

STATEMENT 7: FORECASTING PERFORMANCE AND SCENARIO ANALYSIS

The economic and fiscal estimates presented in the 2019-20 Budget incorporate assumptions and judgments based on information available at the time of preparation. These estimates are subject to uncertainty.

This Statement provides details of the historical performance of Budget forecasts for the macroeconomic aggregates of real and nominal GDP as well as for estimates of government receipts. The Statement also presents a number of scenarios seeking to illustrate the sensitivity of budget aggregates to changes in economic forecasts and projections and some underlying assumptions.

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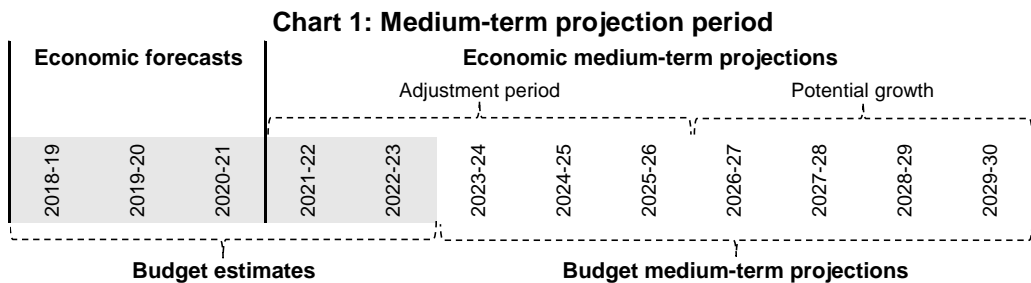
STATEMENT 7: FORECASTING PERFORMANCE AND SCENARIO ANALYSIS

OVERVIEW

Macroeconomic and fiscal forecasts are important for government policy and decision making. The macroeconomic and fiscal forecasts in the Budget are based on information available at the time of preparation, which also informs assumptions and judgments. Better forecasting and a better understanding of the uncertainties around the forecasts contribute to better policy and decision making.

This Statement assesses the historical performance of budget forecasts and estimates of uncertainty around these forecasts. This assessment is consistent with the practice of many other international fiscal agencies to improve forecasting performance and, more importantly, to raise awareness of the uncertainties inherent in forecasting.

The fiscal estimates presented in the Budget are underpinned by short-term economic forecasts for the current financial year, the budget year and the subsequent financial year, and economic projections for the following two years. These five years are followed by medium-term projections for a further seven years to provide an indication of the longer-term fiscal trajectory. The economic projections, which are generated by returning economic activity to its potential level over an adjustment period, underpin the medium-term fiscal projections (Chart 1).



Source: Treasury.

This Statement presents an analysis of the sensitivity of 2019-20 Budget forward estimates to changes in assumptions as required under the *Charter of Budget Honesty Act 1998*. It also provides sensitivity analysis of the medium-term projections.

FORECASTING PERFORMANCE

Macroeconomic forecasting performance

The Government's macroeconomic forecasts are prepared using a range of modelling techniques including macroeconometric models, spreadsheet analysis and accounting frameworks. These are augmented by survey data, business liaison, professional opinion and judgment.

Forecasts are subject to inherent uncertainties. Generally, these uncertainties tend to increase as the forecast horizon lengthens. Forecast errors (the differences between forecasts and outcomes) can arise for a range of reasons – for example, differences between the assumed path of key variables and outcomes, changes in the relationships between different parts of the economy and unexpected events.

Confidence intervals seek to illustrate that there is a range of plausible outcomes around any forecast. Confidence intervals are based on observed historical patterns of forecast errors. They are a guide to the degree of uncertainty around a forecast and can span a wide range of outcomes.

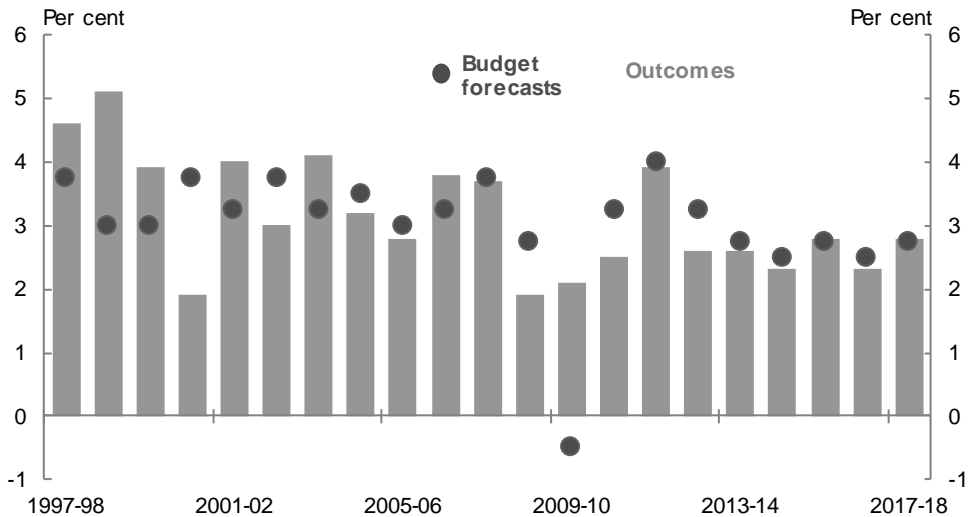
Real GDP forecasts

Real GDP forecasts factor in a number of assumptions, including exchange rates, interest rates and commodity prices. The forecasts also incorporate judgments about how developments in one part of the economy affect other parts and how the domestic economy is affected by events in the international economy. The accuracy of the forecasts is influenced by the extent to which the assumptions and judgments underpinning them prove to be correct – and also the reliability of the economic relationships embodied in the macroeconomic models used to produce them. For example, an exchange rate that is lower than assumed would be expected to result in higher-than-forecast GDP growth.

Forecast errors for real GDP can also result from unexpected shifts in the pace or nature of economic activity during the forecast period. For example, a faster-than-expected pick-up in Australia's economic growth in 2019-20 could be driven by stronger consumer spending, underpinned by faster-than-expected growth in employment and wages. Faster economic growth could also be driven by stronger-than-expected major trading partner growth, which could boost exports and, in turn, stimulate incomes and demand throughout the economy.

Over the past 20 years, the Budget forecasts of real GDP growth have exhibited little evidence of bias, with the mean absolute forecast error being insignificantly different from zero. While forecasts of real GDP growth were less accurate in the years during and immediately after the global financial crisis (GFC), forecast errors have been smaller in recent years (Chart 2).

