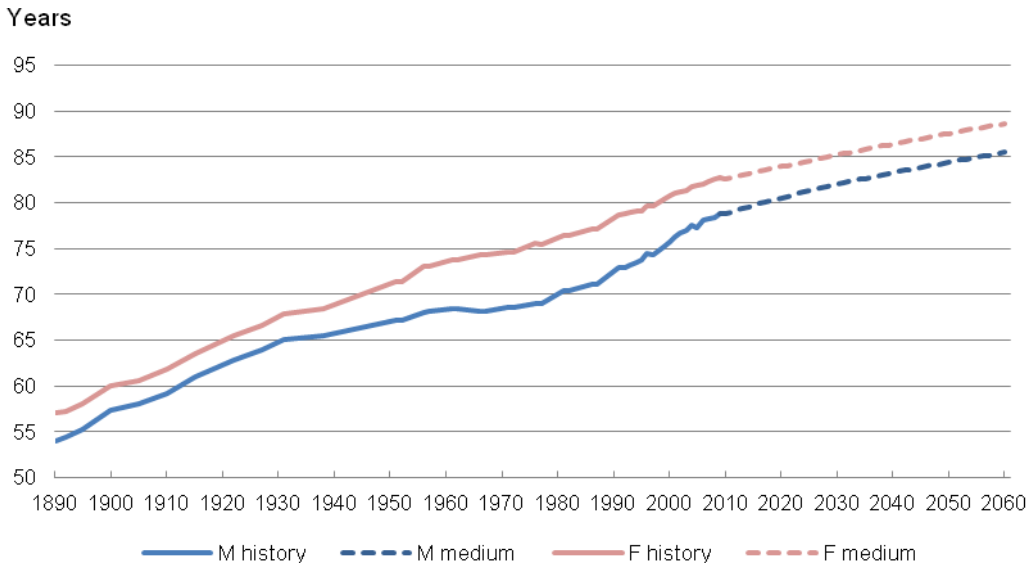
These trends to longer lives on average are a result of drier and warmer homes, cities without horse manure dust in the air, clean water and communal sewage disposal, public health campaigns for immunisation and against smoking, healthier lifestyles and food, and better medical care and technology. Improvements in life expectancy resulted first from reductions in infant mortality and maternal deaths and later from people living to older ages. What has not changed much over this period is the age of the oldest people. We are seeing more people surviving to older ages.

Compared with New Zealanders born in 1900, those born in 2000 can expect on average to live an additional 27 years. Since 1950, life expectancy at birth (period measure) has risen by about 23 months (1.9 years) each decade. There is uncertainty about how far and fast mortality rates will continue to fall.

SNZ assumes mortality rates will continue falling and so life expectancy (the period measure) will continue rising, but the medium assumption (2009) indicates a slowing of the life expectancy growth rate (to about 16 months per decade for males and 14 months

for females) to reach 85.6 years for men and 88.7 years for females in 2060.[6] A linear projection of both male and female life expectancy based on growth patterns since 1985 indicate a life expectancy at birth for both in 2060 of around 95 years.

Figure 9 – Rising life expectancy at birth



Source: Statistics New Zealand

Notes: 1) The base year for the projections is 2009.
2) There is a break in 1952 when for the first time Māori life expectancy was included in the national data.

Māori life expectancy has increased substantially from 1950 to 2007: for males it rose by 30% and for females by 34% (the New Zealand total changes were 16% for males and 15% for females over this period). However, Māori life expectancy in 2005-07 stayed lower than the total by 7.6 years for males and by 7.1 for females). More are surviving to older ages (TPK, 2011, p28). Only 52% on males born in 1950 could expect to reach 60; by 2005-07, this proportion had reached almost 80%. For females, the proportions were 53% in 1950 and 87% in 2005-07. The proportions for the total population in 2005-07 were 90% for males and 93% for females.

One issue that has been brought up about our past fiscal statements is that these life expectancy assumptions for the total population may be too low and, if true, we may be underestimating the fiscal costs of ageing since several of the large spending areas have costs that rise with age.

In our work with the long-term fiscal projections, we want to indicate the upside risk to the debt position of a delayed response to addressing likely future pressures. For this, we would like to have a central projection that continued the growth in life expectancy at birth that we've seen over the past quarter century, for a few decades ahead, rather than one that slows down. An extrapolation based on a longer span of history could be downplaying the effects of medical breakthroughs in the last 25 years.

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[6] This reflects the non-linear relationship between age-specific death rates and life expectancy combined with the fact that death rates are relatively low at younger ages so further reductions cannot generate the same life expectancy gains that we've had in the past.

Other reasons for assuming a higher live expectancy track than we have in the past are:

- Work by O'Connell and Dunstan (2010) show that some "golden cohorts" in the UK have longer life expectancy than people born a decade before or after and these cohort effects have "migrated" to New Zealand. There may also be cohort differences already here which may mean higher averages in the future.

- Other health trends such as the falling incidence of smoking and diabetes (and the apparent effects of obesity on morbidity rather than on mortality) may point to higher life expectancy assumptions.

The OECD's estimate of life expectancy for New Zealand females was 82.7 years in 2009 putting the country about half way down the OECD. For males, life expectancy was 78.8 years in 2009, ranked 8th in the OECD.

However, in the 2010 UN population projections, the agency made these assumptions for life expectancy in the early 2050s.

Table 1 – Assumptions of life expectancy at birth (years)

	Males	Females
SNZ assumptions (2051), (2009-base)		
Low	82.0	85.6
Medium	84.5	87.7
High	87.0	89.7
Very high	91.9	92.7
UN 2010 medium assumptions (2050-55)		
Australia	84.5	88.6
Canada	83.3	87.9
New Zealand	83.6	87.3
Sweden	84.3	88.1
United Kingdom	82.8	87.0

Sources: Statistics New Zealand, United Nations (2010) (period life expectancy)

This indicates that (period) life expectancy assumptions made by the UN and SNZ for New Zealand in the early 2050s are broadly consistent and that New Zealand is comparable with the countries in the table. Because of the tendency of agencies doing population projections to underestimate longevity (including the UN), however, we could perhaps use the high life expectancy assumption as our base and test the upside with the unofficial very high assumption (at least until the updates). Risks on the downside are no further convergence in average life expectancy between Māori-Pasifika and Europeans (genetics, socioeconomic backgrounds and health access could be drivers of this), and a faster-than-expected rise in obesity and diabetes, or similar health conditions, across all population groups.

