

Statement 8: Forecasting Performance and Sensitivity Analysis

Economic and fiscal forecasts and projections in the Budget are underpinned by a range of assumptions and judgements based on best available information at the time of preparation. In practice, economic and fiscal circumstances can evolve in ways that differ from expectations.

This statement assesses:

1. The performance of past forecasts based on the variance between forecasts and actuals.
2. The uncertainty around current forecasts using confidence interval analysis.
3. The sensitivity of current forecasts to changes in key assumptions:
 - Iron ore prices
 - Yields on Australian Government Securities.

The economic impact of other key variables, including iron ore and metallurgical coal prices are considered in *Budget Statement 2: Economic Outlook*. The fiscal impact of key developments and Australia's climate change outlook are considered in *Budget Statement 3: Fiscal Strategy and Outlook*.

Forecasts are based on assumptions and judgements. Forecast accuracy depends on whether assumptions and judgements prove to be correct, and the reliability of the modelled economic and fiscal relationships.



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Statement 8: Forecasting Performance and Sensitivity Analysis

Assessing past forecasting performance

This section assesses the variance between historical forecasts and outcomes (forecast errors) for real and nominal GDP, tax receipts, non-tax receipts, payments and the underlying cash balance.

Forecasts are prepared using a range of techniques:

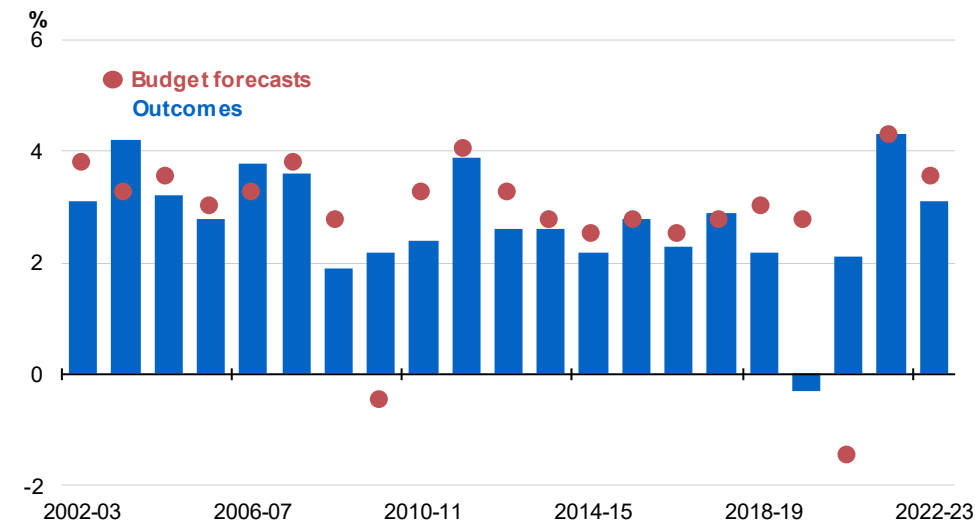
- Macroeconomic forecasts are prepared consistent with a national accounting framework using econometric models, analysis and professional judgement.
- Tax receipts forecasts are generally prepared using a 'base plus growth' methodology. The last outcome for each head of revenue is the base to which growth rates are applied, using appropriate economic parameters. Forecasts are then updated to include costings of new policy.
- Payments forecasts are generally prepared through analysis of payment program data, costings for new policies and historical trends in programs, in consultation with relevant agencies.

Economic forecasting performance

Real GDP forecasts incorporate assumptions for exchange rates, interest rates, commodity prices and population growth. The forecasts also incorporate judgements about how domestic and international developments might affect Australia’s economy.

Real GDP grew by 3.1 per cent in 2022–23 rather than the 3½ per cent growth forecast at the March 2022–23 Budget (Chart 8.1). The overestimate of real GDP growth in 2022–23 was primarily due to weaker-than-expected household consumption in response to cost-of-living pressures.