Chart 2: Budget forecasts of real GDP growth

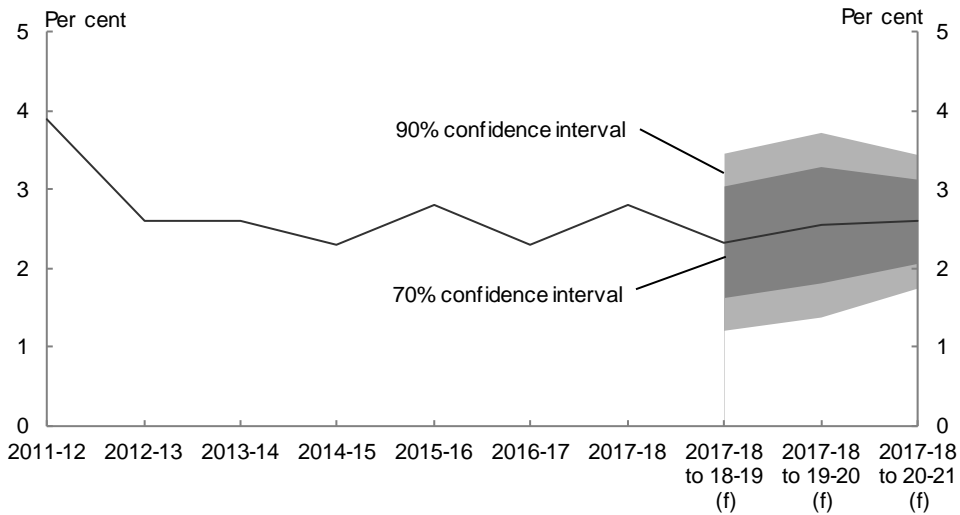


Note: Outcome is as published in the December quarter 2018 National Accounts. Forecast is that published in the Budget for that year.

Source: ABS cat. no. 5206.0 and Budget papers.

Chart 3 shows that the average annualised growth rate of real GDP in the two years to 2019-20 is expected to be around 2½ per cent, with the 70 per cent confidence interval ranging from 1¾ per cent to 3¼ per cent. In other words, if forecast errors are similar to those made over recent years, there is a 70 per cent probability that the growth rate will lie in this range.

Chart 3: Confidence intervals around real GDP growth rate forecasts



Note: The central line shows the outcomes and the 2019-20 Budget forecasts. Annual growth rates are reported for the outcomes. Average annualised growth rates from 2017-18 are reported for 2018-19 onwards. (f) are forecasts. Confidence intervals are based on the root mean squared errors (RMSEs) of Budget forecasts from 1998-99 onwards, with outcomes based on December quarter 2018 National Accounts data.

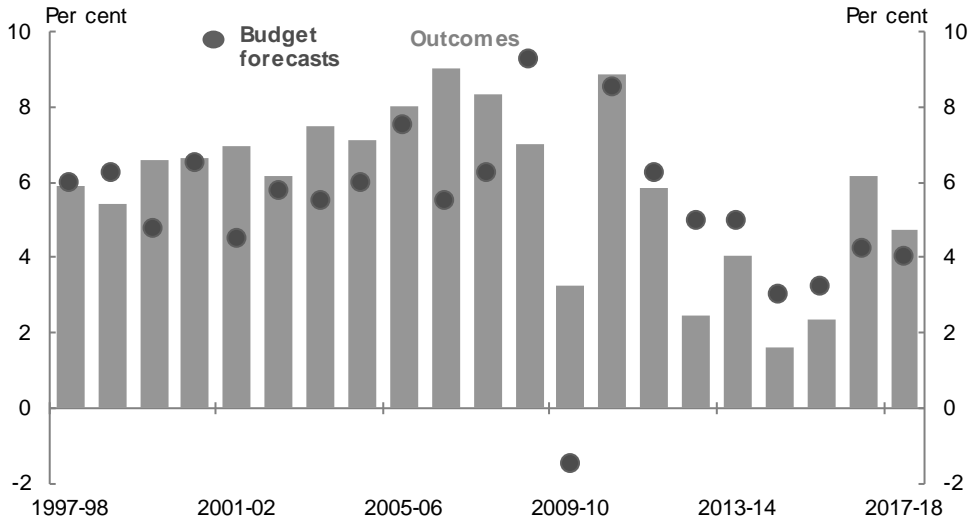
Source: ABS cat. no. 5206.0, Budget papers and Treasury.

Nominal GDP forecasts

Compared with real GDP forecasts, nominal GDP forecasts are subject to additional sources of uncertainty from the evolution of domestic prices and wages, prices of imported goods and world prices for Australia's exports, including commodities.

Since the early 2000s, nominal GDP forecast errors have reflected the greater difficulties in predicting movements in global commodity prices (Chart 4). From 2011-12 to 2015-16, as key commodity prices were falling from their record highs, larger-than-expected falls in the terms of trade meant that nominal GDP growth was overestimated. However, the outcomes for nominal GDP growth in 2016-17 and 2017-18 were higher than were forecast in the Budgets for those years. This primarily reflected stronger-than-expected commodity prices.

Chart 4: Budget forecasts of nominal GDP growth

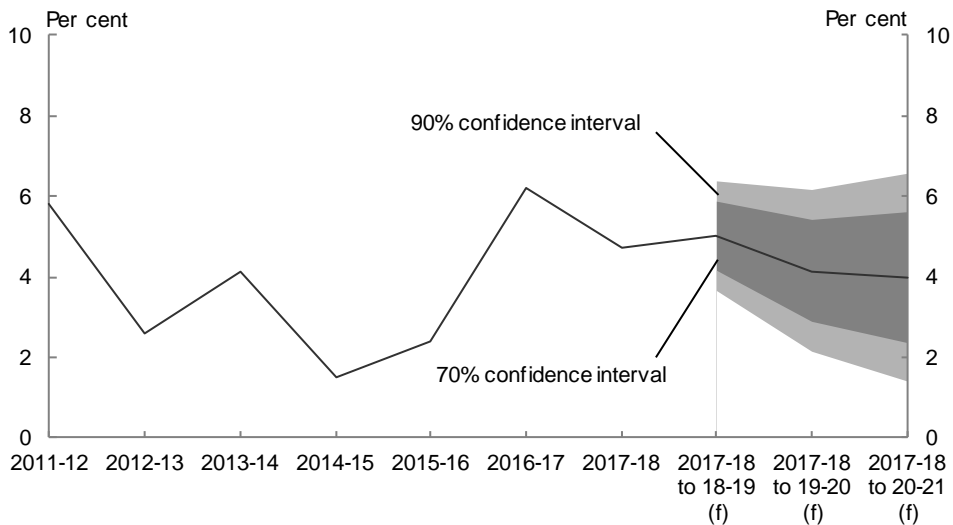


Note: Outcome is as published in the December quarter 2018 National Accounts. Forecast is that published in the Budget for that year.

Source: ABS cat. no. 5206.0 and Budget papers.

The confidence intervals around the nominal GDP forecasts are wider than those around the real GDP forecasts, reflecting both the uncertainty around the outlook for real GDP and the added uncertainty about the outlook for domestic prices and commodity prices. Average annualised growth in nominal GDP in the two years to 2019-20 is expected to be around 4¼ per cent, with the 70 per cent confidence interval ranging from 3 per cent to 5½ per cent (Chart 5).

Chart 5: Confidence intervals around nominal GDP growth rate forecasts



Note: See note to Chart 3.

Source: ABS cat. no. 5206.0, Budget papers and Treasury.

