

The Treasury

Budget 2018 Information Release

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In preparing this Information Release, the Treasury has considered the public interest considerations in section 9(1) and section 18 of the Official Information Act.

Treasury Report: Budget 2018 Preliminary Economic and Tax Forecasts

Date:	27 February 2018	Report No:	T2018/364
		File Number:	BM-3-6-1

Action Sought

	Action Sought	Deadline
Minister of Finance (Hon Grant Robertson)	<p>Note the Treasury's preliminary Budget economic and tax revenue forecasts.</p> <p>Refer this report to the Associate Ministers of Finance</p>	Budget Matters meeting, Thursday 8 March 2018

Contact for Telephone Discussion (if required)

Name	Position	Telephone	1st Contact
Peter Mawson	Principal Advisor, Forecasting	[39]	N/A (mob) ✓
Peter Gardiner	Manager, Forecasting	[39]	[23] (mob)

Actions for the Minister's Office Staff (if required)

Return the signed report to the Treasury.
If agreed, **refer** a copy of this report to the Associate Ministers of Finance

Note any feedback on the quality of the report

Enclosure: No

Treasury Report: Budget 2018 Preliminary Economic and Tax Forecasts

Executive Summary

Preliminary *Budget Update* forecasts show a broadly similar cumulative outlook for nominal GDP, relative to the *Half Year Update*, when large revisions to historical GDP are accounted for. This reflects a slightly weaker near term growth outlook followed by stronger growth later in the forecast period. Tax revenue forecasts follow this broad pattern of modestly weaker near term growth followed by slightly stronger growth in later years, but are also influenced by the judgement that the current strength in tax relative to the *Half Year Update* is likely to persist. Over the 5 years to June 2022 tax revenue is forecast to be a cumulative \$3.4 billion higher than previously forecast.

Table 1 provides a summary of key forecast variables and a comparison to the *Half Year Update* forecasts.

Table 1: Forecast Summary

		2017	2018	2019	2020	2021	2022	5-year total
June years		Actual	Forecast	Forecast	Forecast	Forecast	Forecast	
Economic growth ¹	Half Year	2.7	2.9	3.6	3.0	2.6	2.1	
	Budget	3.3	2.9	3.3	3.5	2.8	2.3	
Economic growth per capita ¹	Half Year	0.6	0.9	1.7	1.4	1.4	1.1	
	Budget	1.2	0.9	1.3	1.9	1.4	1.1	
Unemployment rate ²	Half Year	4.8	4.6	4.4	4.2	4.0	4.1	
	Budget	4.8	4.6	4.3	4.1	4.0	4.1	
CPI inflation ³	Half Year	1.7	2.0	1.9	2.1	2.2	2.2	
	Budget	1.7	1.6	1.6	2.0	2.1	2.2	
Current account balance ⁴	Half Year	-2.9	-2.1	-2.3	-2.7	-3.3	-3.9	
	Budget	-2.8	-2.6	-3.0	-2.8	-3.0	-3.0	
Nominal GDP ⁵	Half Year	5.8	5.0	5.3	5.0	4.8	4.2	
	Budget	6.2	5.4	4.6	5.5	4.9	4.5	
Nominal GDP (\$billions)	Half Year	268.0	281.4	296.2	311.0	325.9	339.6	
	Budget	273.8	288.5	301.7	318.2	333.6	348.6	
	change	5.8	7.1	5.5	7.2	7.8	8.9	36.4
	adj. change⁶		0.0	-1.6	0.1	0.6	1.8	0.9
Tax revenue (\$billions)	Half Year	75.6	78.2	82.8	87.8	93.0	97.8	
	Budget	75.6	79.4	83.1	88.0	93.5	99.0	
	change	0.0	1.2	0.3	0.2	0.5	1.2	3.4

1. Production GDP, annual average % change 2. June quarter 3. Annual % change 4. Annual as % of GDP

5. Expenditure measure 6. change adjusted for starting point revisions to historical GDP data

Economic data has been broadly in line with the *Half Year Update*, with GDP growth very close to forecast. Revisions to historic GDP data mean that annual growth in real GDP has generally been in the 3.5% to 4.0% range over most of the past three years, whereas previously it was generally thought to be in the 2.5% to 3.5% range. While growth has been revised up, there is now evidence of a slightly greater slowing in growth over the past year.

Areas that have deviated somewhat from that expected in the *Half Year Update* include inflation developments and weather conditions. Inflation was weaker than expected in the December quarter and has contributed to markets pushing out their expected timing of the first increase in the Official Cash Rate to the first half of 2019. Weather conditions are likely, on balance, to have caused some disruption to agricultural production, contributing to softer near term growth but a recovery as growing conditions return to normal.

The global outlook remains positive with consensus forecasts revised slightly higher, with falls in global share markets in early February assumed to reflect market volatility rather than foreshadowing a material shift in the outlook for real activity.

Domestically, real GDP growth is forecast to remain around 2.9% throughout 2018 before peaking at 3.7% in late 2019, and then easing to 2.3% in 2022. For the five years to 2022, growth averages 3.0% per annum, similar to the *Half Year Update* average of 2.9%, reflecting that the key drivers of growth are largely unchanged outside of some initial weakness in part related to unfavourable climatic conditions, as well as an increase in the end of forecast annual migration assumption from 15,000 to 25,000.

Recent weakness in inflation and moderately weaker GDP growth in the near term results in a softer inflation outlook with inflation gradually rising to 2.0% by mid 2020.

The Treasury uses a macroeconomic model of the New Zealand economy to help produce economic forecasts. During this forecast round we have shifted to a new macroeconomic model. The change in model has not created any significant issues or changes at the aggregate level, including for forecasts of GDP and unemployment, with the outlook for the unemployment rate similar to the *Half Year Update*, reaching a low of 4.0% in late 2020. Perhaps the most noticeable change is in the current account deficit, where the use of the new model has led us to revise up our views on export growth, and contributed to less of a widening in the forecast deficit later in the forecast period.