Chart 8.1: Comparison of forecasts and outcomes for real GDP growth

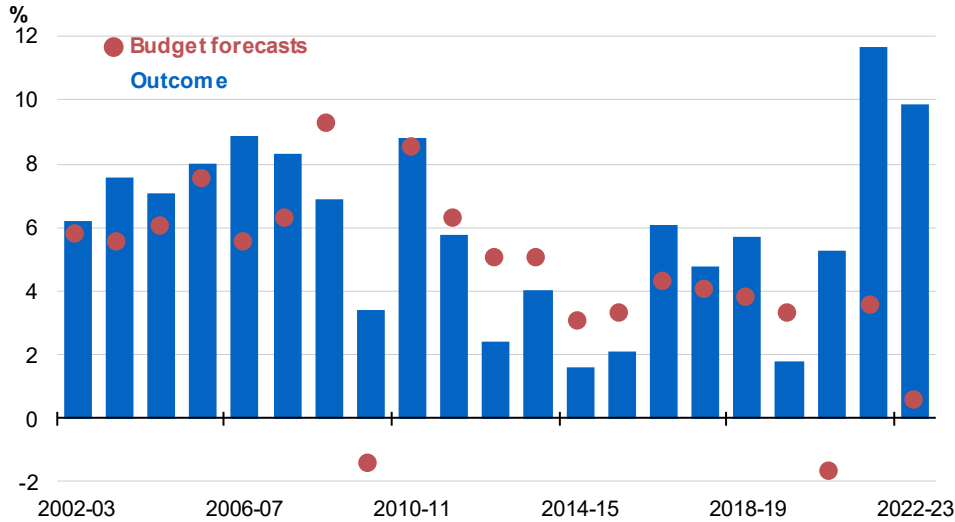


Note: Outcome is as published in the December quarter 2023 National Accounts. Forecast is that published in the Budget for that year. For 2022–23, the forecast is from the March 2022–23 Budget.

Source: ABS Australian National Accounts: National Income, Expenditure and Product and Budget papers.

Nominal GDP forecasts include a price component that adds uncertainty compared to real GDP forecasts. Price uncertainty relates to 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 largely reflected volatility in global commodity prices.

Nominal GDP grew by 9.9 per cent in 2022–23 rather than the ½ per cent growth forecast at the March 2022–23 Budget (Chart 8.2). The large underestimation in nominal GDP largely reflected higher-than-expected commodity prices. The March 2022–23 Budget assumed commodity prices would decrease to levels more consistent with long-term fundamentals, but global energy prices and the prices of Australian coal and LNG exports remained elevated, partly due to the continuation of Russia’s invasion of Ukraine. Consequently, over 2022–23, the terms of trade decreased by 0.5 per cent, rather than the decline of 2¼ per cent expected in the March 2022–23 Budget.

Chart 8.2: Comparison of forecasts and outcomes for nominal GDP growth

Note: Outcome is as published in the December quarter 2023 National Accounts. Forecast is that published in the Budget for that year. For 2022–23, the forecast is from the March 2022–23 Budget.

Source: ABS Australian National Accounts: National Income, Expenditure and Product and Budget papers.

Fiscal forecasting performance

Fiscal forecast errors are driven by economic and demographic forecast errors, along with unanticipated changes in demand for government programs. Government policies announced after the Budget can also affect fiscal forecast errors. Further information on Budget outcomes can be found in the *2022–23 Final Budget Outcome*.