Fiscal forecasting performance

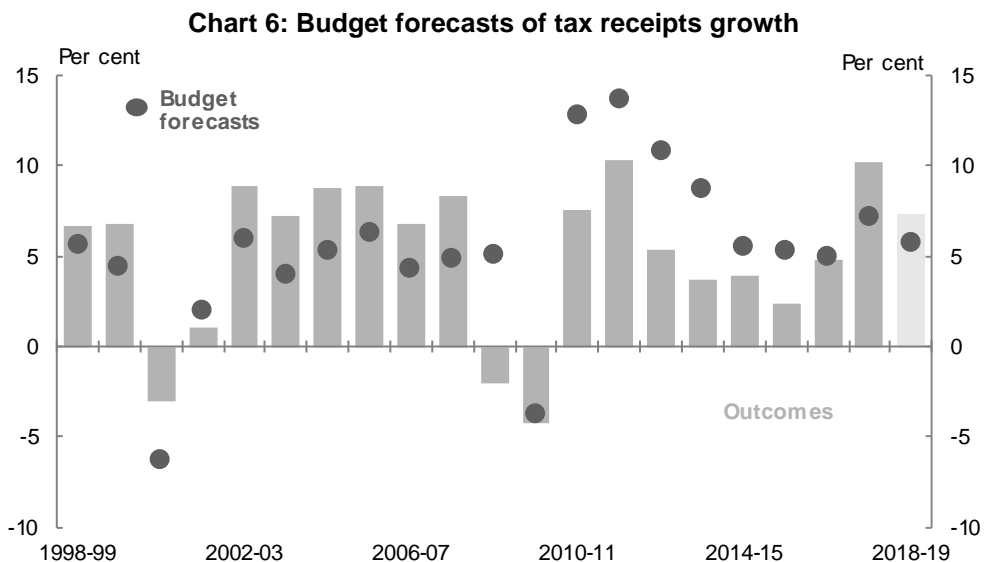
The fiscal estimates contained in the Budget are based on economic and demographic forecasts and projections, as well as estimates of the impact of government spending and revenue measures. Changes to the economic or demographic forecasts and projections underlying the estimates will affect forecasts for receipts and payments. As such, this will have a direct impact on the profile of the underlying cash balance and government debt. Even small movements in economic forecasts and projections or outcomes that differ from the forecasts and projections can result in large changes to the budget aggregates.

Receipts

Tax receipts estimates are generally prepared using a 'base plus growth' methodology. The last known outcome (2017-18 for the 2019-20 Budget) is used as the base to which estimated growth rates are applied, resulting in tax receipts estimates for the current and future years. Estimates for the current year also incorporate recent trends in tax collections.

Most of the indirect heads of revenue, such as GST and fuel excise, are forecast by mapping the growth rate of an appropriate economic parameter directly to the tax growth rate in the relevant head of revenue. A number of income taxes also involve determining whether this tax will be paid in the year the income is earned, such as for pay-as-you-go withholding tax, or in future years, such as for individuals' refunds.

Over the past two decades, tax receipts forecasts have both under-predicted and over-predicted outcomes (Chart 6).

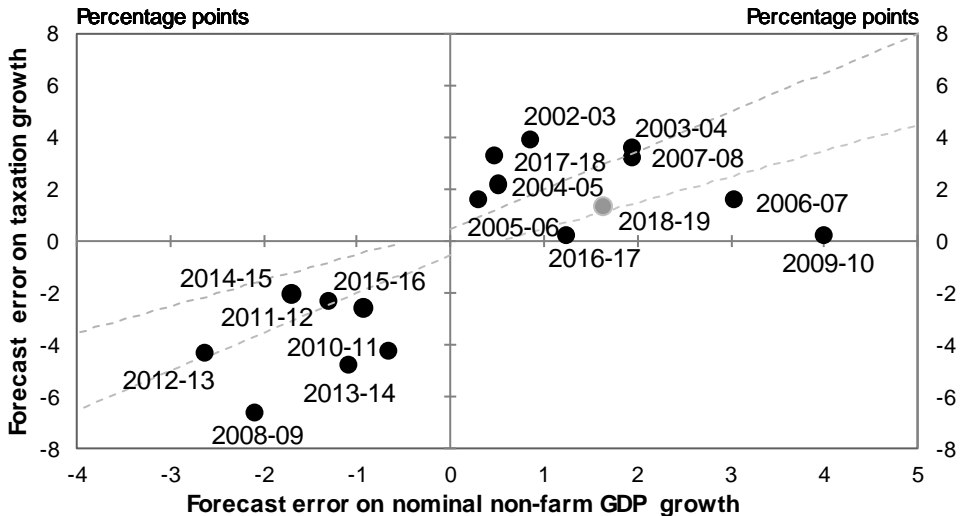


Note: Forecast error for 2018-19 is an estimate.

Source: Budget papers and Treasury.

Generally, there is a strong correlation between the accuracy of the forecasts of nominal GDP and its components and the forecasts for tax receipts. On average, economic forecast errors will be magnified in receipts forecast errors, owing to the progressive nature of personal income tax. Chart 7 plots the forecast errors for nominal non-farm GDP against the errors for tax receipts excluding capital gains tax (CGT). It shows that where there has been an underestimate of nominal non-farm GDP growth, tax receipts tend to be underestimated and vice versa.

Chart 7: Budget forecast errors on nominal non-farm GDP growth and taxation receipts growth (excluding CGT)



Note: The lower and upper lines indicate the expected forecast error in tax receipts given the associated forecast error in nominal non-farm GDP growth. Forecast errors outside this range could be a result of factors such as timing of tax receipts. The lines are based on aggregate elasticities (of receipts with respect to nominal non-farm GDP) of 1.0 and 1.5 respectively, assuming an error of plus or minus 0.5 per cent if there is zero error on the economic forecasts. Forecast error for 2018-19 is an estimate. Source: ABS cat. no. 5206.0, Budget papers and Treasury.

Looking at the medium term, tax receipts projections are driven by long-term economic trends and tax policy settings. External structural pressures and systemic design factors in Australia’s tax system could result in tax receipts from many sources as a proportion of GDP declining over this extended time period.

One driver of this decline could be a continuation of consumer preferences away from highly taxed items such as fuel, alcohol and tobacco. GST revenue growth could also weaken if consumption favours non-GST items.

The extent to which the tax system is resilient to these and other factors is highly uncertain and not independent of tax rate differentials, both domestically and internationally.