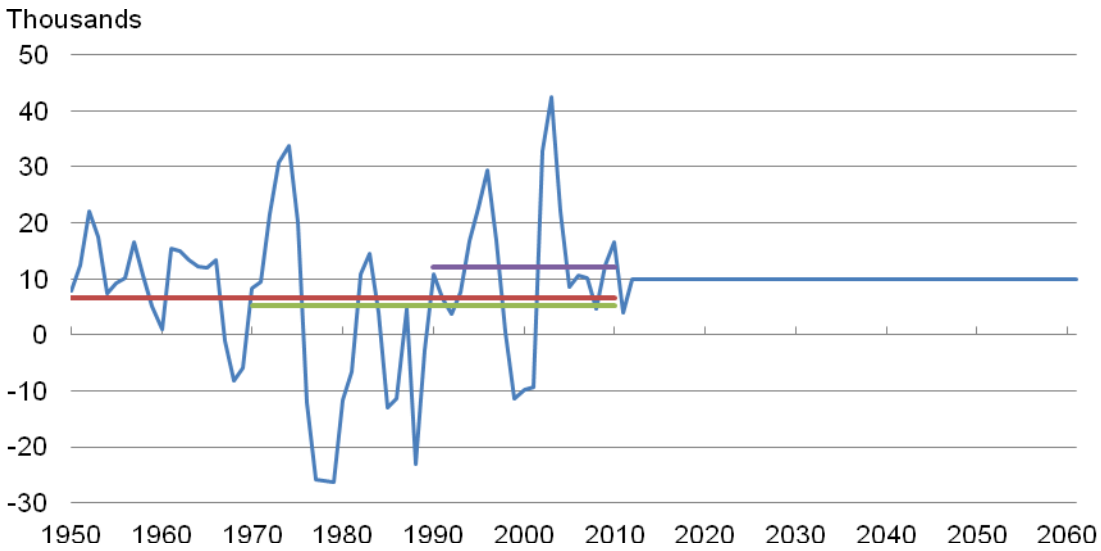
3.4 Net migration assumptions

The other key variable used in producing population projections is net migration. This has moved erratically up and down over the past half century, because of policy changes, the relative economic growth differences between New Zealand and the source and destination countries, and on the numbers of Kiwis leaving for their "overseas experience," returning Kiwis and the reunification of families of former migrants.

Assumptions about levels of net migration do not have a major bearing on the ageing of the New Zealand population, as there are relatively small numbers with few older people migrating. If anything, higher net migration tends to reduce slightly the effects of ageing over the long term. For example, SNZ's medium fertility and mortality series with zero net migrants has a ratio of people 65 and older to 15-64 in 2060 of 0.47, compared with 5,000 net migrants (0.44), 10,000 (0.43) and 15,000 (0.42). Similar slight differences hold for the median age indicator of population ageing. So holding fertility and mortality as in Series 5, but decreasing the numbers of net migrants ages the population a little.

The medium assumption of 10,000 net migrants each year is a little lower than the average from 1990 and higher than the 60-year average. The economic slowdown after the GFC, along with the Christchurch earthquakes, may have changed the near term.

3.4.1 *Figure 10 –Net migration, 1950-2060 (medium, 2009-base)*



Source: Statistics New Zealand

As more of our traditional source countries face greater pressures from ageing, we are likely to see greater competition for immigrants, and inducements for Kiwis to migrate. Hence, we are likely to find it is harder to attract, or hold onto, 10,000 net migrants. Any lower numbers occurring over a long period means greater pressure on government spending and taxation from a population that is ageing faster than the Series 5 medium scenario.

3.5 Role of the baby boom

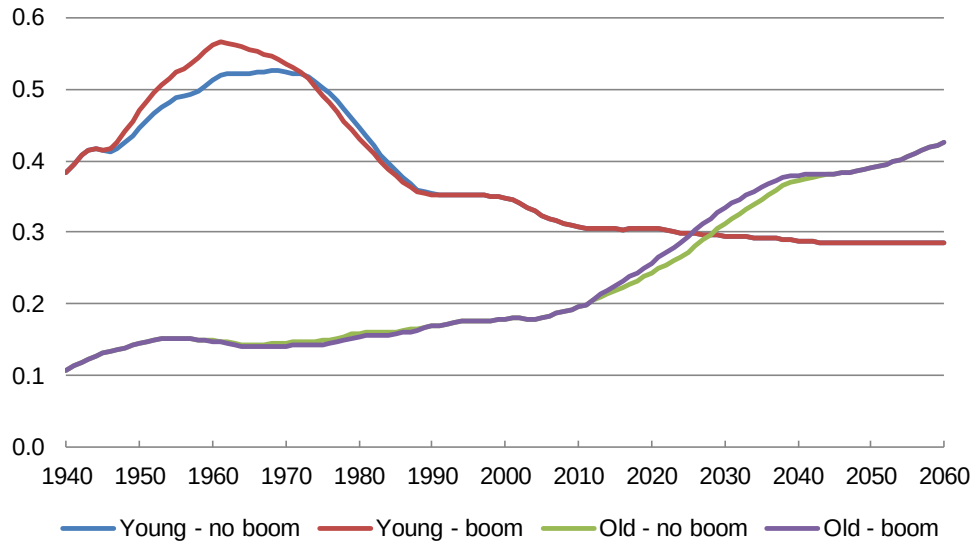
One reason people do not appreciate the permanency of the change in the population structure is that they think it is all a "baby boomer" story. In the two decades after World War II, fertility was high, with a peak twice the average number of births per woman as is the case now. And life expectancy is much higher today.

Even without the post-WWII baby boom, our population would still be ageing as a result of the fall in the fertility rate and lengthening lives over the past century. Over the past half century, the baby boom held back the rise in the median age. Over the next three decades or so, the baby boom will speed up the proportion of the population over 65. By

the mid-century, when most of the post-WWII baby boomers will have died, the population will have an older age structure than it had at any time in the past.

Figure 11 illustrates this using the ratios of the young (0-14 years) and old (65 years and older) to the prime working age population aged from 15 to 64 years. The figure shows the actual ratios and endeavours to illustrate what these ratios would be like if the fertility rate had not increased and the baby boom had not occurred during the immediate post-war years. This has the effect of smoothing out the number of births between 1945 and 1965. Taking the top off the baby boom shows up as the gap between the red and blue lines (young dependency ratios) and removes some of the 65-year-old survivors from 2012 onwards (gap between the green and purple lines). The important point is that from 2050 or so onwards, when the bulk of the baby boomers have died, the aged dependency ratio is still twice as large as it is now.

Figure 11 – Effect of removing the 1946-1965 baby boom



Source: The Treasury, SNZ Series 5 projection

The biggest contributors to New Zealand's ageing population occur because of low fertility and mortality rates.

3.6 Demographic assumptions: conclusions

What we do for the final base case projections will depend on what Statistics New Zealand assumes for their mid-range projection in the mid-July 2012 update. There are positives in using an official projection by the country's statistical agency. Here are our high-level comments about the three main assumptions:

- At present, the medium fertility assumption of 1.9 in the long run seems balanced between risks.
- As indicated above, assuming something like the present high life expectancy case would better reflect the longer-term fiscal risks we are likely to be facing (IMF, 2012).
- The present medium migration assumption of 10,000 is probably fairly balanced, but it does have some risks on the downside from increased competition for people from other countries facing similar ageing pressures.

4 Economics

The assumptions needed to produce projections of GDP are outlined here. These include an average of weekly hours worked, labour productivity growth, labour participation, unemployment rate, inflation rate (used for general price growth), the government five-year bond rate. Drawing on the recent work by Gardiner *et al.* (2012), we examine how population ageing might affect these assumptions through time.

4.1 Unemployment rate

This is the steady state unemployment rate for which inflation remains steady. This is estimated in the NZTM at 4.5% and applies in the LTFM from 2019 onwards.