Total receipts

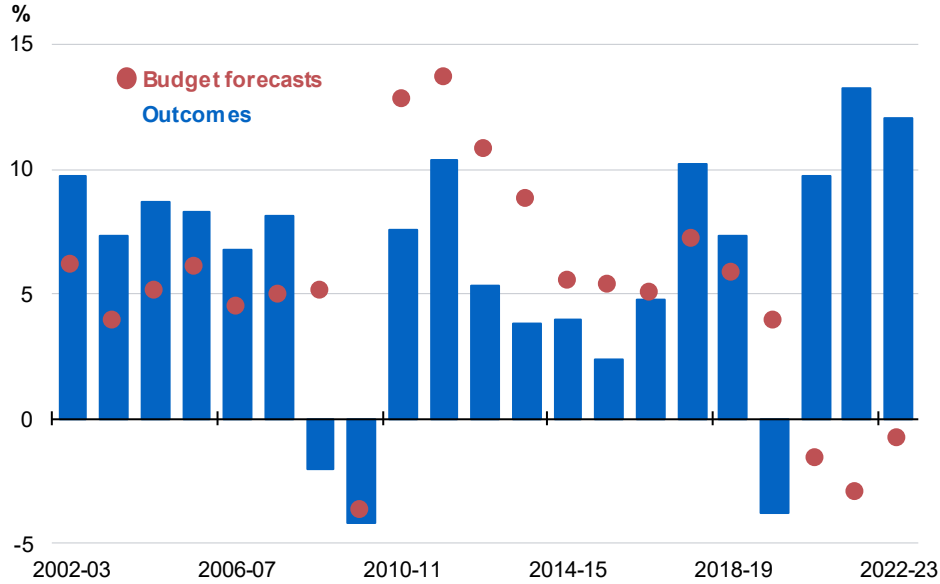
Total receipts are comprised of tax and non-tax receipts (for example, dividends from investment funds). Tax receipts account for over 90.0 per cent of total receipts and are therefore the main driver of forecasting performance.

Total receipts grew 11.1 per cent in 2022–23 rather than the 1.6 per cent decrease forecast at the March 2022–23 Budget. Total receipts were \$101.8 billion higher than forecast.

Tax receipts

Tax receipts grew 12.1 per cent in 2022–23 rather than the 0.8 per cent decrease forecast at the March 2022–23 Budget (Chart 8.3). Tax receipts were \$92.9 billion higher than forecast. This outcome reflected higher-than-expected company tax receipts and stronger-than-expected employment and wage growth.

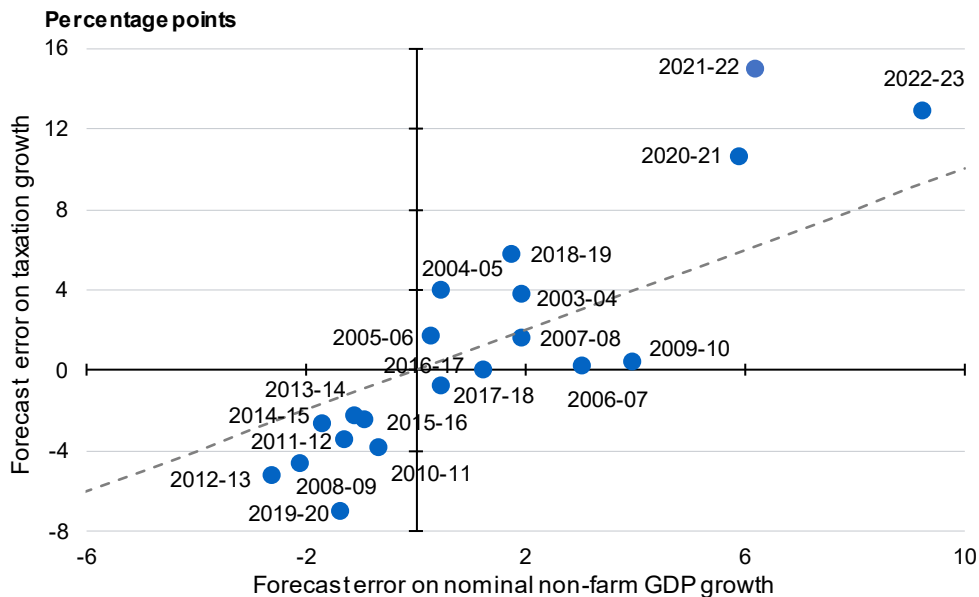
Chart 8.3: Comparison of forecasts and outcomes for tax receipts growth



Source: Budget papers and Treasury.

On average, nominal GDP forecast errors magnify tax receipts forecast errors, owing to Australia’s progressive personal income tax system (Chart 8.4).

Chart 8.4: Forecast errors for nominal non-farm GDP and tax receipts growth^(a)



a) Excludes CGT.