Statement 7: Forecasting Performance and Scenario Analysis

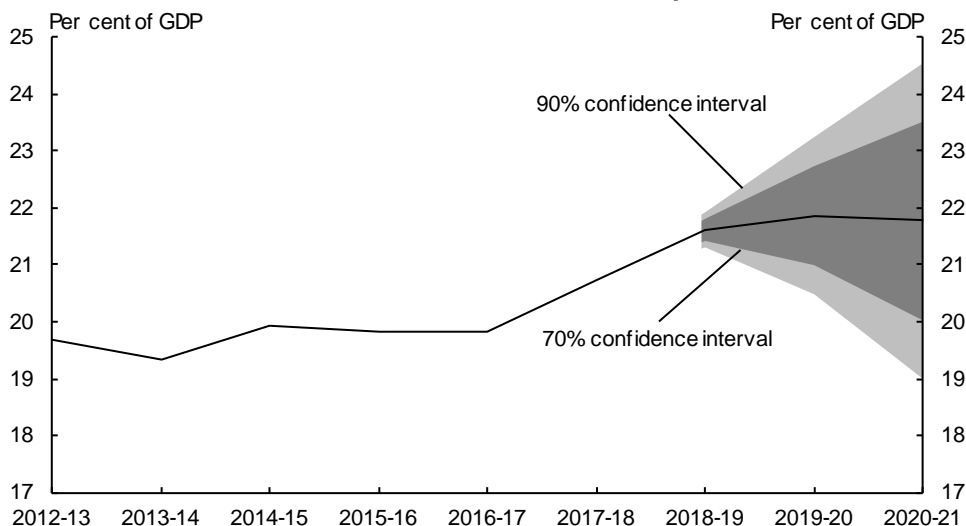
The forecast for 2018-19 tax receipts (excluding CGT) in the 2018-19 Budget is expected to be an underestimate of around 1.3 percentage points, compared with an underestimate of around 1.6 percentage points for nominal non-farm GDP growth.

The largest contributor to the expected forecast error for 2018-19 is company tax, which is estimated to be \$4.6 billion (5.2 per cent) higher than expected in the 2018-19 Budget. This is primarily driven by higher-than-expected company profits, including upward revisions to profits in 2017-18 and 2018-19. Gross income tax withholding is estimated to be \$4.0 billion (2.0 per cent) above the forecast of the 2018-19 Budget, consistent with strong labour market conditions. These boosts to tax receipts have been partly offset by GST, which is estimated to be \$1.7 billion (2.6 per cent) below the forecast of the 2018-19 Budget. These and other variations are discussed further in *Budget Statement 4: Revenue*.

Discussions of earlier years' forecast performance can be found in previous budgets.

Chart 8 shows confidence intervals around the forecasts for receipts (excluding GST¹ and including Future Fund earnings). Confidence intervals constructed around the receipts forecasts exclude historical variations caused by subsequent policy decisions. These intervals take into account errors caused by parameter and other variations in isolation.

Chart 8: Confidence intervals around receipts forecasts



Note: The central line shows the outcomes and the 2019-20 Budget point estimate forecasts. Confidence intervals use RMSEs for Budget forecasts from the 1998-99 Budget onwards.

Source: Budget papers and Treasury.

1 GST was not reported as a Commonwealth tax in budget documents prior to the 2008-09 Budget. As a result, GST data have been removed from historical receipts and payments data to abstract from any error associated with this change in accounting treatment.

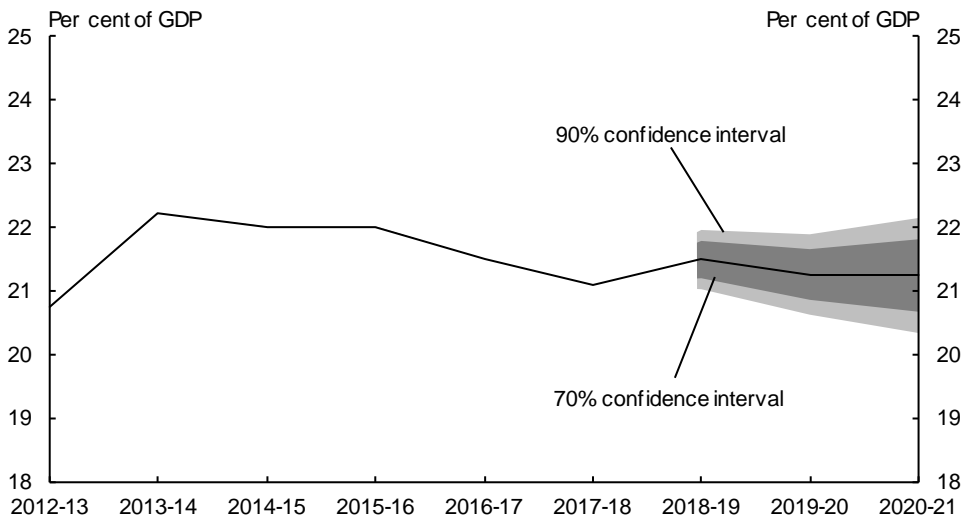
The chart shows that there is considerable uncertainty around receipts forecasts and that this uncertainty increases as the forecast horizon lengthens. It suggests that in 2019-20, the width of the 70 per cent confidence interval for the 2019-20 Budget receipts forecast is approximately 1.7 per cent of GDP (\$34.9 billion) and the 90 per cent confidence interval is approximately 2.8 per cent of GDP (\$55.3 billion).

Payments

The Government’s payments estimates are predominantly prepared by agencies that comprise the Australian Government general government sector. An assessment of payments forecasting performance is not included in this Statement. However, historical errors have been incorporated in estimated confidence intervals.

Chart 9 shows confidence intervals around payments forecasts (excluding GST). As with receipts estimates, historical variations caused by subsequent policy decisions are excluded.² Payments estimates include the public debt interest impact of policy decisions and a provision for contingencies.³

Chart 9: Confidence intervals around payments forecasts



Note: See note to Chart 8.

Source: Budget papers and Treasury.

2 The allowance for historical policy variations only includes subsequent policy decisions made at each update. No allowance is made for other decisions, such as assistance for the impact of natural disasters or changes to the timing of projects announced in previous updates. These decisions will contribute to historical forecast errors and therefore increase the size of the confidence intervals around payments.

3 The impacts of past policy decisions on historical public debt interest through time cannot be readily identified or estimated. For this reason, no adjustment has been made to exclude these impacts from the analysis.

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The chart shows that there is moderate uncertainty around payments forecasts. In 2019-20, the width of the 70 per cent confidence interval for the 2019-20 Budget payments forecast is approximately 0.8 per cent of GDP (\$16 billion) and the 90 per cent confidence interval is approximately 1.3 per cent of GDP (\$25.3 billion).

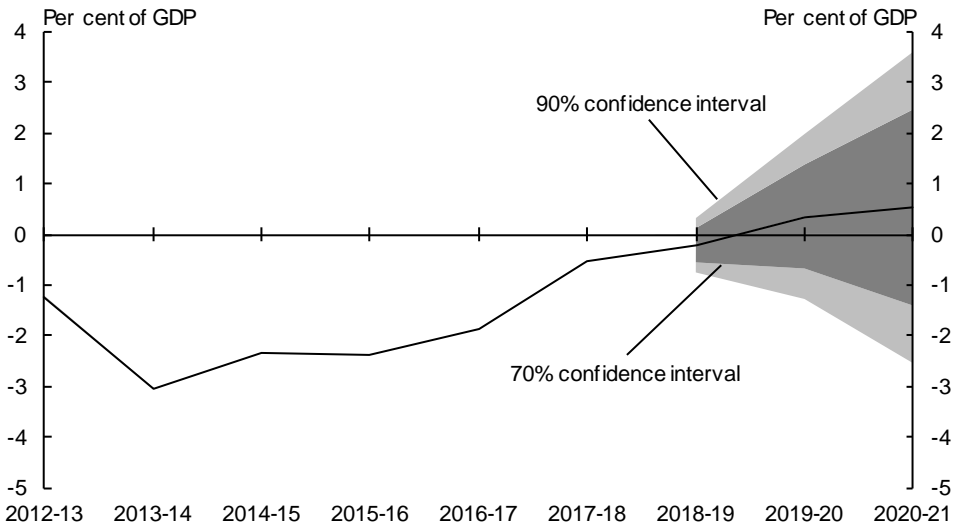
Payments outcomes can differ from forecasts for a number of reasons. Demand-driven programs, such as payments to individuals for social welfare, form the bulk of government expenditure. Forecasts of payments associated with a number of these government programs depend on forecasts of economic conditions. For example, higher than forecast unemployment levels will mean that expenditure for related social services payments, including allowances, will be higher than forecast.