Over the five years to June 2022, tax revenue is forecast to be a cumulative \$3.4 billion higher than previously forecast. \$2.4 billion of this upward revision across the five-year forecast period is directly attributable to the current strength in tax revenue, relative to the *Half Year Update* forecast. A further \$1.5 billion has come from changes in the composition of forecast GDP, while a lower outlook for deposit interest rates has reduced forecasts of resident withholding tax (RWT) on interest by \$0.6 billion.

The forecasts assume a fairly stable outlook for world growth, with growth in our top 16 trading partners in the 3.5% to 3.8% range throughout the forecast period. Should the global economy significantly deviate from this assumption, the New Zealand economy would be impacted via a range of channels, including demand for exports, global commodity price movements and shifts in financial conditions and asset prices.

Domestic risks include the weather and its effect on agricultural production; the risk that net migration is materially different than assumed; house price developments and relatedly the behaviour of households, including their response to eventually higher interest rates; the risk that falls in confidence have more of an impact on firm activity than anticipated; and the extent to which growth in industries such as construction is limited by capacity constraints.

Recommended Action

We recommend that you:

a **note** the Treasury's preliminary economic and tax forecasts prior to the Budget Matters meeting on Thursday 8 March.

b **refer** this report to:

- Hon David Clark, Associate Minister of Finance

Refer/not referred.

- Hon David Parker, Associate Minister of Finance

Refer/not referred.

- Hon Shane Jones, Associate Minister of Finance

Refer/not referred.

- Hon James Shaw, Associate Minister of Finance

Refer/not referred.

Peter Gardiner
Manager, Forecasting

Hon Grant Robertson
Minister of Finance

Treasury Report: Budget 2018 Preliminary Economic and Tax Forecasts

Purpose of Report

1. This report provides an overview of the Treasury's preliminary Budget 2018 economic and tax forecasts. The Treasury produces two sets of economic and tax forecasts as part of the Budget process. The forecasts cover the period through to June 2022. The first, preliminary set of economic forecasts underpins our preliminary forecasts of tax revenue and are used by several other departments as the basis for producing their fiscal forecasts. These fiscal forecasts are then aggregated to form an overall set of preliminary fiscal forecasts, which include the main operating balance and debt forecasts. Officials will be available to discuss the preliminary economic and tax forecasts at the Budget Matters meeting on 8 March.
2. A report on the preliminary fiscal forecasts will be provided to you during the week beginning 19 March and we will use this information to inform our advice on overall fiscal strategy and recommended Budget allowances on 22 March, ahead of you taking Budget decisions. Following this, a final set of economic and fiscal forecasts will be produced that include updated fiscal decisions taken in Budget Ministers meetings 3 and 4, as well as incorporating economic data and other information released after the preliminary forecasts were completed.
3. In preparing the preliminary economic forecasts the Treasury has used a new macroeconomic model. The new model, Matai, replaces the New Zealand Treasury Model (NZTM) that has been used for the past 12 years. The new model has been developed to help overcome key person risk and further move our forecasting system away from being reliant on software that is no longer widely used.
4. Annex 2 to this report contains further summary information about the new model. Our forecasting approach involves considerable judgement alongside the use of technical models. This, combined with the relatively small magnitude of the change in the overall nominal gross domestic product (GDP) forecast since the *Half Year Update*, means we do not believe that changing the model has had a large influence on the economic forecasts as a whole and therefore is not unduly influencing the fiscal forecasts. This view is also supported by nominal GDP forecasts from a dual forecast run using the previous model, not being significantly different to those presented in this report.

Economic developments

5. Since the *Half Year Update* forecasts were finalised economic data has been broadly in line with forecast. Real GDP growth in the September 2017 quarter of 0.6% matched forecast; quarterly nominal GDP growth of 2.3% was close to the forecast of 2.2%; and the annual current account deficit narrowed to 2.6% of GDP (compared to a forecast 2.5%).

6. In the labour market, quarterly employment growth of 0.5% for the December 2017 quarter built on the exceptionally strong 2.2% growth experienced in the September quarter and contributed to a small fall in the unemployment rate to 4.5% (Figure 1). This was slightly below the 4.6% forecast in the *Half Year Update*, which allowed for the possibility of a degree of data volatility following the unusually strong September quarter employment result.
7. Wage growth measures have been mixed with the Quarterly Employment Survey showing a faster than expected pickup in wage growth of 1.0% in the December 2017 quarter and 3.1% for the year, the fastest pace of growth in nearly 6 years, while Labour Cost Index measures were more subdued. Despite stronger than forecast growth in hourly wages, annual growth in weekly wages of 3.3% was close to the 3.2% forecast, with lower than forecast weekly hours providing the offset.

Figure 1: Unemployment and participation rates

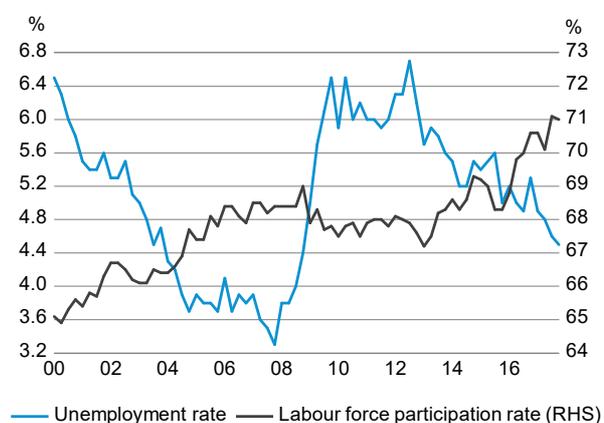
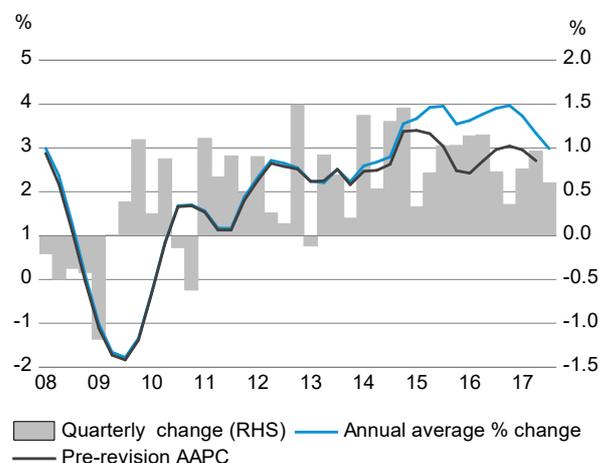