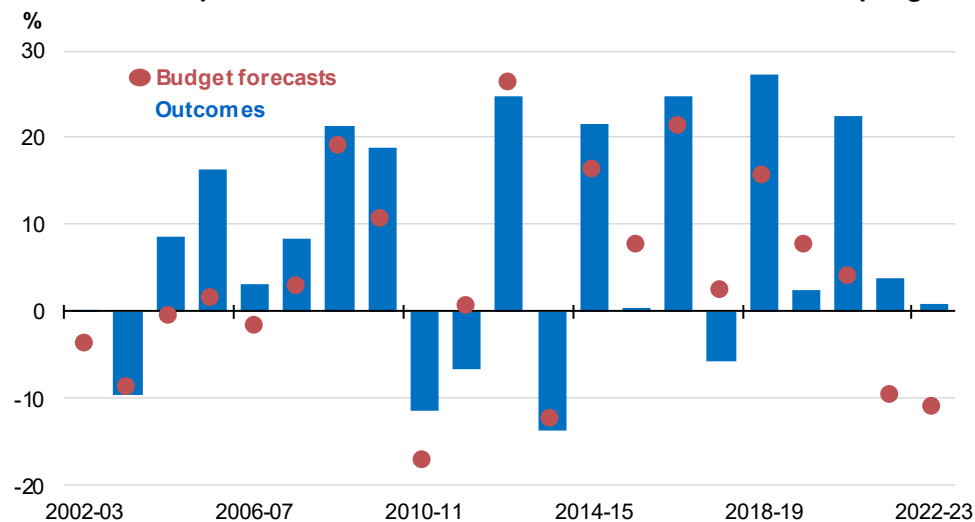
Source: ABS Australian National Accounts: National Income, Expenditure and Product and Treasury.

Non-tax receipts

Forecast variances for non-tax receipts are generally driven by financial market volatility which impacts investment earnings and resource royalties.

Non-tax receipts grew by 0.8 per cent in 2022–23 rather than the 11.1 per cent decrease forecast at the March 2022–23 Budget (Chart 8.5). Non-tax receipts were \$8.9 billion higher in 2022–23 than forecast in the March 2022–23 Budget. This increase largely reflects significant variations in returns on investments, including higher than estimated earnings from interest on cash deposits due to the rise in short-term interest rates, and higher than estimated earnings from the Future Fund and the Australian Government Investment Funds. Additionally, increases to non-tax receipts flowed from increased passport demand following the reopening of Australia’s borders, and higher-than-estimated receipts under the Higher Education Loan Program due to strong labour market conditions.

Chart 8.5: Comparison of forecasts and outcomes for non-tax receipts growth



Source: Budget papers and Treasury.

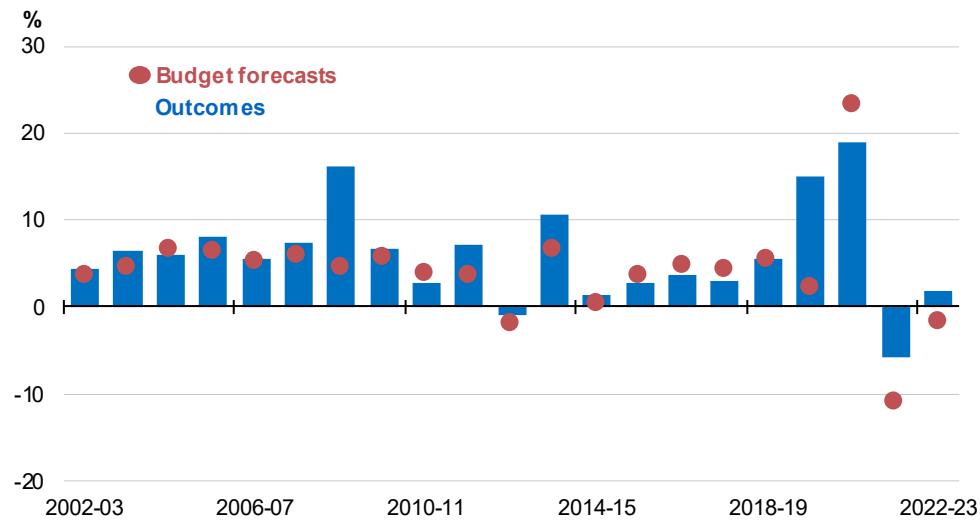
Payments

Payments forecasting performance is affected by growth in indexation factors (for example, CPI growth) and demand for government programs. Demand-driven programs, such as payments to individuals for social welfare, form the bulk of Australian Government expenditure and vary with economic conditions.