Underlying cash balance

The underlying cash balance estimates are sensitive to the same forecast errors that affect estimates of receipts and payments. Confidence interval analysis shows that there is considerable uncertainty around the underlying cash balance forecasts (Chart 10).

In 2019-20, the width of the 70 per cent confidence interval for the 2019-20 Budget underlying cash balance forecast is approximately 2.1 per cent of GDP (\$41.1 billion) and the 90 per cent confidence interval is approximately 3.3 per cent of GDP (\$65.2 billion). In line with receipts forecasts, uncertainty increases over the estimates period.

Chart 10: Confidence intervals around the underlying cash balance forecasts



Note: See note to Chart 8.

Source: Budget papers and Treasury.

SENSITIVITY AND SCENARIO ANALYSIS

Small movements in economic forecasts or projections can improve or worsen the underlying cash balance, depending on their impacts on payments and receipts. This in turn can drive changes in gross and net debt. Consideration of particular scenarios and sensitivity analysis demonstrates the potential impact of these changes. The analysis presented considers the impact of changes to the economic outlook over the forecast years to 2020-21 and the projections beyond that.

Scenarios 1 and 2 explore the sensitivity of fiscal aggregates to alternative paths for the terms of trade and consumption growth.

Scenarios 3 and 4 illustrate the sensitivity of fiscal aggregates to changes in assumptions underpinning the medium-term economic projections.

Scenario 5 illustrates the sensitivity of fiscal aggregates to changes in market yields.

Sensitivity analysis over the forecast period

The following two scenarios provide an indication of the sensitivity of receipts, payments and the underlying cash balance to changes in the economic outlook over the forecast period to 2020-21.

Sensitivity analysis on inflation and wages and commodity price assumptions is contained in *Budget Statement 2: Economic Outlook*.

Scenario 1: Alternative paths for the terms of trade

This scenario considers the consequences of a permanent 10 per cent movement in world prices of non-rural commodity exports through 2019-20 relative to the 2019-20 Budget forecast levels. The scenario assumes that there is no change in the exchange rate or interest rates. Under a floating exchange rate, however, a change in the terms of trade would be expected to lead to a movement of the exchange rate in the same direction. This would mitigate the effects on real GDP, meaning the impact on the fiscal position would be smaller than presented below.

Such a price rise (fall) is consistent with a rise (fall) in the terms of trade of 5¼ per cent and an increase (decrease) in nominal GDP of 1¼ per cent by 2020-21. The change in the terms of trade from a 10 per cent movement in non-rural commodity exports varies over time in line with the share of those exports in total exports. The sensitivity analysis shows the flow-on effects to GDP, the labour market and prices. The impacts in Table 1 are stylised and refer to percentage deviations from the Budget forecast levels due to a permanent rise in non-rural commodity prices. The impacts on the economy of a permanent fall in these prices of the same magnitude would be broadly symmetric.

Table 1: Illustrative impact of a permanent 10 per cent rise in non-rural commodity prices (per cent deviation from the Budget level)⁴

	Impact after 1 year (2019-20) per cent	Impact after 2 years (2020-21) per cent
Real GDP	0	1/4
GDP deflator	1/2	1
Nominal GDP	1/2	1 1/4
Employment	1/4	1/4
Wages	1/4	1/2
CPI	0	1/4
Company profits	2	3 1/2
Nominal household consumption	0	1/2

Under this scenario, which assumes no change in exchange rates or interest rates, the increase in export prices leads directly to higher overall output prices (as measured by the GDP deflator) and higher domestic incomes compared with Budget levels. Higher domestic incomes cause both consumption and investment to rise, resulting in higher real GDP and employment and an increase in wages. The rise in aggregate demand puts upward pressure on domestic prices.

On the receipts side, an increase in nominal GDP increases tax collections. The largest impact is on company tax receipts as the increase in export income increases company profits. The impact on company tax is larger in 2020-21, partly owing to lags in tax collections and a larger impact on company profits in the second year of the scenario.

On the payments side, a significant proportion of government expenditure is partially indexed to movements in costs (as reflected in various price and wage indicators). Many forms of expenditure, in particular income support payments, are also driven by the number of beneficiaries.

The overall estimated expenditure on income support payments (including pensions, unemployment benefits and other allowances) decreases in both years, reflecting a lower number of unemployment benefit recipients. The fall in spending on unemployment benefits is partially offset by increased expenditure on pensions and allowances reflecting stronger growth in benefit payment rates, resulting from slightly higher inflation. At the same time other payments linked to inflation are also higher in line with the stronger growth in prices.

Given these assumptions, the overall impact of the increase in the terms of trade is an improvement in the underlying cash balance of around \$2.3 billion in 2019-20 and around \$6.7 billion in 2020-21 (see Table 2). Broadly opposite impacts would be expected for a fall in the terms of trade of the same magnitude.

⁴ These results represent a partial economic analysis only and do not attempt to capture all the economic feedback effects or policy responses resulting from changed economic conditions and assume no change in the exchange rate, interest rates or government policy over the forecast period.

Table 2: Illustrative sensitivity of the budget balance to a permanent 10 per cent rise in non-rural commodity prices

	2019-20	2020-21
	\$b	\$b
Receipts		
Individuals and other withholding taxes	0.6	2.5
Superannuation fund taxes	0.1	0.1
Company tax	1.4	3.4
Goods and services tax	0.0	0.3
Excise and customs duty	0.0	0.2
Other taxes	0.1	0.2
Total receipts	2.2	6.7
Payments		
Income support	0.1	0.3
Other payments	0.0	0.0
Goods and services tax	0.0	-0.3
Total payments	0.1	-0.1
Public debt interest	0.0	0.1
Underlying cash balance impact(a)	2.3	6.7

(a) Estimated impacts fall within the 70 per cent confidence intervals for years 2019-20 and 2020-21, as shown in Charts 8 to 10.

Note: Numbers may not sum due to rounding.

The specific impact of a US\$10 per tonne free-on-board (FOB) higher or lower iron ore price is outlined in Box 1.

Box 1: Sensitivity analysis of iron ore price movements

The impacts of a **US\$10 per tonne FOB movement in iron ore prices** over the course of a year is set out in Table A. This is based on the sensitivity analysis presented in Scenario 1, and is calibrated to take into account the share of iron ore in the value of total exports, which can change over time. An increase of US\$10 per tonne FOB in the iron ore price results in an increase in nominal GDP of around \$6.3 billion in 2019-20 and over \$13 billion in 2020-21. Similarly, a decrease of US\$10 per tonne FOB in the iron ore price results in a decrease in nominal GDP of an equivalent amount.