Figure 2: Real GDP growth



8. While September quarter GDP growth was in line with expectations, there were large historical revisions. Revisions to GDP data are common in the September quarter as Statistics New Zealand aligns the quarterly data with their latest annual data release. Annual GDP measures are based on more comprehensive sets of data but are less timely than the quarterly estimates. The revisions were, however, larger than normal, with nominal GDP in the year to June 2017 revised up by \$5.8 billion or 2.2%.¹
9. The revisions to GDP data meant that annual average real GDP growth was stronger than expected at 3.0%. Annual average growth is estimated to have peaked at 4.0% in December 2016 and was generally in the 3.5% to 4.0% range over most of the past three years, whereas previously it was generally in the 2.5% to 3.5% range (Figure 2). These upward revisions also flow through to higher estimates of GDP per capita and productivity growth, including in the latest annual productivity data released on 22 February. This is because while output has been revised up, population and labour input estimates have not.

¹ Annual GDP data for the year to March 2017 was released in November after the *Half Year Update* economic forecasts were finalised but before publication of the *Half Year Update*. To better reflect the likely level of nominal GDP in fiscal ratios we used a scaled version of the nominal GDP forecast based on the \$4.7 billion difference between the Annual GDP figures and the quarterly GDP data that was available at the time. As a result the great majority of the impact of the GDP revisions has already been reflected in the ratios such as debt to GDP.

10. While growth over the past four years is now thought to be higher than previously estimated, it also appears to have slowed a little more rapidly with annual average growth falling 1 percentage point from 4.0% at the end of 2016 to 3.0% in September 2017, possibly indicating less near term momentum in growth.
11. After hovering near 2.0% over most of 2017, annual Consumers Price Index inflation was unexpectedly weak in December with annual inflation falling to 1.6%. Inflation is likely to ease further as the impact of earlier petrol price increases drop out of the annual calculation, and some policy changes (including around tertiary education) are expected to result in low inflation in the March 2018 quarter. Markets responded to the weaker inflation result by pushing out the date for which they have fully priced in an increase in the OCR from the end of 2018, to the first half of 2019.
12. Growth indicators for the December quarter have been mixed. Measures of consumer confidence and business confidence fell in the December quarter. However, electronic cards transactions have been solid, and consumer confidence appears to have recovered somewhat in January suggesting ongoing consumption growth. Dwelling consents rebounded in the September quarter and are expected to underpin an increase in building activity in the December quarter. The implications for actual economic activity from the falls in business confidence are less clear cut. It is likely that some of the falls relate to uncertainty during the post-election period as well as the political attitudes of business managers as falls in the outlook for firms' own activity have not been quite as large. Nevertheless, it also follows a period in which growth has been slowing, admittedly from higher than previously thought rates.
13. Weather extremes are likely to be, on balance, slightly negative for growth over the first half of 2018. Milk production was down nearly 6% in the months of December and January from the same two months a year ago and is shaping up to be weaker than expected over the remainder of the season, which will impinge on exports. The impact of lower dairy production in the December quarter is likely to be offset by a strong lift in meat processing and meat exports. However, this represents a timing effect as higher slaughter in December is likely to have been driven by farmers destocking in response to poor pasture growth and therefore implies lower production in early 2018.
14. Growth among New Zealand's major trading partners strengthened over 2017, rising to 3.8% from 3.4% in 2016, driven by stronger growth in China, the US and the euro area. Consensus forecasts for 2018 and 2019 have been revised higher since the *Half Year Update*. Higher energy prices had seen inflation picking up in many countries over 2017, although this inflationary impulse has started to dissipate as oil prices have fallen since the start of the year. Core inflation has remained low. Growth is expected to be sufficient to see spare capacity reduce somewhat further and therefore see a gradual increase in core inflation. Until events in the first half of February, when United States and then global share markets fell sharply on concerns of rising interest rates, financial market volatility had been low.

Economic and Tax Outlook

15. The outlook for nominal GDP is the key driver of our forecasts for tax revenue. Nominal GDP is forecast to be a cumulative \$36 billion higher than forecast in the *Half Year Update* over the five years to June 2022. Most of this difference is explained by revisions to starting GDP. Once the \$1.8 billion revision to June 2017 quarter GDP is allowed for then the effective cumulative difference between the two sets of forecasts is less than \$1 billion (or less than 0.1%), Figure 3.