Payments increased by 1.8 per cent in 2022–23 rather than the 1.7 per cent decrease forecast at the March 2022–23 Budget (Chart 8.6). Payments were \$1.8 billion higher in 2022–23 than forecast in the March 2022–23 Budget. This relatively small increase reflects a large number of individual variations having offsetting impacts. These include higher-than-estimated payments across a range of welfare programs, including Jobseeker, the Disability Support Pension, and the Age Pension due to higher-than-expected indexation. Policy decisions

made in the 2022–23 October Budget to deliver cheaper child care, ease the cost of living for families, and reduce barriers to greater workforce participation also resulted in increases to payments in 2022–23. These increases were partially offset by lower-than-expected interest payments due to the reduction in the level of gross debt. The stronger budget position resulted from a range of factors, including upgrades to tax revenue that were largely used to repair the budget, and lower-than-estimated medical benefits payments, resulting from lower spending on COVID-19 pathology and vaccine administration and a reduction in demand for services.

Chart 8.6: Comparison of forecasts and outcomes for payments growth



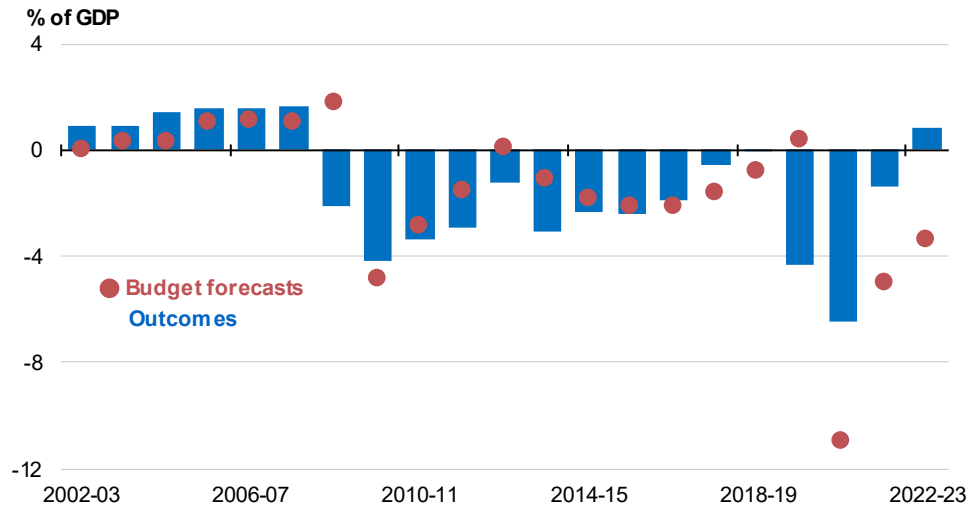
Source: Budget papers and Treasury.

Underlying cash balance

Underlying cash balance forecasting performance is driven by the forecast errors of total receipts and payments.

The underlying cash surplus was 0.9 per cent of GDP in 2022–23 rather than the forecast deficit of 3.4 per cent of GDP (Chart 8.7). The underlying cash balance was \$100.0 billion more than forecast. The better-than-expected underlying cash balance outcome in 2022–23 largely reflected higher-than-expected receipts, the majority of which were returned to the budget.