Table A: Sensitivity analysis of a US\$10 per tonne movement in iron ore prices

	US\$10/tonne FOB ^(a) fall		US\$10/tonne FOB increase	
	2019-20	2020-21	2019-20	2020-21
Nominal GDP (\$billion)	-6.3	-13.6	6.3	13.6
Tax receipts (\$billion)	-1.1	-3.7	1.1	3.7

(a) Prices are presented in free-on-board (FOB) terms which exclude the cost of freight.

Scenario 2: Alternative paths for household consumption growth

This scenario considers the economic and fiscal impacts of a change in household consumption growth in 2019-20, consistent with a shift in household saving preferences. The scenario is a two-sided sensitivity analysis, where the low consumption growth analysis illustrates the consequences of households shifting their

preferences towards a higher rate of saving than forecast in the Budget. This could occur if, for example, households reduce consumption in response to lower housing prices. The high consumption growth analysis illustrates the consequences of households reducing their rate of saving by more than forecast in the Budget, for example, due to an increase in risk appetite.

Consumption accounts for a large share of the economy, so its growth profile is an important source of uncertainty around the GDP growth forecasts. Household consumption growth has exceeded household income growth for several years, resulting in a decline in the household saving ratio from 8.4 per cent in the June quarter 2014 to 2.5 per cent in the December quarter 2018. At the same time, year-average growth in household consumption remains below its 20-year average rate, which is also true on a per capita basis. The Budget forecasts assume that the household saving ratio will be broadly flat over the forecast period.

For the scenario, household consumption growth in 2019-20 has been adjusted so that, by the end of 2019-20, the level of consumption is either 1 per cent lower or higher than the levels currently forecast in the Budget.⁵ The scenario then evaluates the flow-on effects to GDP, the labour market and prices. It assumes no changes to investment, the exchange rate, interest rates or the cost of capital. The impacts of a lower-than-anticipated pick-up in consumption are presented in Table 3. These are stylised results and refer to percentage deviations from the Budget forecast levels. A higher-than-anticipated pick-up in consumption would have broadly opposite effects on the economy over the scenario period.

Table 3: Illustrative impact of a lower-than-anticipated pick-up in household consumption (per cent deviation from the Budget level)⁶

	Impact after 1 year (2019-20)	Impact after 2 years (2020-21)
	per cent	per cent
Real GDP	- 1/4	- 1/2
Nominal GDP	- 1/4	- 1/2
Employment	0	- 1/4
Company profits	- 1/2	- 1/2
Nominal household consumption	- 1/2	-1

The results of the analysis show that a lower-than-anticipated pick-up in consumption lowers real GDP compared with Budget levels. The fall in output is a little less than would be implied by the direct effect of the fall in consumption as imports also fall. As a result of the decline in output, employment falls and wage and price pressures are modestly lower.

5 Consumption is higher or lower by 1 per cent by the end of 2019-20 in through-the-year terms. Table 3 presents the results in year-average terms.

6 These results represent a partial economic analysis only and do not attempt to capture all the economic feedback effects or policy responses resulting from changed economic conditions, and assume no change in the exchange rate, interest rates or government policy over the forecast period.

On the receipts side, the reduction in consumption immediately affects indirect taxes, particularly goods and services tax. Business income falls in both years but the impact on company tax receipts is larger in the second year, owing to lags in tax collections. Lower employment and wages lead to lower tax receipts from individuals' salary and wage withholding taxes.

On the payments side, overall estimated expenditure on income support payments is higher in both years due to a higher number of unemployment benefit recipients. The increase in spending on unemployment benefits is partially offset by decreased expenditure on pensions and allowances reflecting slightly lower inflation in 2020-21. In addition, other payments linked to inflation are also lower in line with the weaker growth in prices.

The overall impact of the lower-than-anticipated pick-up in consumption is a deterioration in the underlying cash balance of around \$0.8 billion in 2019-20 and around \$2.8 billion in 2020-21 (see Table 4). A higher-than-anticipated pick-up in consumption would have a broadly opposite effect on the underlying cash balance over the scenario period.

Table 4: Illustrative sensitivity of the budget balance to a lower-than-anticipated pick-up in household consumption

	2019-20	2020-21
	\$b	\$b
Receipts		
Individuals and other withholding taxes	-0.3	-1.5
Superannuation fund taxes	0.0	-0.1
Company tax	-0.3	-0.5
Goods and services tax	-0.3	-0.5
Excise and customs duty	-0.2	-0.4
Other taxes	0.0	0.0
Total receipts	-1.1	-3.0
Payments		
Income support	0.0	-0.3
Other payments	0.0	0.0
Goods and services tax	0.3	0.5
Total payments	0.3	0.3
Public debt interest	0.0	0.0
Underlying cash balance impact(a)	-0.8	-2.8

(a) Estimated impacts fall within the 70 per cent confidence intervals for years 2019-20 and 2020-21, as shown in Charts 8 to 10.

Note: Numbers may not sum due to rounding.

Sensitivity analysis over the medium term

The medium-term fiscal projection period is the seven years after the Budget forward estimates. These fiscal projections are underpinned by economic projections of key economic variables.

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A distinction is drawn between economic forecasts and economic projections. The forecasts are based on a range of short-run forecasting methodologies informed by professional opinion, information from business liaison and broader judgment. By contrast, the economic projections are based on a medium-term methodology which returns economic activity to its potential level over an adjustment period. An important assumption underpinning the economic projections is that specific government policies do not change.

Economic projections framework

Treasury's medium-term economic projection methodology assumes that any spare capacity remaining in the economy at the end of the forecast period will be absorbed over the following five years (the adjustment period). Over this period, productivity and labour force variables, including employment and the participation rate, are assumed to converge to their potential levels as real GDP returns to its estimated potential level. Treasury continues to review the methodology.

Potential GDP is estimated based on analysis of underlying trends for population, productivity and participation. The Budget forecasts imply that the level of real GDP will be lower than potential GDP at the end of the forecast period – that is, there will be a negative output gap. To close the estimated output gap and absorb forecast spare capacity in the economy, real GDP is projected to grow faster than potential over the adjustment period (over the five years from 2021-22). By the end of the adjustment period, the output gap is assumed to have closed completely and real GDP grows at its potential rate thereafter.

Fiscal projections framework

Treasury's medium-term fiscal projections use the Budget forward estimates as a base. They are therefore subject to similar risks and uncertainties that affect the fiscal aggregates discussed earlier in this Statement, but the longer timeframes mean these risks and uncertainties can be amplified.

Beyond the forward estimates, a range of simplifying assumptions are used to project government receipts and payments. The main drivers are movements in economic growth, the size and structure of the population, and prices. The medium-term economic projections are a driver of the fiscal projections. For payments, a key parameter is expected per person costs (in each age bracket) of major government programs based on current policy. The projections assume current policy does not change.

Changes to the assumptions underpinning Treasury's estimate of Australia's potential GDP – as well as the pace of adjustment back to potential – can have large impacts on the fiscal projections. The following section illustrates the sensitivity of fiscal aggregates to these assumptions over the medium-term projection period.