Figure 3: Nominal GDP

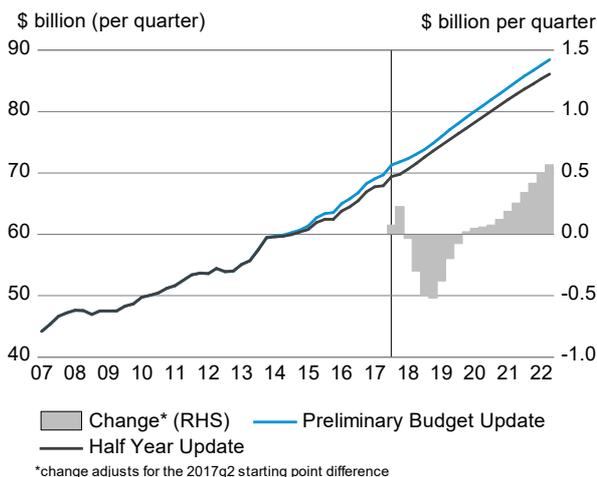
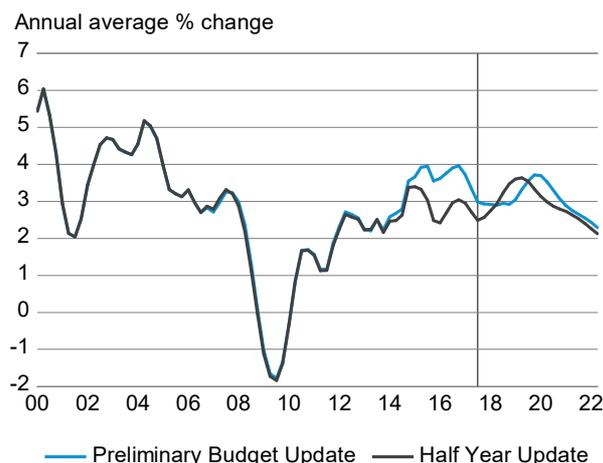


Figure 4: Real GDP growth



16. This minimal change to the outlook for nominal GDP reflects an outlook for real activity growth that is a little softer over 2018, but a little stronger from late 2019 (Figure 4), combined with a weaker inflation outlook, particularly in the near term. A slightly higher terms of trade in the final three years of the forecast period also supports nominal GDP.
17. We expect annual average real GDP growth to remain around current levels of around 2.9% throughout 2018. This represents modestly weaker quarterly growth relative to the *Half Year Update* owing to both less favourable conditions for agricultural production as well as reflecting some of the slowing momentum in GDP growth evident in the revised GDP data.
18. The broad drivers influencing the growth outlook remain similar to those in the *Half Year Update*. Migration continues to add to the population and therefore economic activity but is assumed to ease and therefore provide less of a growth impetus over time. However, we have revised up our end of forecast annual migration assumption from 15,000 to 25,000. Interest rates remain low and, reflecting a more muted inflation outlook, are expected to begin increasing around the middle of 2019 – later than in the *Half Year Update*.

19. The Families Package supports household incomes from the second half of 2018, supporting household spending. KiwiBuild contributes to an acceleration in residential investment, particularly in the second half of the forecast period and, as was the case in the *Half Year Update*, is assumed to add a little over \$5 billion to nominal residential investment over the forecast period. Real GDP growth is forecast to peak at 3.7% in late 2019 – a similar but later peak to the *Half Year Update*. Growth is then forecast to slow as population gains from migration ease and as interest rates increase to contain rising inflation pressures. Relative to the *Half Year Update*, the higher end-of-forecast migration assumption supports slightly faster aggregate GDP growth in the final two years of the forecast period.
20. For the five years to 2022, real GDP growth averages 3.0% per annum, similar to the *Half Year Update* average of 2.9%. The small increase reflects stronger population growth from the higher migration assumption, with average real GDP per capita growth of 1.3% per annum matching the *Half Year Update*.
21. The forecast inflation profile is a little softer than in the *Half Year Update* (Figure 5), reflecting slightly weaker demand pressures in the near term, owing to the slightly weaker near term growth, combined with indications from the revised GDP data that the economy can accommodate faster growth without generating excessive inflation (i.e. potential output is higher). This weakness also influences inflation expectations, which act to dampen future inflation. A higher exchange rate also results in less tradables inflation.

Figure 5: CPI inflation

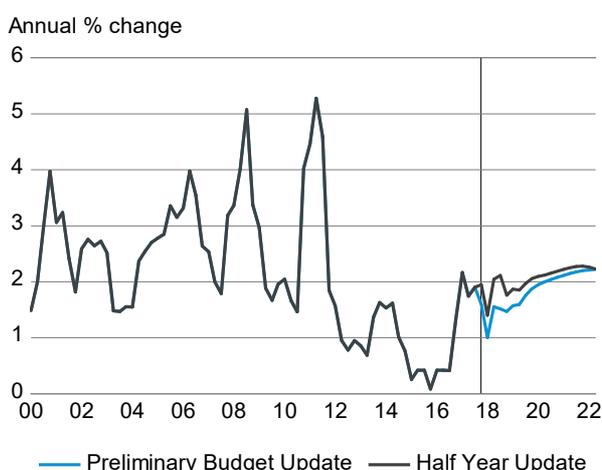
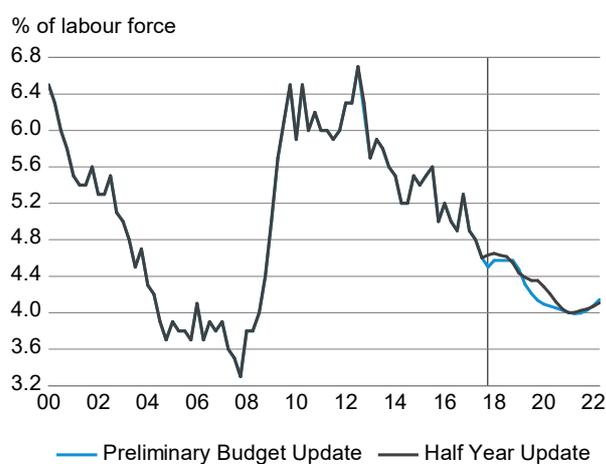


Figure 6: Unemployment



22. The forecast profile for economic growth is consistent with ongoing growth in employment and declines in the unemployment rate (Figure 6). Similar to the *Half Year Update*, we forecast a relatively flat unemployment rate over 2018 as employment growth approximately balances growth in the labour force, stemming from population growth as well as a participation rate that remains around historic highs.
23. The unemployment rate is forecast to then fall towards 4% by late 2020. Employment growth is expected to slow as economic growth slows but is nevertheless slightly stronger over the later part of the forecast period relative to the *Half Year Update* owing to the slightly stronger outlook for activity during this period. This stronger employment growth absorbs the modestly stronger labour force growth that results from an assumption that labour force participation is likely to remain close to current levels, as well as higher population growth from

the revised migration assumption. As a result, the unemployment rate is predicted to end the forecast period at a similar level to that forecast in the *Half Year Update*.