Chart 8.7: Comparison of forecasts and outcomes for underlying cash balance



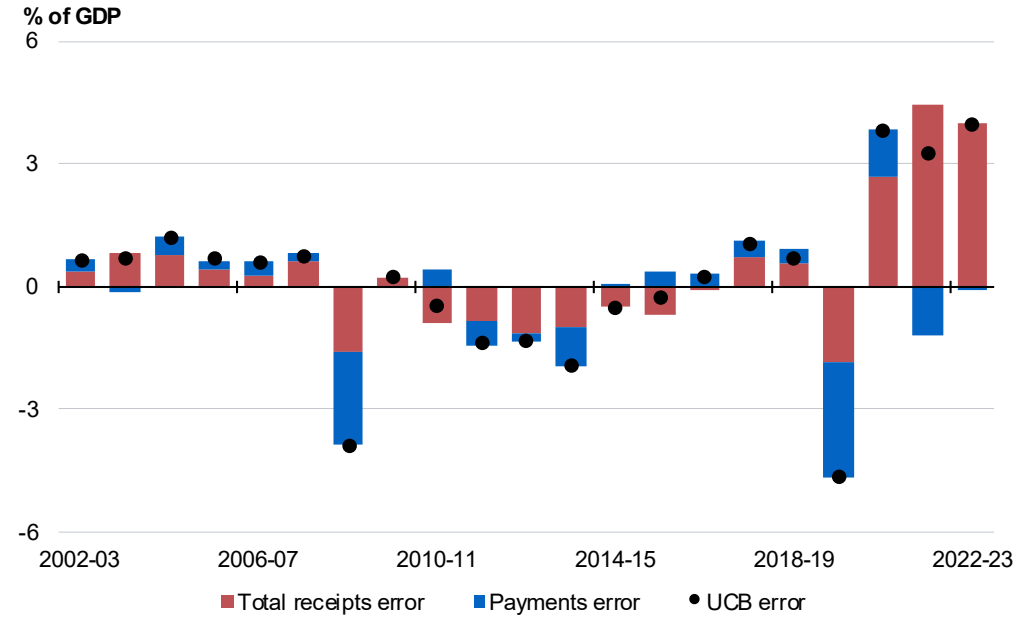
Source: Budget papers and Treasury.

The underlying cash balance³⁸ forecast error for 2022–23 is consistent with the experience of the past two decades, outside major downturns, where forecast errors largely reflect forecast errors of total receipts (Chart 8.8). In 2022–23 key contributors to the error were the impact on tax receipts of higher global commodity prices and stronger-than-expected employment and wage growth.

Large forecast errors for payments in 2008–09 and 2019–20 reflected unexpected Government payment assistance during the Global Financial Crisis and COVID-19. Overestimates of receipts tend to coincide with underestimates of payments during economic shocks, magnifying underlying cash balance forecast errors.

38 Between 2005–06 and 2019–20, the underlying cash balance was equal to receipts less payments, less net Future Fund earnings. In all other years, the underlying cash balance is equal to receipts less payments.

Chart 8.8: Total receipts, payments, and underlying cash balance forecast errors



Source: Budget papers and Treasury.

Assessing forecast uncertainty – confidence interval analysis

Confidence intervals illustrate the uncertainty around current forecasts based on the historical distribution of forecast errors. Confidence interval analysis assumes that future forecast errors are consistent with the distribution of past forecast errors³⁹ Based on past forecasting performance, there is a 70 and 90 per cent probability that the actual outcome will lie within the 70 and 90 per cent confidence interval bands.

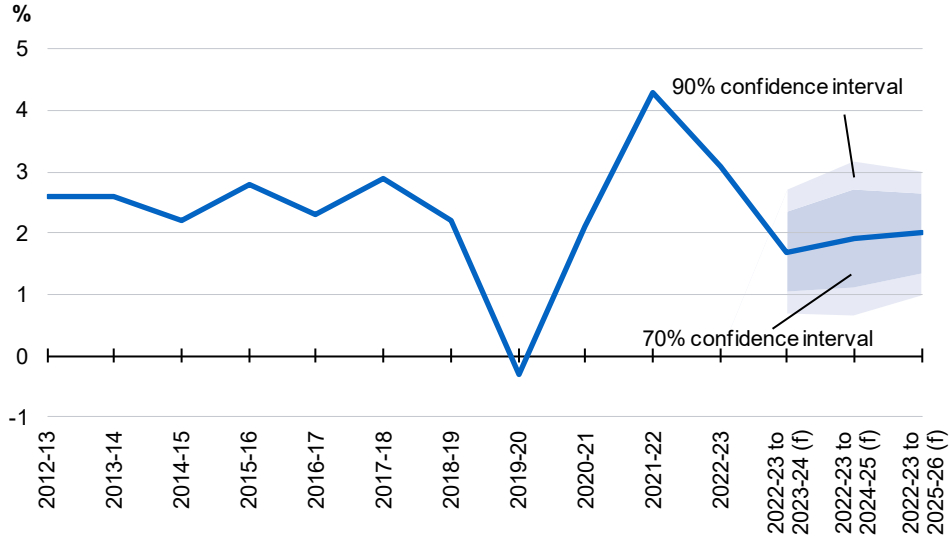
Future forecast errors may not have the same distribution as historical forecast errors. The large forecast errors in 2019–20 and 2020–21, related to the COVID–19 pandemic, are an example of events not previously captured in the historical error sample. Large disruptive events are difficult to predict and could occur again in the future.