Potential growth scenarios

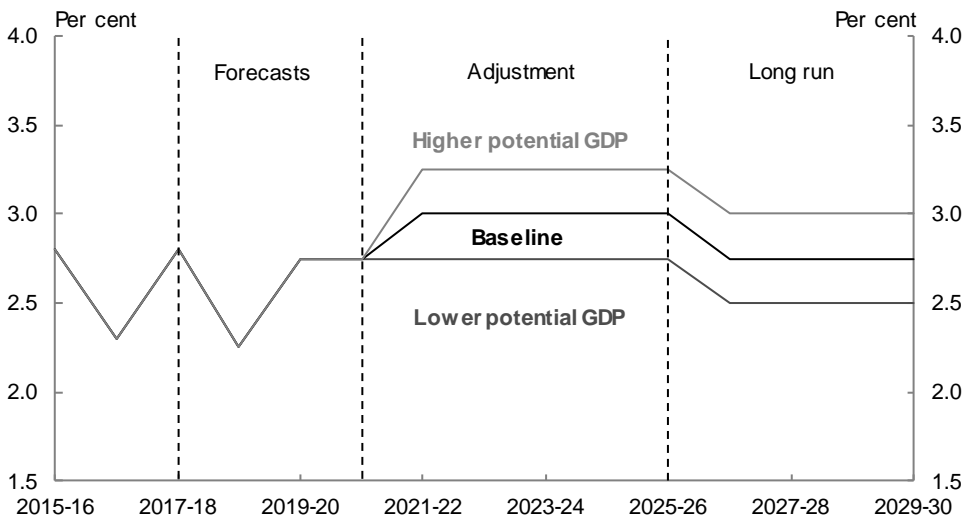
Scenarios 3 and 4: Alternative pathways for potential GDP

As noted above, the estimate of potential GDP underpins projections of real GDP in the medium-term economic projection methodology. The Budget projections are based on an estimate of the growth rate of potential GDP of 2¾ per cent over the next few years. Variations in productivity, population or participation could lead to a lower or higher estimate of potential GDP growth. Indeed, a number of the components are currently some way from their estimated potential levels, which increases the uncertainty around the estimates. In light of this, Scenarios 3 and 4 examine the impacts of higher and lower potential GDP.

Scenario 3 assumes potential GDP grows at 3 per cent, which is ¼ of a percentage point higher than the Budget projections in the medium term (Chart 11). This change could come from one or a combination of the components that make up potential growth. The numbers presented below are calculated off a change in productivity growth, as that has the greatest fiscal impact. The Budget projections assume that potential productivity growth is 1.5 per cent in the long run, in line with its 30-year average. This scenario assumes long-run productivity growth is ¼ of a percentage point higher.

By the end of the projection period in 2029-30, the level of real GDP is around 2¼ per cent higher compared with the Budget projections. Higher labour productivity growth flows through to higher wages. Nominal GDP rises in line with real GDP as there is only a small effect on wages per unit of output (nominal unit labour costs) and, in turn, prices.

Chart 11: Real GDP growth rate – Illustrative impact of lower and higher potential GDP



Source: ABS cat. no. 5206.0 and Treasury.

Statement 7: Forecasting Performance and Scenario Analysis

The higher level of nominal GDP means higher projected tax receipts over the 10-year period to 2029-30. Payments are projected to be lower overall driven by lower projected unemployment which reduces unemployment benefit recipient numbers.

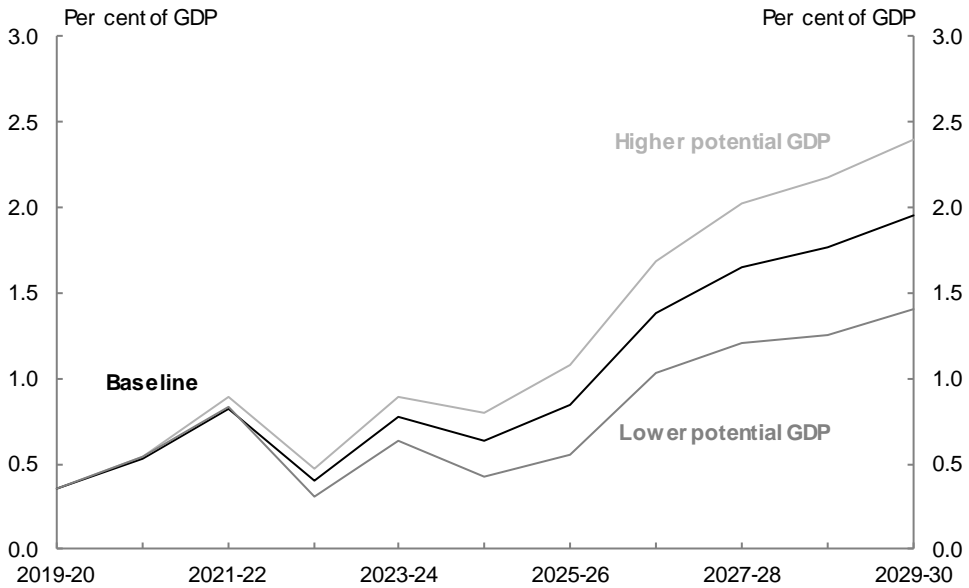
Overall, the higher potential growth in Scenario 3 has a positive impact on the underlying cash balance (Chart 12). In this scenario, the underlying cash balance is 0.4 percentage points of GDP higher at the end of the medium term, compared with the baseline projection.

The variation in the underlying cash balance would have implications for the level of government debt. Under Scenario 3, gross debt, measured by the face value of Australian Government Securities (AGS) on issue, would be lower, reflecting lower government borrowing associated with the stronger budget position. Public debt interest payments would also be lower, further contributing to the improvement in the underlying cash balance.

Scenario 4 assumes potential GDP grows at 2½ per cent, which is a ¼ of a percentage point lower than the Budget projections. This is calculated off a potential productivity assumption that is ¼ of a percentage point lower than the 1.5 per cent used in the medium-term projections framework. This has broadly opposite effects on the economy compared with Scenario 3.

The lower potential growth in Scenario 4 has a negative impact on the underlying cash balance (Chart 12). Receipts are lower across the period and payments higher overall. In this scenario, the underlying cash balance is 0.5 percentage points of GDP lower than baseline at the end of the medium term. Gross debt and public debt interest payments would be higher than in the baseline scenario.

Chart 12: Underlying cash balance — Illustrative impact of higher or lower potential GDP growth



Source: Treasury projections.