24. The outlook for the current account is an area where we have made some change relative to the *Half Year Update* (Figure 7). Over the next year, weaker agricultural production growth hampers export values, while import growth appears to have risen to meet growing domestic demand. This initially sees less of an improvement in the current account deficit than was forecast in the *Half Year Update*. However, a stronger trend for exports in the new forecast model combined with a lower import share of GDP apparent in the revised GDP data means that the current account deficit is not expected to widen as much over the remainder of the forecast period, remaining around 3% of GDP. This contrasts to the *Half Year Update* where the current account deficit widened to close to 4% of GDP. The stronger export forecast is consistent with the relatively positive outlook for trading partner growth.

Figure 7: Current account

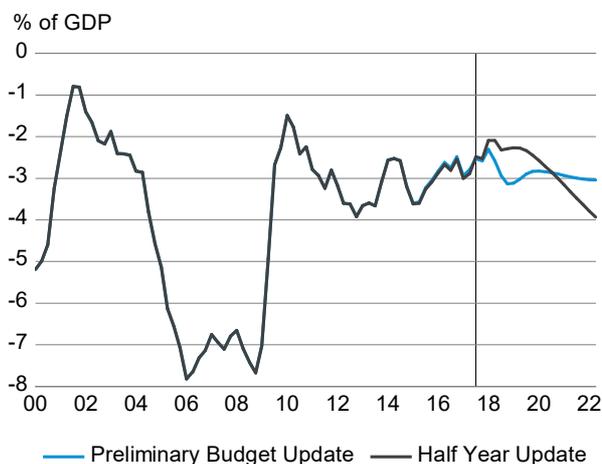
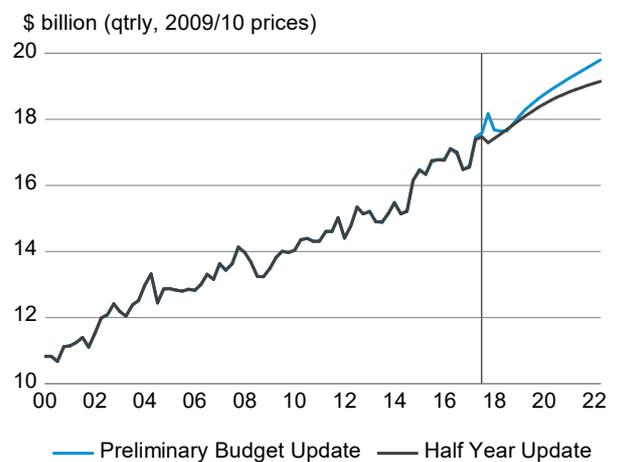


Figure 8: Real exports



25. In contrast to nominal GDP that has been broadly in line with forecast, tax revenue has been particularly strong. For the seven months to January 2018, core Crown tax revenue was \$0.9 billion (2.1%) above the *Half Year Update* forecast, with source deductions² and GST revenue each \$0.3 billion above forecast and customs and excise duties \$0.2 billion above forecast. Some judgement was therefore required in the compilation of the tax forecasts, to reconcile recent tax outturns with the revised macroeconomic outlook.
26. Firstly, a -\$0.2 billion per annum adjustment to PAYE revenue forecasts that was included in the *Half Year Update* has been removed. This negative adjustment was included in the Half Year forecasts to partly 'look through' exceptionally strong September employment growth given the perceived risk that it could partly reflect survey noise. Rather than seeing any fall back, subsequent labour market data and PAYE outturns appear to support the strength of the labour market. The preliminary Budget source deductions forecasts are now fully consistent with the employment forecast, resulting in an increase of \$0.3 billion in the source deduction forecast for the 2017/18 year.

² Source deductions are pay-as-you-earn (PAYE) tax deducted from salary and wage income, and Employer Superannuation Contribution Tax (ESCT) deducted from employer contributions to registered superannuation schemes.

27. In a similar vein, the GST forecast for 2017/18 has been increased by \$0.4 billion, mainly owing to a higher outlook for growth in residential investment in the current year.

Table 2: Change in core Crown tax revenue forecasts since 2017 HYEFU

June years, \$ billions	2017	2018	2019	2020	2021	2022	5-yr totals
2017 HYEFU	75.6	78.2	82.8	87.8	93.0	97.8	
% of GDP	28.2	27.8	28.0	28.2	28.5	28.8	
<i>Forecasting changes by tax type:</i>							
Source deductions	-	+0.3	+0.3	+0.4	+0.6	+0.7	+2.3
GST	-	+0.4	+0.2	+0.1	+0.2	+0.4	+1.3
Net other persons tax	-	+0.1	+0.1	+0.2	+0.3	+0.3	+1.0
Corporate tax	-	+0.3	-0.2	-0.2	-0.2	-0.1	-0.4
RWT on interest	-	-	-0.1	-0.3	-0.2	-0.1	-0.7
All other taxes	-	+0.1	-	-	-0.2	-	-0.1
Total change	-	+1.2	+0.3	+0.2	+0.5	+1.2	+3.4
2018 Budget Update	75.6	79.4	83.1	88.0	93.5	99.0	
% of GDP	27.6	27.5	27.5	27.7	28.0	28.4	

28. From the 2019 June year onwards, the changes in the tax forecasts broadly follow changes in the macroeconomic forecasts, namely:
- a stronger forecast for growth in total employees' compensation has raised the source deductions forecast through all forecast years;
 - the GST forecasts have been increased owing to recent GST outturns and the stronger initial outlook for residential investment, tempered a little by a reduced outlook for nominal consumption growth through the middle years of the forecast period;
 - a higher forecast for growth in entrepreneurial income has pushed the forecasts of net other persons tax³ a little higher; but
 - slower forecast growth for operating surplus in the June 2019 year has reduced the corporate tax forecasts a little in that year and all subsequent years; and
 - a softer outlook for deposit interest rates has reduced the forecasts of RWT on interest, particularly through 2020 and 2021.
29. The tax revenue forecasts above were calculated as at 23 February. They will almost certainly change prior to finalisation of the preliminary Budget fiscal forecasts in mid-March, as more information from departments is collected and aggregated, particularly with respect to GST.