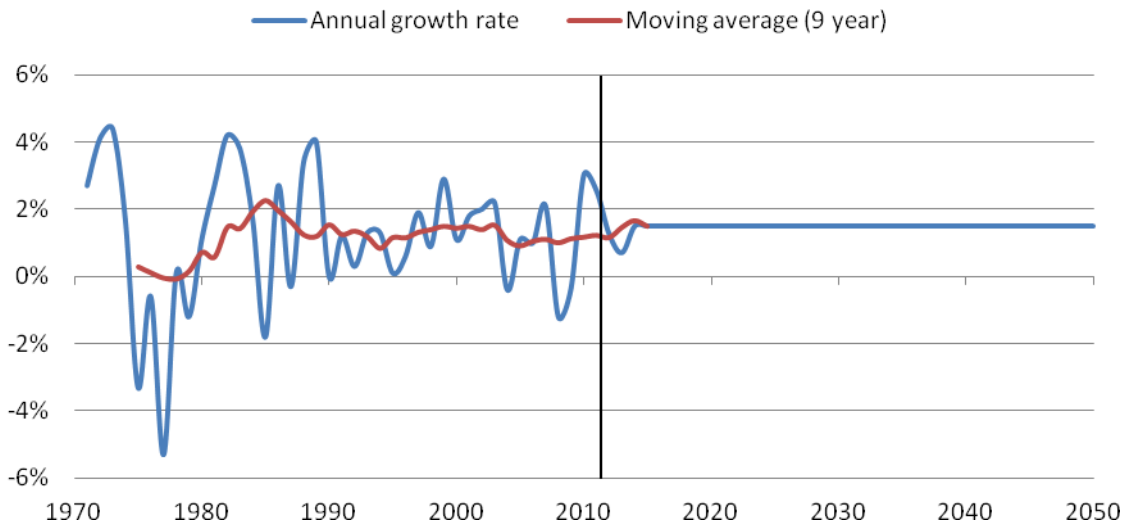
4.2 Average hours worked

The assumption of average weekly hours paid in the long run is based on an average paid hours paid over the past decade and a half. For the forecast, average hours paid is scaled up to hours worked by using a recent ratio of the two. This puts the long run hours worked per week at 33.2 hours. Gardiner *et al.* have shown that the ageing population alone could reduce average hours from 33.2 to 32.4 hours by 2060.

4.3 Productivity growth assumption

We intend to keep the 1.5% annual growth used in both the 2006 and 2009 statements. This is broadly in line with smoothed productivity growth over the past two decades. Using the proxy of average wages by age and gender groups, Gardiner *et al*. show that the assumed labour productivity growth would fall through time to about 1.45% in 2060. They conclude that the relatively small reduction in labour productivity growth from 1.5% reflects that the increase in the proportion of people 65 and older is offset by the decline in youth and a marginal increase in the proportion of prime age adults into the higher relatively productivity age groups.

Figure 12 – Labour productivity growth in history and long-term assumption



Source: Statistics New Zealand

4.4 Participation assumptions

Significant changes have occurred in labour participation rates over recent years. The rates have typically fallen amongst the younger age groups, associated with increased tertiary participation rates. Male labour participation rates up to age 50 have fallen, while most female rates have been rising (Figure 12).

The 2012 labour-force projections will be treated in the same way as the underlying mid-range demographic projection: a deterministic mid-range projection based on the central demographic projection with percentiles of various statistics around this to reflect historically based uncertainty in demographic and participation rate assumptions. The labour force consists of people aged 15 years and over who regularly work for one or more hours per week for financial gain, or work without pay in a family business, or are unemployed and actively seeking part-time or full-time work.

In the past, SNZ has picked three of the alternative population projections (Series 1, 5, and 9) and constructed high, medium and low participation scenarios for each of these projections. The 2010 release of these nine National Labour Force Projections (NLFP) had labour force numbers for single years of age from 15 to 79 and for the open-ended band 80 and older, for males and females. Dividing these numbers by the underlying population gives a measure of participation for each age and gender group. The labour force projections are based on census data (the latest census is still 2006).

In 2010, for the Series 5M (M for medium participation) the average working life for males in 2051 is 48.3 years and for females, 40.9 years. The base average working life (to age 80 years) in 2006 was 45.3 years for males and 36.9 years for females.

Population ageing will tend to lower aggregate participation through time. This is because participation rates of older groups tend to be lower than those of younger groups. So as people join the older groups in relatively greater numbers, the aggregate rate will tend to fall. This is one factor, among several, likely to slow GDP growth in the future.

The labour force projection is a key input to our GDP projections. This is the only use the labour force participation rates are put to in the LTFM. So just the aggregate labour force is used and used to grow out the aggregate five-year forecast of the labour force from the New Zealand Treasury Model.

GDP in the projection period comes from:

$$Y_t = Y_{t-1} \frac{LF_t(1-UR_t)}{LF_{t-1}(1-UR_{t-1})} \left(\frac{HW_t}{HW_{t-1}}\right) \left(\frac{LP_t}{LP_{t-1}}\right)$$