Output gap scenarios

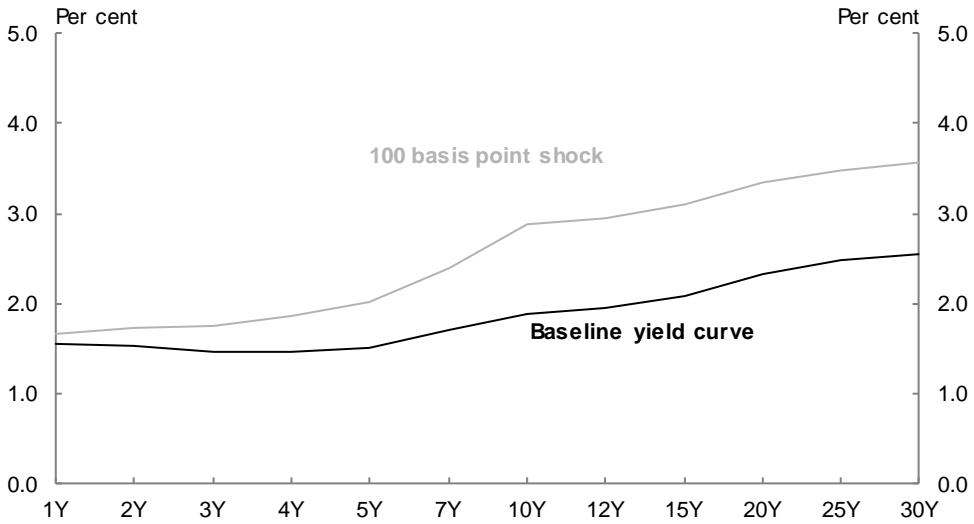
The assumption that the economy will absorb spare capacity over five years affects the economic and fiscal projections. In *2018-19 Budget Paper 1, Statement 8 Forecasting Performance and Scenario Analysis*, the impact of shortening and lengthening this period was examined. The broad conclusions remain unchanged.

Scenario 5: Alternative yield assumption

Over the forward estimates period, yields on Australian Government Securities (AGS) are assumed to remain fixed at the levels observed immediately prior to the Budget update, before converging to a long-run assumed yield curve over the medium term. The long-run curve is based on a 10-year AGS yield of 5 per cent. This is consistent with the 2017 Long-Term Cost Report released by the Australian Government Actuary. The observed yield curve converges to the long-run curve in the medium term.

Scenario 5 examines the consequences of a 100 basis point steepening of the yield curve between the cash rate and the 10-year bond rate (Chart 13). Yields remain higher until the end of the forward estimates, after which yields converge to the assumed long-run yield curve, consistent with the baseline assumption.

Chart 13: Steeper yield curve compared to Budget baseline over the forward estimates



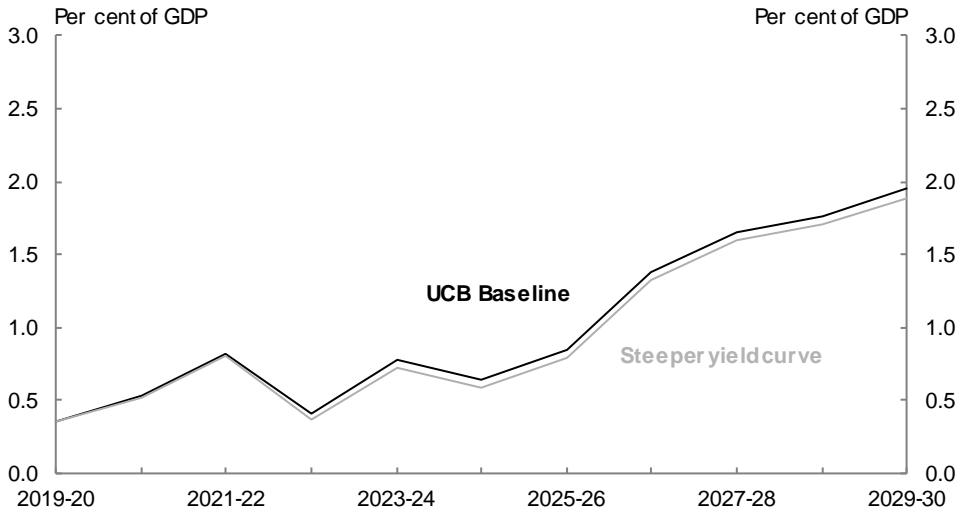
Source: Treasury.

Yields on AGS affect both government income and expenses. Yields affect the amount of public debt interest (PDI) the Government has to pay on its borrowings, but also have an impact on projections of the receipts the Government earns on its investments.

As shown in Table 6 of *Budget Statement 6: Debt Statement, Assets and Liabilities*, the Government borrows a large proportion of its debt in medium and long-dated debt. Conversely, many government investments are held in short-dated assets. As such, a steepening of the yield curve affects government debt more than assets.

Compared with the Budget projections, a steeper-than-assumed yield curve results in a small deterioration to the underlying cash balance over the forward estimates, and a net deterioration in the projected underlying cash balance of around 0.1 percentage points of GDP by 2029-30 (Chart 14).

Chart 14: Impact of alternative yield assumption on underlying cash balance projections



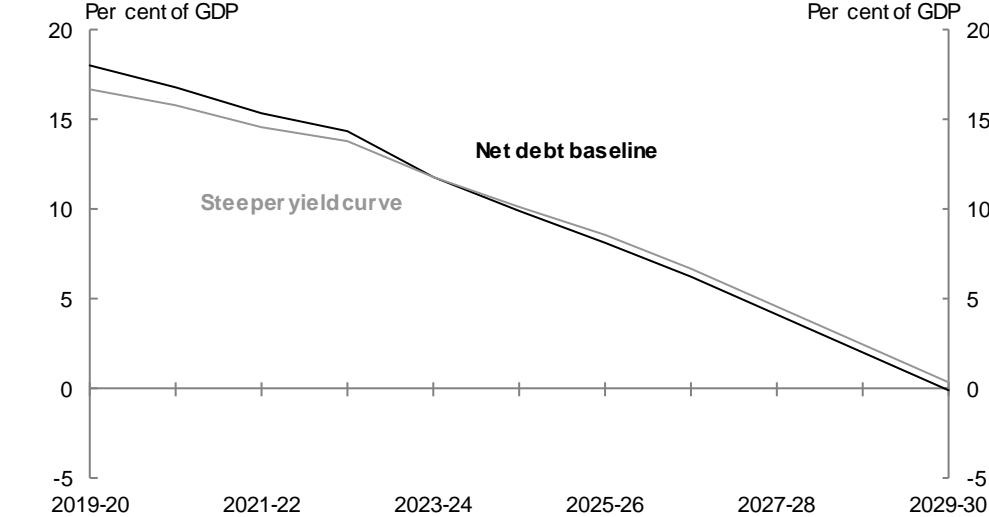
Source: Treasury projections.

Gross debt increases by \$2.5 billion compared to the Budget estimates for 2019-20, and increases by \$13.0 billion by 2022-23. Gross debt is \$10.0 billion higher than the Budget baseline by 2029-30.

The increase in gross debt results in a similar increase in net debt (Chart 15). However, this is offset over the forward estimates by lower market values of AGS from higher yields. As a result, compared to baseline, net debt decreases by 1.3 percentage points of GDP in 2019-20, and remains 0.5 percentage points of GDP lower by 2022-23. Over the medium term, as the baseline yields converge to their long-run rates, the impact of the yield shock is unwound. The combination of increased gross debt and unwinding the valuation effect results in net debt projections being 0.5 percentage points higher compared to the Budget by 2029-30.

A flattening of the yield would have broadly opposite effects.

Chart 15: Impact of alternative yield assumption on net debt projections



Source: Treasury projections.