³ Net other persons tax includes income tax paid by unincorporated taxpayers such as sole-traders, trusts, clubs and societies, less tax refunds paid to all individuals, including salary and wage earners.

30. Inland Revenue has also prepared a set of tax forecasts, based on the Treasury's macroeconomic forecasts, but using a different set of forecasting models and judgements. Across the five years of the forecast period, Inland Revenue's forecasts are generally higher than the Treasury's, but the difference is very small, just 0.2% of total forecast tax revenue.

Table 3: The Treasury and Inland Revenue core Crown tax revenue forecasts

June years, \$ billions	2018	2019	2020	2021	2022	5-yr total
Treasury forecast	79.4	83.1	88.0	93.5	99.0	
Inland Revenue forecast	79.5	83.6	88.3	93.7	98.8	
<i>Treasury less Inland Revenue</i>	-0.1	-0.5	-0.3	-0.2	+0.2	-0.9
<i>Percentage difference</i>	-0.1%	-0.6%	-0.3%	-0.2%	0.2%	-0.2%

Risks

31. New Zealand's economic performance is affected by global economic conditions. The forecasts assume a fairly stable outlook for world growth, with growth in our top 16 trading partners in the 3.5% to 3.8% range throughout the forecast period. Should the global economy significantly deviate from this assumption, the New Zealand economy would be impacted via a range of channels. These channels include demand for exports, global commodity price movements and shifts in financial conditions and asset prices. Recent movements in equity markets highlight that swings in sentiment can occur even in an environment where developments are otherwise relatively positive, i.e., the falls in equity markets were in response to the risk of interest rate increases, but interest rate increases are being considered because of the strength in the US economy.
32. Domestically there are a range of risks that could result in either faster or slower growth. These risks include:
- weather-related risks;
 - the risk that net migration is materially different than assumed;
 - house price developments and relatedly the behaviour of households including their response to eventually higher interest rates;
 - the risk that falls in confidence have more of an impact on firm activity than anticipated; and
 - the extent to which growth in industries such as construction is limited by capacity constraints.
33. Variable weather, ranging from extremely dry to extremely wet, has influenced the near term outlook for agricultural production and the economy. We assume that growing conditions return to normal and this contributes to a pick up in both production and exports as the year progresses. There is uncertainty associated with the magnitude of these effects, which on balance we anticipate are relatively small. Further adverse weather, such as widespread drought would hamper production. From an economy-wide perspective, there is often a partial offset to

lower production as a result of higher prices for commodities that are in shorter supply. Nevertheless, the overall impact tends to be negative.

34. While we have revised up our end of forecast annual migration assumption by 10,000 people to 25,000 there remains the risk that net migration may contribute more to population growth than assumed and therefore support higher levels of demand.
35. The forecasts include strong residential investment growth which plays a role in limiting house price inflation. Other factors include the high current level of prices and rising interest rates. Should prices rise more rapidly this could promote stronger consumption growth. Alternatively, any rapid correction could adversely impact on consumer confidence and spending.
36. As noted in the *Half Year Update* we assume that there will be a range of policies designed to alleviate capacity constraints that allow residential investment to accelerate over the later part of the forecast period. These policies could be more effective than assumed and mean that aggregate residential investment expands faster to meet the demand created by KiwiBuild. Conversely, constraints may have a more prolonged impact and it could take longer until policies take effect.
37. The response of households to eventual increases in interest rates is another area of uncertainty. For some borrowers this will represent their first experience of a tightening cycle. We assume that household saving behaviour is broadly balanced, with neither strong rates of dissaving nor large rates of debt repayment in aggregate. A greater focus on debt repayment could dampen consumption growth.
38. If the above risks were to eventuate, real activity as well as nominal GDP could be higher/lower than forecast and result in higher/lower tax revenue. In addition there are risks associated with judgements that are particular to the tax forecast. A key assumption is that recent strength in tax revenue outturns is likely to persist.

Annex 1: Forecast Summary Tables

Summary of Preliminary Economic Forecasts – June years (Annual Average percentage change, unless specified otherwise)