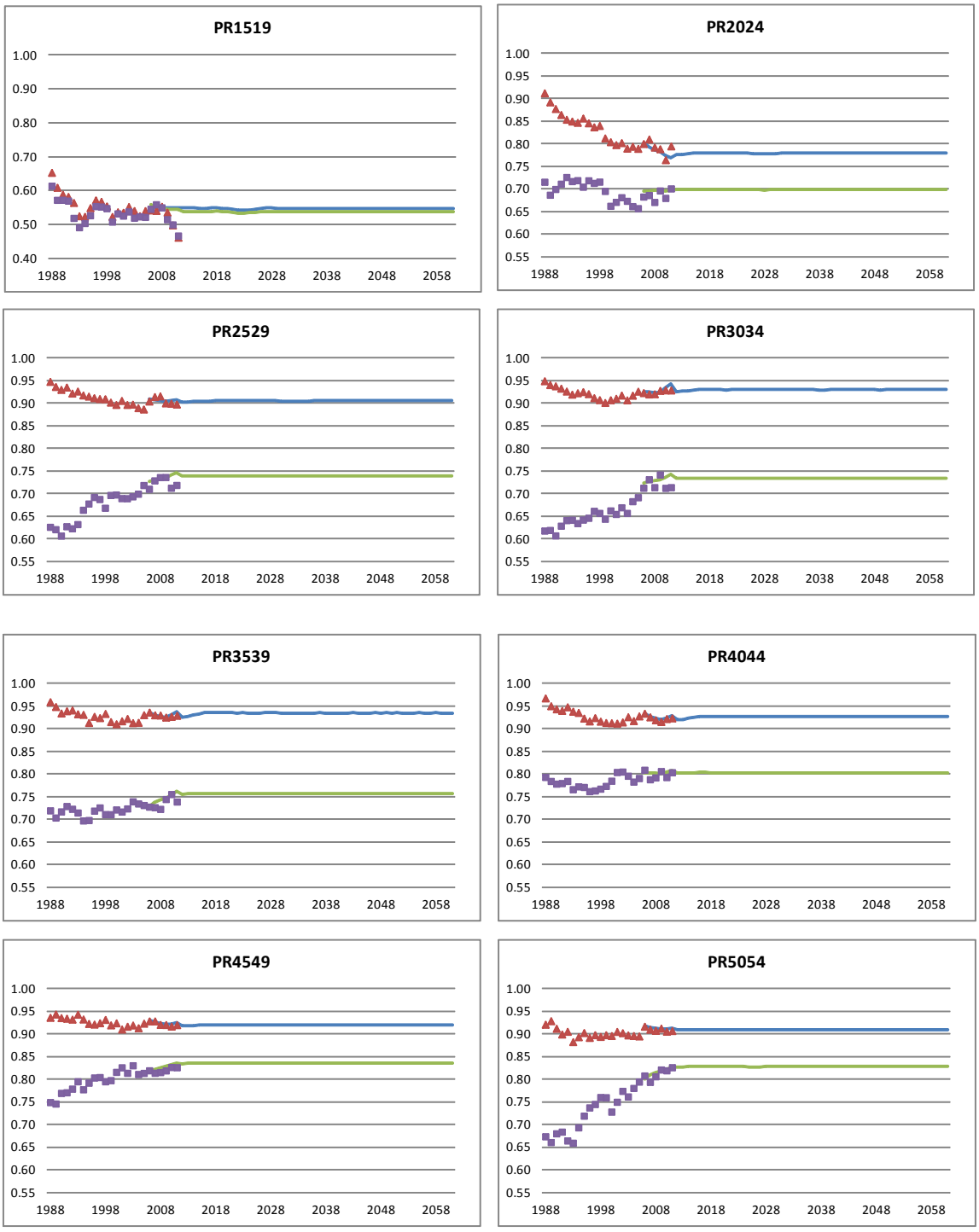
and

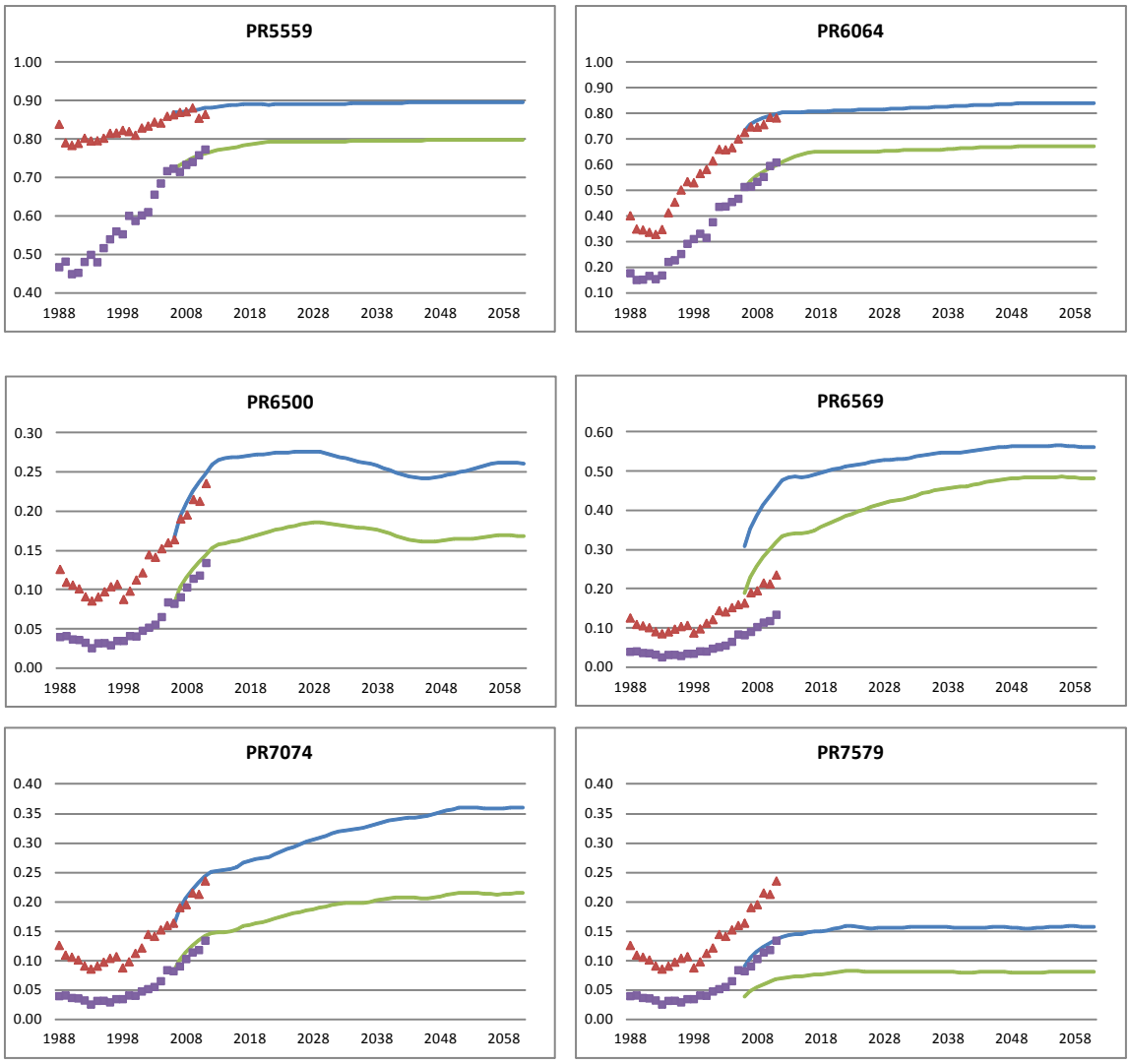
$$N_t = N_{t-1} \frac{Y_t}{Y_{t-1}} \left(\frac{P_t}{P_{t-1}}\right)$$

where Y_t (N_t) is real (nominal) GDP in year *t,* LF_t the aggregate labour force, UR_t the unemployment rate, HW_t average hours worked, LP_t labour productivity, and P_t the price level in year *t*. This means that growth of real GDP equals growth in the number employed plus growth in the average hours worked and the growth in average real output produced per worker. Then nominal GDP growth is the growth of real GDP plus the growth in prices.

The problem with the Series 5M projection of the labour force is that by 2016, about the time when the LTFM's projection begins, SNZ tends to flatten the single-year-of-age participation rates of the workers aged under 65 (see Figure 12). For some age groups, this is justified – they are high and stable anyway - but in other cases, this breaks rising trends. For example, without the recent effects of the recession, the participation rates for women aged 25-29 rose strongly through history (as shown by the quarterly HLFS) and then the Census-based projected rates rise for a few years and then stop rising. This break is a particular issue for women aged 25-34 and 50-64, and for men aged 55-64.

Figure 13 – Grouped-labour force participation: HLFS (to 2012), NLFP (2006-61)





Source: Statistics New Zealand

Notes: 1) Red triangles: Males; Purple squares: Females (HLFS)
2) Blue line: Males; Green lines: Females (National Labour Force Projections, Based on 2006 Census, 2010)
3) For PR6500 and the 65 and older five-year age groups, the HLFS triangles and squares refer to the open-ended, 65 and older group.

The last time SNZ published labour-force projections (in 2010), the agency assumed that participation rates by single year of age from 65 to 75 would continue to rise all the way out to 2060.