June Years	2014	2015	2016	2017	2018	2019	2020	2021	2022
					Forecast	Forecast	Forecast	Forecast	Forecast
Private consumption	3.5	3.4	4.3	5.0	3.5	3.3	2.9	2.5	2.4
Public consumption	2.9	3.3	1.5	3.0	3.5	1.2	1.0	1.0	0.7
TOTAL CONSUMPTION	3.4	3.4	3.6	4.5	3.5	2.8	2.5	2.2	2.0
Residential investment	13.1	6.4	10.6	4.9	4.5	1.5	6.4	8.1	4.2
Business investment*	9.5	7.3	3.8	3.9	5.1	5.2	7.2	4.0	2.9
TOTAL INVESTMENT	10.4	7.1	5.5	4.1	4.9	4.2	7.0	5.1	3.3
Stocks (contribution to GDP growth)	0.4	-0.0	-0.4	0.2	-0.7	0.7	-0.0	-0.0	-0.0
GROSS NATIONAL EXPENDITURE	4.8	4.0	3.6	4.5	3.5	3.8	3.6	2.9	2.3
Exports	0.1	5.8	5.0	0.1	5.3	1.2	3.9	2.7	2.3
Imports	9.0	6.6	1.0	6.1	6.5	2.5	4.0	3.1	2.4
EXPENDITURE ON GDP	2.3	3.9	4.6	3.0	3.3	3.2	3.5	2.7	2.3
GDP (PRODUCTION MEASURE)	2.7	3.9	3.8	3.3	2.9	3.3	3.5	2.8	2.3
- annual % change, June quarter	2.8	3.8	4.4	2.8	2.7	3.8	3.1	2.6	2.0
Other Output Measures									
Real Gross National Disposable Income	6.2	2.8	3.8	4.6	3.5	3.3	3.8	2.7	2.2
Nominal GDP (Expenditure Basis)	8.2	3.5	5.2	6.2	5.4	4.6	5.5	4.9	4.5
Output gap (June qtr, % of potential)	-1.4	-0.6	0.5	0.2	-0.1	0.7	1.0	1.0	0.6
Per Capita Output Measures									
Real GDP per capita (Production basis)	1.5	2.1	1.7	1.2	0.9	1.3	1.9	1.4	1.1
Real Gross Nat. Disp Income per capita	5.0	1.0	1.7	2.4	1.5	1.3	2.1	1.3	1.0
Nominal GDP per capita (Expenditure basis)	7.0	1.7	3.1	4.0	3.3	2.6	3.7	3.4	3.2
Labour Market									
Employment	3.2	3.2	2.3	5.2	3.7	1.8	2.0	1.6	1.3
Unemployment Rate (June quarter)	5.2	5.5	5.0	4.8	4.6	4.3	4.1	4.0	4.1
Labour Productivity (Hours worked basis)	-0.5	1.2	0.8	-1.6	-0.7	1.6	1.5	1.3	1.2
Wages (QES average hourly ord time earnings, APC)	2.5	2.7	2.1	1.6	3.2	2.7	3.1	3.3	3.3
Unit Labour Costs (Hours worked basis)	3.2	1.2	1.5	3.2	3.7	1.2	1.4	1.9	2.1
Monetary Conditions									
90-day Bank Bill Rate (June quarter ave)	3.4	3.5	2.4	2.0	1.9	1.9	3.3	4.0	4.3
10-year Bond Rate (June quarter ave)	4.4	3.6	2.7	2.9	3.0	3.1	3.8	4.2	4.4
TWI (June quarter ave)	81.5	76.2	73.6	76.5	75.1	75.0	75.2	75.1	74.9
- annual % change (June quarter)	6.9	-6.5	-3.4	3.9	-1.9	-0.1	0.3	-0.2	-0.3
Price Measures									
CPI Inflation (ann % change, June quarter)	1.6	0.4	0.4	1.7	1.6	1.6	2.0	2.1	2.2
Consumption Deflator	1.0	0.6	0.8	0.9	1.3	1.6	1.6	1.8	1.9
GDP Deflator	5.7	-0.3	0.6	3.2	2.0	1.3	1.9	2.1	2.2
House Price Inflation (ann % change, June qtr)	6.9	11.2	14.0	5.5	6.2	3.8	2.6	3.4	3.4
Key Balances									
Current account balance (\$ million)	-5,966	-8,744	-6,760	-7,643	-7,444	-9,096	-9,051	-9,878	-10,606
Current account balance (% of GDP)	-2.5	-3.6	-2.6	-2.8	-2.6	-3.0	-2.8	-3.0	-3.0
Terms of Trade (goods) - SNA Basis	16.4	-4.7	-2.7	4.9	3.5	0.1	1.2	0.4	0.2
Household saving ratio (% of HHDl, March yr)	0.1	-1.5	-1.3	-2.8	-1.6	-0.3	0.1	0.7	0.9

* Total investment excluding residential

Change in Economic Forecasts from Half Year 2017 – June years (Annual Average percentage change, unless specified otherwise)