In summary, we believe the 2010 participation rate projections for some age groups downplay the likely overall labour force growth in the economy.

The single-year-of-age breakout is useful in showing possible effects of changing the NZS eligibility age on participation and hence on GDP. The proposed stochastic population and labour force projections will enable us to produce a fan of uncertainties (percentiles around the mid-range projection) for the cost of NZS as a proportion of GDP. This is essentially a scaled version of the ratio of people aged 65 and older to the labour force. It will quantify the uncertainty in demographic and labour force assumptions on the ratio of the costs of NZS to GDP.

In summary, after reviewing assumptions and new trends, SNZ is going to release its mid-range population projection in July and labour force projection in August. We would prefer to use the official national population and labour force projections, but a slowing or

stagnation of life expectancy gains will tend to underplay the fiscal risks involved in health and NZS spending. Similarly, flattening participation rates for age and gender groups who have been growing quickly in the past will mean slower GDP growth projections (and hence slower growth of tax revenue). Guest *et al.* (2003) estimated that population ageing in New Zealand would lower the level of GDP in 2050 by about 12% relative to a population where no ageing took place. This is relatively small when compared with the expected doubling in incomes and consumption over this period.

Solutions to this issue of rapid flattening out of rising trends (if it is one!):

If in August, Statistics New Zealand still has static participation in the new mid-range projection for some of the prime age groups, we could (reluctantly) do our own participation rate projections using the dynamic cohort method (following the OECD, 2005, Australian Productivity Commission, 2005, and our 2006 statement). This takes the probably of working or not working in synthetic cohorts from the recent past, projects the cohort forward using these probabilities. The advantage of this is that rising participation in the recent past is reflected in the future, but dampened through time. The disadvantage is that there is no target towards which participation for a particular age and gender group is heading. Another disadvantage is that choosing the entry and exit probability values is often more or an art than a science.

Another approach we could explore is to benchmark key participation rates with comparable countries and use, say, a logistic curve, to fit between current values and a later, plausible higher point after which the rate remains stable (Australian Treasury 2010).

4.5 Inflation

For all the longer-term projection work, we have used a CPI inflation assumption of 2%. This was not based on history, but simply because it is the centre point of the Reserve Bank's policy band: keep CPI inflation between 1% and 3%.

This is different from the inflation assumption used by the Treasury accountants in their long-term work, for example, to calculate returns to funds. They use an assumption of 2.5% average inflation which is closer to an historical average for net-present-value calculations.

4.6 Interest rates

The 10-year bond rate assumed for NZTM is 4% real or 6% nominal. This is adopted as the long-term interest rate for calculating the financial costs of borrowing on government bonds. The accountants have come to a different position on interest rates. They believe interest rate reductions in the international financial markets (now 50 basis points lower than they were before the GFC) are structural and are assuming a 10-year-bond rate over the long term of 5.5%.

In the preliminary projections, we assume the bond rate moves up gradually to 5.5% in 2021, remains at this level until 2026 and then climbs to its peak 6% in 2031.

5 Revenue

For this and the following Section, we outline the fiscal assumptions for the "cost pressures" scenario, where we try to capture something like current policy or past practice for projected revenue types, and spending on public services and transfers, against a background of relative constraint. The cost pressures all end up in the debt track.

Three bundles of taxation are covered in the model: source deductions (tax on wages withheld at source), corporate taxes (net of refunds), and the rest (dominated by GST). In the longer run, these are targeted at a historically derived share of GDP (allowing for recent tax rate changes). This requires a rise in core crown tax from the present 26.7% of GDP to 29% in 2030.

From history (adjusted for recent tax rate changes), the current progressive tax scale on source deductions has a tax elasticity with respect to wages of 1.35. This means that for every 1% rise in wages, source deductions will grow by 1.35%. We assume this "fiscal drag" from rising average tax rates resulting from rising wages moving through a progressive tax scale will last until 2021, after which is it quickly returned to the historical average (11.2% of GDP) and stays there until the end of the projection period (this might happen through reasonably regular tax rate reductions).

For the total crown basis, corporate taxes net of refunds are adjusted to a historically justified 4.5% of GDP soon into the projection period. The adjustment might be delayed if we believe there is a large stock of accessible tax losses which would delay the growth of corporate tax for a year or two. The rest of taxes (GST, excises, tax on entrepreneurial income, withholding taxes on interest income and dividends and so on) move quickly to 13% of GDP in the projection period, matching an historical average.

Our later work will illustrate various options and trade-offs in changing various spending or tax policies to achieve various net debt to GDP targets, while meeting other objectives in distribution or maintain growth or supporting the environment.

6 Expenditure

For the 2009 statement (Bell, *et al.*, 2010), we derived a growth formula for spending on public services that drew on inflation, the growth of real input costs, and demographic and non-demographic volume factors, for what we are now calling the "cost-pressures scenario." The trend growth parameters were derived from history or current policy settings, and from the underlying demographic projections. Many of the spending lines in the core Crown expense tables (for example, 2012 Budget, pp123-125) are modelled separately in the LTFM.

Annual price growth of public services (health, long-term care, education, law and order) is composed of inflation (π_t = 2.0%), real input price growth (w_t = 1.2%, or 0.8 of labour productivity growth 1.5%), and average public sector productivity (a_t = 0.3%). Annual growth in the quantity of services is composed of demographically-driven growth (d_t which depends on each sector because different age groups are drivers and different cost weights) and non-demographic volume growth (p_t, again sector-dependent). The non-demographic volume growth parameter is the residual growth in past expenditure that is not attributable to other drivers, and is derived from trends for the particular sector.

The equation below outlines the framework for modelling public services expenditure growth in year *t*, g_t (Bell, *et al.*, 2010, p.82):

$$1 + g_t = (1 + \pi_t)(1 + w_t)\left(\frac{1}{1 + a_t}\right)(1 + d_t)(1 + p_t).$$

In other words, expenditure growth equals price growth (the *π, w* and *a* terms) times quantity growth (the *d* and *p* terms). In a simple, linearised form (dropping the higher-order terms), this becomes:

$$g_t = \pi_t + w_t - a_t + d_t + p_t.$$

In contrast, the expenditure growth of demand-driven transfers (eg, NZS, unemployment benefit, accommodation supplement) is modelled more simply as

$$1 + g_t = (1 + \pi_t)(1 + d_t),$$

where g_t is the growth of expenditure in year *t*, π_t is the growth of transfer indexation (typically CPI inflation or nominal wage growth), and d_t is the growth of the recipient population.

6.1 Health

Public health is probably one of the most complicated of the public services sectors to model. What we spend as a country for public health is the result of layers of decisions stretching back for decades. As such, it lacks the simple parametric structure of a (near) universal programme like New Zealand Superannuation.

The Ministry of Health provides us with cost weights which allow us to breaks health spending into five functional categories. Spending amounted to $13.8 billion in 2011 (a fifth of all non-interest spending):

- personal health (public costs GP visits, public hospital stays, public funding of drugs), making up 68% of total core crown spending on public health,
- mental health, 10%
- disability support services for older people, 10%
- disability support services for those 64 and younger, 8%, and
- public health (preventative health services), 4%.

Each of these has its own per capita costs by age group and gender for 2010. These cost weights are multiplied by the appropriate demographic group and then used to calculate category population cost growth d_t which varies by year, gender and category.

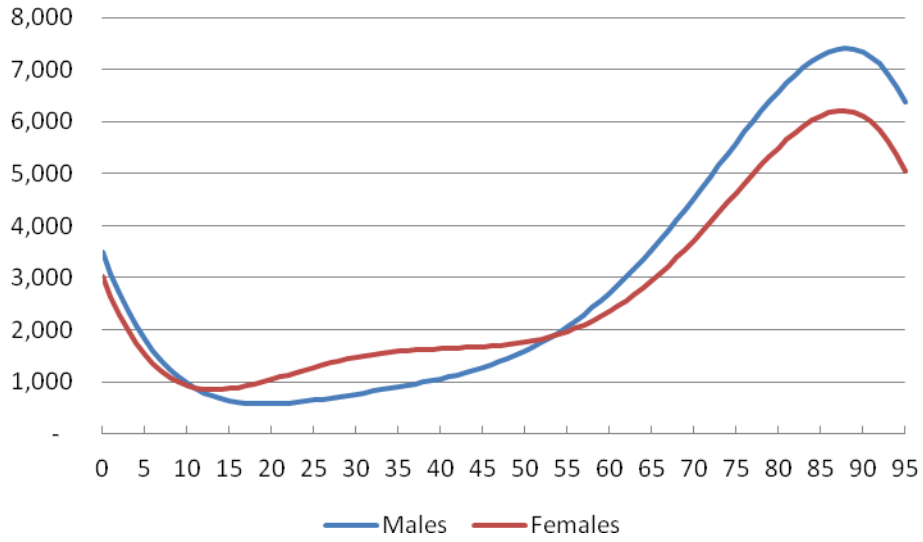
While the evidence for “healthy ageing” (compression of morbidity) is not always unequivocal and may depend on types of disease, we have attempted to model this for personal health spending by shifting out the cost weight curves to reflect the rising longevity (which is now largely occurring in the older age groups). So if life expectancy of a 65-year-old increases by four years in 2060 compared with 2010, we would assume the

average spending in real terms for a 65-year-old in 2060 is equivalent to that of a 61-year-old now. This aligns with the approach taken by the OECD in its public health modelling (OECD, 2006).

Another suggestion which we intend to pursue in subsequent work is to include a distance to death effect for personal health. Those who die in the next year are modelled using average death costs. The residual costs are averaged over the survivors.

The disability support for older people is a proxy for long-term care. The cost curve for this in 2010 has ever-rising growth with age.

Figure 14 – Cost weights for personal health spending, by age and sex ($2010)



Source: Based on Ministry of Health data (2010), smoothed by the Treasury

Parkyn and Ball (2012) have revisited the non-demographic volume growth assumption, pushing up the cost curves. In 2009, we estimated this growth at 0.8% as an average across all government public services (Bell, *et al.,* 2010). This has been re-estimated just for the public health sector as 1.5%, equal to the Treasury's assumption for long-term annual growth in economy wide labour productivity. This means that the long-term non-demographic cost growth is now 2.4%, which is 0.9% from the relative price effect ($w_t - a_t$ = 1.2% - 0.3% = 0.9%) plus the 1.5%. The relative price effect is an example of Baumol's cost disease. This contrasts with the assumption of 1.7% in the 2009 report. By decomposing New Zealand's public health growth rates between 1981 and 2002, the average is 2.5%, close to the new estimate.

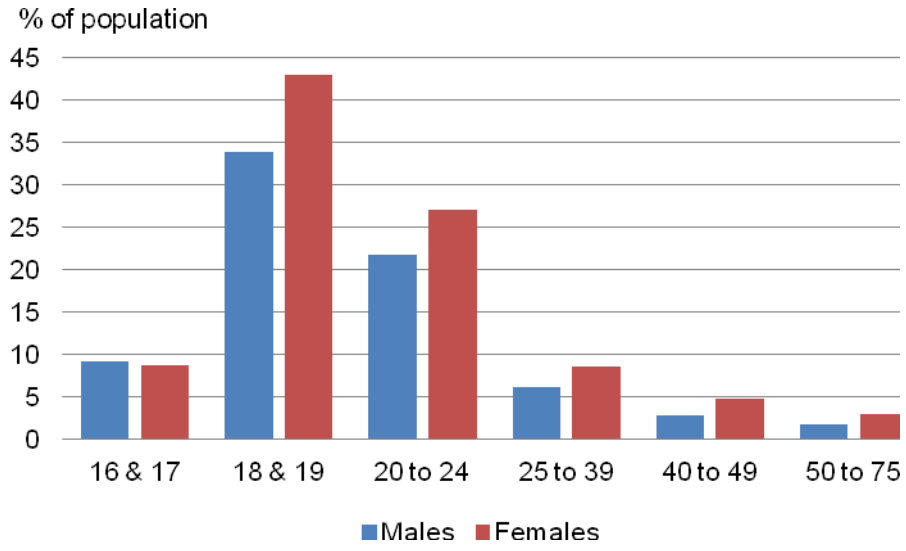
6.2 Education

Education expenditure in the LTFM is modelled by four levels: early childhood, primary, secondary, tertiary, and by tertiary student allowances, student-loan write-offs and Ministry of Education expenses and other expenses.

We have taken current participation rates by age for each of these levels. The data for domestic tertiary equivalent full-time (EFT) students is displayed below. The bulk of tertiary EFT students come from the 18-24 population group, although older age groups are also keen on tertiary. In 2010 about a third of males aged 18-19 were in tertiary (on

an EFT student basis), while almost half of females of those ages were participating. These numbers have risen since 2008 (boosted undoubtedly by a tighter job market since the start of the recession).

Figure 15 – Tertiary participation by domestic EFTS by age group and gender (averaged over calendar years from 2003 to 2010)



Source: Ministry of Education

These average proportions are applied to the population projections to provide an estimate of the tertiary EFTS through time. A similar participation rate weighting process is used for the early childhood and compulsory sectors (primary and secondary).

Parkyn and Ball have re-estimated the non-demographic volume growth for the public education system. Over the last 50 years, education spending has risen at around the same rate as health spending (around 3% real per capita). This has outstripped GDP growth, with the result that spending as a share of GDP has increased from around 2% of GDP in 1950 to 6% of GDP by 2011.

The baby boom added to education pressures in the 1950s and 1960s, but this has been in reverse since. After accounting for these pure demographic effects, Parkyn and Ball suggest that non-demographic education costs have increased at the rate of around 3% per annum over history. In 2009, we assumed the growth of the non-demographic volume as 0.8% across the board. This time, looking at education spending on its own, we feel 1% growth is a better estimate, which when coupled with the relative price factor (0.9%) gives the non-demographic part of nominal education growth as 1.9% per annum.