June Years	2014	2015	2016	2017	2018	2019	2020	2021	2022
					Forecast	Forecast	Forecast	Forecast	Forecast
Private consumption	0.2	0.3	1.1	0.3	0.6	-0.2	-0.2	-0.1	0.1
Public consumption	0.0	0.2	-0.3	-0.4	0.7	-0.7	-0.0	-0.0	-0.0
TOTAL CONSUMPTION	0.1	0.3	0.8	0.1	0.6	-0.3	-0.2	-0.0	0.1
Residential investment	-0.5	0.8	4.3	-1.4	6.0	-1.5	0.2	0.2	-0.2
Business investment*	0.7	2.0	1.2	-0.1	-1.0	-0.3	1.2	-1.1	-1.2
TOTAL INVESTMENT	0.4	1.7	1.9	-0.4	0.9	-0.7	1.0	-0.7	-1.0
Stocks (contribution to GDP growth)	0.0	0.0	-0.0	0.1	0.0	0.4	-0.2	-0.3	-0.3
GROSS NATIONAL EXPENDITURE	0.2	0.6	0.9	0.2	0.7	-0.2	-0.2	-0.5	-0.4
Exports	-0.0	-0.0	-0.0	0.1	1.9	-1.5	1.1	0.6	0.9
Imports	0.0	0.0	0.0	0.0	3.8	-0.8	-1.0	-1.2	-0.9
EXPENDITURE ON GDP	0.2	0.6	0.9	0.2	0.3	-0.4	0.5	0.1	0.2
GDP (PRODUCTION MEASURE)	0.2	0.6	1.1	0.6	-0.0	-0.3	0.5	0.1	0.2
- annual % change, June quarter	0.1	1.4	0.9	0.3	-0.6	0.4	0.3	0.1	0.1
Other Output Measures									
Real Gross National Disposable Income	0.2	0.6	1.1	0.6	-0.4	-0.2	0.7	0.2	0.3
Nominal GDP (Expenditure Basis)	0.2	0.6	1.0	0.4	0.4	-0.7	0.5	0.1	0.3
Per Capita Output Measures									
Real GDP per capita (Production basis)	0.2	0.6	1.1	0.6	-0.0	-0.4	0.4	-0.0	-0.1
Real Gross Nat. Disp Income per capita	0.2	0.6	1.1	0.6	-0.4	-0.3	0.6	0.0	0.0
Nominal GDP per capita (Expenditure basis)	0.2	0.6	1.0	0.4	0.4	-0.7	0.4	-0.1	0.0
Labour Market									
Employment	0.0	0.0	0.0	-0.0	0.4	-0.1	0.5	0.3	0.3
Unemployment Rate (June quarter)	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.0	0.0
Labour Productivity (Hours worked basis)	0.2	0.6	1.0	0.6	0.1	-0.4	-0.2	-0.2	-0.2
Wages (QES average hourly ord time earnings, APC)	-0.0	-0.0	-0.0	-0.0	0.4	-0.5	-0.2	-0.1	-0.2
Unit Labour Costs (Hours worked basis)	-0.2	-0.6	-1.1	-0.6	0.3	0.1	-0.1	0.1	-0.0
Monetary Conditions									
90-day Bank Bill Rate (June quarter ave)	0.0	0.0	0.0	-0.0	-0.1	-0.5	-0.3	-0.1	0.1
10-year Bond Rate (June quarter ave)	0.0	0.0	0.0	0.0	0.0	-0.3	-0.1	-0.0	0.1
TWI (June quarter ave)	0.0	0.0	0.0	-0.0	1.3	1.2	1.4	1.3	1.1
- annual % change, June quarter	0.0	0.0	0.0	-0.0	1.6	-0.1	0.3	-0.2	-0.3
Price Measures									
CPI Inflation (ann % change, June quarter)	-0.0	-0.0	0.0	-0.0	-0.5	-0.3	-0.1	-0.1	-0.0
Consumption Deflator	0.0	0.1	-0.0	0.0	-0.4	0.0	0.0	0.0	0.2
GDP Deflator	0.0	-0.0	0.1	0.1	0.1	-0.2	-0.1	-0.0	0.1
House Price Inflation (ann % change, June quarter)	-0.0	-0.0	0.0	0.3	4.1	1.4	0.4	1.4	1.4
Key Balances									
Current account balance (\$ million)	5	12	16	109	-1,563	-2,357	-625	926	2,738
Current account balance (% of GDP)	0.0	0.0	0.1	0.1	-0.5	-0.7	-0.1	0.4	0.9
Terms of Trade - SNA Basis	0.0	0.0	-0.0	-0.2	-0.7	1.0	0.8	0.1	0.1
Household saving ratio (% of HHDI, March year)	-0.3	0.0	0.9	-1.7	-1.5	-1.2	-0.5	0.0	0.3

* Total investment excluding residential

Annex 2: An introduction to the Treasury's new macroeconomic model

The Treasury uses a macroeconomic forecasting model of the New Zealand economy to aid in the production of the economic and tax forecasts. For the past 12 years we have used the New Zealand Treasury Model as a key tool in the forecast process. During the Budget 2018 forecast round we have introduced a new model called Matai, which is one of a number of tools used to produce the forecasts. The development of Matai has occurred over the past 18 months. While the shift to the new model represents a significant milestone, the use of models tends to be an evolutionary process, as key assumptions and relationships are tested and updated to reflect changes in the economy. We therefore expect Matai to evolve as our understanding of the New Zealand economy changes.

What is a macroeconomic model?

A macroeconomic model consists of a set of mathematical equations which attempt to identify and quantify relationships between variables suggested by economic theory. For example, theory suggests that household spending depends on household incomes. In order to use this theory in a model we need to quantify the relationship by looking at the New Zealand data. We need to be able to say, for example, if incomes were to increase by \$100, spending would increase by \$90 and \$10 would be saved. Matai has around 40-50 of these types of equations. Rather than being a collection of individual isolated equations, Matai attempts to capture the real world dynamic interactions between variables. In the previous example output may need to increase to meet the additional spending (demand) initiating a second round of increases to income and spending. Modelling software is used to solve all these types of interactions.

In Matai, all variables are split into trend and cycle. The (smooth) trend attempts to capture the elements of the data series that are expected to persist longer than the business cycle (structural elements). All short term and business cycle elements are captured in the gap between actual and trend. For example, real GDP represents total demand in the economy, while sustainable supply is captured in the trend (potential output). The difference between demand and potential supply is the output gap. Potential output is forecast using a single production function that weights together trend estimates of inputs - the capital stock, labour, and multifactor productivity. The output gap is modelled as a sum of the individual expenditure gaps such as the private consumption gap, residential investment gap etc. Each expenditure component gap equation is a weighted sum of other gaps. For example the private consumption gap is a function of the wage income gap, house price gap (deviation from fair value), and interest rate gap (deviation from assumed neutral interest rate).

Often significant adjustments/judgements are made to the initial forecasts that come out of the model. As part of the forecast process we examine a range of other models and information. This information is used to form judgements that are used to influence the model output. Matai is in fact an organising and documentation framework for the forecasters. It is a receptacle for all relevant information gathered from off-model sources. Perhaps the most important key inputs/judgements introduced from outside the model are assumptions for government consumption, population growth (including migration) and in the current forecast round assumptions about how export volumes will be affected by adverse agricultural conditions (and the resulting recovery as conditions return to normal).

The model is a useful tool aiding consistency both within and between forecast rounds. Within rounds it retains an element of consistency with both economic theory and New Zealand-specific data. Between forecast rounds it provides a systematic record of the previous rounds and a benchmark starting point from which to launch an updated view. It provides a consistent and stable framework to document previous judgements.