6.3 New Zealand Superannuation

New Zealand Superannuation is a pension scheme paid out of current taxation to people from their 65th birthday, provided they satisfy a residency test.[7] The payment is set at 66% of the net average wage for a couple. A person who lives with others (uncoupled) or who lives alone is paid at a higher rate than half of the couple rate. On each 1 April, the couple

[7] To be eligible for NZS, a person must be a New Zealand citizen or permanent resident, and have been a resident and present in New Zealand for not less than 10 years since the age of 20, of which five years or more must be since the age of 50.

payment is adjusted upwards by the CPI inflation rate for the year to the preceding December with the provision that the result must lie between 65% and 73.5% of the net average wage. Without tax changes and real wage growth, this means that before long, the Superannuation payments increase with the growth rate of the net wage.

As outlined at the start of this Section, these parameters make modelling NZS aggregate spending relatively simple. From the last year in the forecast, grow out the amount by the growth rate of the numbers of people 65 and older and by the growth rate of the net average wage. This implicitly assumes that the proportions of people who are paid different amounts depending on living style and the proportion of people 65 and older claiming NZS remain constant.

6.4 Welfare

Welfare spending is going to be a tricky area to project as the country we are in the midst of changing the welfare system. Some of these changes may not have been enacted by the time the long-term fiscal report is finished next March. For now, we are using our set of assumptions for the main four benefits as in the 2012 Budget. We apply recent age breakdowns by males and females for those receiving the domestic purposes benefit, the invalid's benefit and the sickness benefit, combined with the population projection to provide a projection of numbers of people on these benefits. The growth rate of numbers on the unemployment benefit is derived from the growth of unemployment derived from the labour force projection and the unemployment rate.

Finny (2012) has surveyed New Zealand legislation and historical practice and it seems that these four main benefits have been indexed by CPI inflation from the early 1970s. This means that relative to the average wage or payments of Superannuation, the amounts paid in these benefits will grow smaller. Finny also found that to address this in some other countries' long-term projections the indexation assumption for welfare benefits is eventually boosted from inflation to to something closer to wage indexation (Canada, UK and some EU members).

To summarise, we assume the recent proportions on DPB, SB and IB will hold into the future and that the payments will be inflation indexed. Through time, the sustainability of this setting is likely to come under increasing political pressure.

As for the supplementary benefits (such as accommodation supplement, disability allowance, family tax credit, and other minor benefits), we assume these grow with inflation and the "target" population. Implicit in this is the assumption that there is an unchanged proportion of the target population that will receive the benefit in the future. For the accommodation supplement, disability allowance and minor supplementary benefits, the target population is all those 15 and older. The family support target population is people 18 and under.

The challenge for us is the sustainability of inflation indexing for these benefits. Some people could remain on the invalid's benefit, for a large proportion of their lives and this assumption will lead to a rise in poverty.

6.5 Law and order

The cost weighting for the corrections part of this area of spending is concentrated on males in their 20s (allowing for rapidly decreasing numbers at older ages). We assume

that 50% of the spending in this area is on imprisonment, while 25% is on home and other detention. For the more untargeted parts of the sector we assume that the population driver is everyone 15 and older. Overall, the other growth parameters follow the generic pattern described at the start of Section 6.

6.6 Others

The other non-finance spending – defence, transport and communications, economic and industrial services, primary services, heritage and culture, housing and community development, core government – are assumed to follow the growth patterns outlined above: public services productivity growth 0.3% a year, non-demographic volume growth 0.8% with demographic growth following that of the adult population.

7 Fiscal framing

The fiscal responsibility provisions of the Public Finance Act can also be viewed as an explicit contract, both state-to-state and state-to-citizens. It was a response to shocks (Britain going into the Common Market and the 1970s oil price shocks), unaffordable policies (Thing Big, supplementary minimum prices for sheep meat) and the inevitable consequence: huge external indebtedness and lower living standards. It reflected a resolve to never to be so exposed and vulnerable again. That was the reason the focus turned to debt as the fiscal anchor and successive governments concentrated on generating surpluses and paying off debt over the last quarter century.

Why would the next 25 years be any different? By simple extrapolations of existing policy, Treasury's past long-term projections have implicitly assumes governments would enter a new reckless phase, without recognising the overarching policy constraint of first the Fiscal Responsibility and now the Public Finance Acts. No modern government would be elected on a platform of running deficits and accumulating more and more debt outside a crisis.

The beauty of the PFA as an explicit contract is the openness and transparency it provides to citizens on the performance of governments against this contract. At the same time, it reflects a liberal democracy approach and provides governments with discretion within this constraint. It doesn't prescribe (or proscribe) different philosophical approaches to policy – as long as they can be afforded and don't create unsustainable obligations for the state in the future. So, all of this supports the use of net debt as our budget constraint in our long-term fiscal modelling (rather than "exploding debt" graphs).

7.1.1 Level of debt constraint

We have assumed a net debt constraint of 20% of GDP. Successive governments have worked down to this level in either gross or net terms. The current government is aiming to return the level of net debt to no higher than 20% of GDP by 2020.

Our constrained debt projection, therefore, shows the effects of long-term net debt constraint levels of 20% of GDP on the projected deficit in 2060. Bell (2012) also considers tighter and looser constraints of 10% and 30% of GDP to illustrate the work needed to reach each of these rather than 20%.

The final report will also show the effects of a GFC-type shock in, say, 2020 and how long it might take to wind net debt back to around 20% of GDP.

7.1.2 Forecast-projection transition issue

In past statements, we have used the full five years of the forecast (plus some occasional extensions to close the output gap) before starting the projections – amounting to one to two terms of government. So we have three options for starting points for the projections:

1 Cold start from the end of history

This involves starting the projections from the last official macro and fiscal outturns and meshing the fiscal projections in as best we can. This tells us something about the sustainability of the current fiscal position and of the demographic, economic and fiscal growth assumptions. It has the advantage of not relying on the fiscal plans of any current or future government. With no forecast at the front, we would avoid the confusion that arises about the difference between forecasts and projections and would considerably simplify the modelling. Current policy and assumptions also become clearer to state (macro parameters become single numbers, for example).

2 Start from the end of the latest five-year forecast

This is what we have done in the past. It has the advantage of having more time to close any fiscal gap. On the other hand, it depends on what could be a current government's optimistic fiscal forecasts at improving the fiscal position early on without any committed and detailed policy programme for actually doing this.

3 Start from around the end of the current parliamentary term

An intermediate position. This is the end of a current government's mandate for its fiscal strategy.

Subsequent work will look at these three options and we will choose one for the final set of projections.

8 Conclusion

The Public Finance Act requires the Treasury to be transparent about assumptions used in making long-term fiscal projections. This paper attempts to capture where we have got to in the demographic, economic, revenue, expenditure and framing assumptions.

These will undoubtedly change as we move through the next six months. We generally use Statistics New Zealand's demographic and labour force projections and these are being recast as stochastic projections. This new process requires setting mid-range assumptions and then provides a way of quantifying uncertainty around the projections. As a result, we may see a change in these central assumptions based on changes in recent trends in demographics, and labour force participation and research.

We are revisiting our economic and fiscal modelling and the assumptions behind the longer term projections. We now acknowledge more explicitly the policy decision making over the past 20 years have generally been taken to constraint debt and that looking ahead some kind of constraint should also apply even in the "unconstrained" scenario.

Key to our fiscal projections is how we treat the current policy or “cost-pressures” projection of health spending. Most spending areas outside health and NZS grow by less than GDP. So the major drivers of the long-term fiscal projections come down to Super, health and taxes. Yes, the others play a role in sustainability of the fiscal position, but most of the action is with the big three. We have still work to do on improving the modelling of health: tying down healthy ageing, and the distance to death issue for personal health. We need to do more thinking about disability services and how close this is to long-term care spending other countries report separately.

The final set of assumptions has to do with the role of debt constraint, where to shift to projections, and sensitivity assumptions around when and how much a repeat of the GFC would set back the sustainability of the long-term fiscal position.

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Appendix

Appendix Table 1 – Summary: Key modelling assumptions

Issue	Proposed view	Alternative view
Demography	(Note: SNZ publishes new projections on 19 July; they could alter these views)	
Fertility	Keep longer-term total fertility at 1.9 babies per woman as in 2009 (SNZ's medium assumption). At present NZ is around replacement rate, 2.1. 1.9 seems consistent with socioeconomic trends.	If Maori and Pasifika fertility rates do not converge to Pakeha levels, we could see a higher aggregate rate (eg, high=2.1). If these rates converge faster, then the rate might be closer to low=1.7.
Life expectancy	Official demographers and fund managers tend to underestimate life expectancy. SNZ medium projections look a little light against comparable countries (although different methods and different ethnic mixes make comparisons tricky.) Propose using a higher life expectancy assumption (perhaps SNZ's high case). Used medium case in 2009.	Problem with this is that the high case is not really stand-alone assumption, just a part of a bracketing exercise around the medium assumption. Alternative is to stay with medium life expectancy and use high life expectancy as a sensitivity test.
Net migration	Keep longer-term assumption of 10,000 (used in 2009)	5,000 on the grounds that competition by ageing countries will increase for migrants. The counter is that NZ likely to remain an attractive destination for migrants.
Economics	(Note: SNZ will publish new labour participation projections on 29 August)	
Labour productivity	We propose using 1.5% labour productivity growth as the base (as in 2009). Can come up with estimates above and below this. An ageing population could be lowering productivity growth. We proxied productivity by age group and gender using hourly wages and found that population ageing would bring productivity growth down by almost a half percentage point by 2060. We recommend using these fixed wage curves in the next projection.	A case could be made for a lower labour productivity growth rate nearer to 1%pa, based on the recent past. Could keep this constant over projection period as we have done in the past.

Labour force participation	Used medium case in 2009. SNZ has tendency to hold (Census-based) participation largely flat early on into its projection. This is particularly a problem with females 25-64. A partial solution would be to choose SNZ's high variant. We may have to set LT targets and do projections ourselves, if SNZ continues to flatten prime age participation from the start of our projection period.	Stay with medium participation projection on the high population case and use high participation as a sensitivity test. The problem with the proposed setting is that the high case is not really stand-alone, just a part of a bracketing exercise around the medium assumption.
Hours worked	We set hours at end-of-forecast level in 2009. Over past 25 years, population ageing has lowered average hours worked, but not by much. Population ageing will tend to lower aggregate hours worked. Using a current breakdown of hours by age group and gender and cross-multiplying by population would give average hours falling by 0.8h in 2060. Recommend we do this in the projection period.	Maintain set numbers of hours worked per week at end of forecast levels.
Inflation	In past, we've used 2%pa as the centre of the RBNZ policy band. We could maintain this, but there is a consistency problem in the accounts. The accountants, however, use 2.5% (derived from history), for example, to calculate their nominal discount rate, but add 1% productivity to 2.5% inflation to get 3.5% nominal age growth (LTFM calculation is 1.5%+2%=3.5%). So an inconsistency that needs to be tidied up!	Use higher inflation 2.5%. With real wage growth of 1.5% this gives nominal wage growth around 4%.
Other variables	As before: Government 5-year nominal bond rate set at 6% in long run (this serves as the rate for all bonds, and the discount rate); Unemployment rate of 4.5% of labour force is the stable-inflation trend rate.	

Tax and spending		
Tax	In the past, set LT tax-to-GDP ratios based on historic averages. The three modelled tax areas (source deductions, corporate tax and all other taxes) reach these ratios at different years of the projection depending on when fiscal drag is turned off and accessible corporate losses are used up. From 2022, at present, tax is at steady-state ratio of 28.7% of GDP.	An alternative is to set steady state ratios so that the tax-to-GDP value is higher than this.
	For 2013, we intend to adjust these ratios to reflect the likely mix changes resulting from population ageing.	The 2009 procedure did not change the tax mix to reflect population ageing.
Health “cost-pressures” track	Growth of non-demographic costs is a key assumption in our modelling, as it plays a large role in setting growth of "cost pressures" public health spending. This, in turn, plays a large role in setting the overall net debt track for the "cost pressures" scenario.	The issue here is how to set a less constrained growth factor as an alternative spending path for public health. Generally speaking, health spending in history is constrained. The 2009 assumption leads to far lower spending growth than we have seen over the past 30 years. As an alternative, we could maintain the 2009 assumption on the grounds that it reflects cost containment.
	In 2009, we assumed a non-demo cost growth of 1.7% pa by applying an across-the-board growth factor. This time, we are proposing to use non-demo cost growth of 2.4% for health. This better matches historic growth of the increase in scope and coverage of public health and aligns with international practice). These issues are being worked through with the Treasury Health Team, the Ministry and the Macro team. Depending on the outcome of these discussions, we may consider applying additional constraints from the past to future spending.	
	Changes to relative public health costs by age to account for healthy ageing and nearness to death: In 2009, relative cost curves were static. We are in the process of applying some dynamics to these curves so that for every year increase in life expectancy at 65 the cost curves shift out a year (ie assume healthy ageing on average, following an OECD approach). This will lower cost growth.	The alternative would be to leave the relative costs curves fixed at in 2009.
	We are also looking at isolating those who die in a particular year and applying DHB "last year of life" health costs to them. The effect of this is uncertain, at this point.	

Education “cost pressures” track	We are staying with the 2009 non-demographic cost growth assumption of 1.7% pa. Since 1950 seen this at about 3%. This covers changes in scope and rising participation in ECE, secondary and tertiary education, but this not likely will continue into the projection period (ie, no allowance has been made for rising tertiary participation, following international practice).	
Other public services “cost pressures” track	In 2009, assumed spending on these public services would maintain a broadly constant share of GDP. Propose maintaining this broad assumption. Spending excl. health, education, social welfare and finance costs falls as a share of GDP through to the early 1990s (reforms), stayed flat until 2004, rose during the “Cullen years” until 2008. We need to test the idea of an ageing dividend in justice sector spending.	
Welfare	Main benefits: In 2009, we indexed payments to CPI inflation and used fixed proportions of age and gender population groups receiving the main benefits to grow beneficiary numbers. We have not landed on assumptions on the effects of the reform package on beneficiary numbers, but this should be settled by July. CPI indexation of core benefits seems to be a reasonable assumption, but we may look at indexing other benefits (eg, accomm. supplement) at a different rate as they seem to be growing faster than GDP. We may also look at a different age-weighting for recipient numbers, to account for rising rates of older New Zealanders accessing AS, for example.	CPI-index all benefits. Alternatively, wage-index all benefits.