Economic uncertainty based on historical forecast errors

Average annualised growth in real GDP in the three years to 2025–26 is expected to be around 2 per cent. The 70 per cent confidence interval ranges from 1¼ per cent to 2¾ per cent. The 90 per cent confidence interval ranges from 1 per cent to 3 per cent (Chart 8.9).

³⁹ See Treasury Working Paper: *Estimates of Uncertainty around Budget Forecasts* (2013).

Chart 8.9: Confidence intervals around real GDP growth rate forecasts

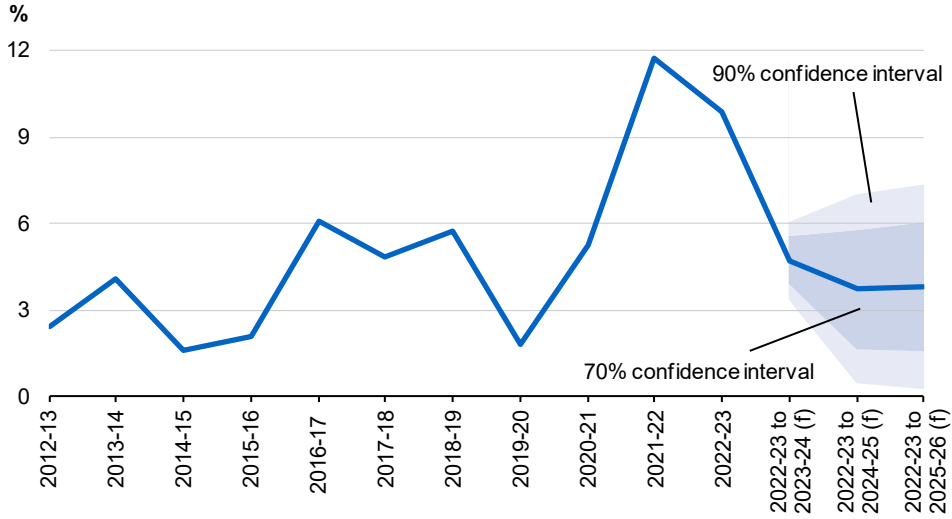


Note: The line shows the outcomes and the 2024–25 Budget forecasts. Annual growth rates are reported for the outcomes. Average annualised growth rates from 2022–23 are reported for 2023–24 onwards. Confidence intervals are based on the root mean squared errors (RMSEs) of Budget forecasts from 1998–99 onwards and are a statistical assessment that does not take account of any change in circumstance in the economic outlook. (f) are forecasts.

Source: ABS Australian National Accounts: National Income, Expenditure and Product and Treasury.

The confidence intervals around the nominal GDP forecasts are wider than those around the real GDP forecasts, reflecting the additional uncertainty around domestic prices and commodity prices. Average annualised growth in nominal GDP in the three years to 2025–26 is expected to be around 3¾ per cent, with the 70 per cent confidence interval ranging from 1½ per cent to 6 per cent. The 90 per cent confidence interval ranges from ¼ per cent to 7¼ per cent (Chart 8.10).

Chart 8.10: Confidence intervals around nominal GDP growth rate forecasts



Note: The line shows the outcomes and the 2024–25 Budget forecasts. Annual growth rates are reported for the outcomes. Average annualised growth rates from 2022–23 are reported for 2023–24 onwards. Confidence intervals are based on the root mean squared errors (RMSEs) of Budget forecasts from 1998–99 onwards and are a statistical assessment that does not take account of any change in circumstance in the economic outlook. (f) are forecasts.

Source: ABS Australian National Accounts: National Income, Expenditure and Product and Treasury.

Fiscal uncertainty based on historical forecast errors

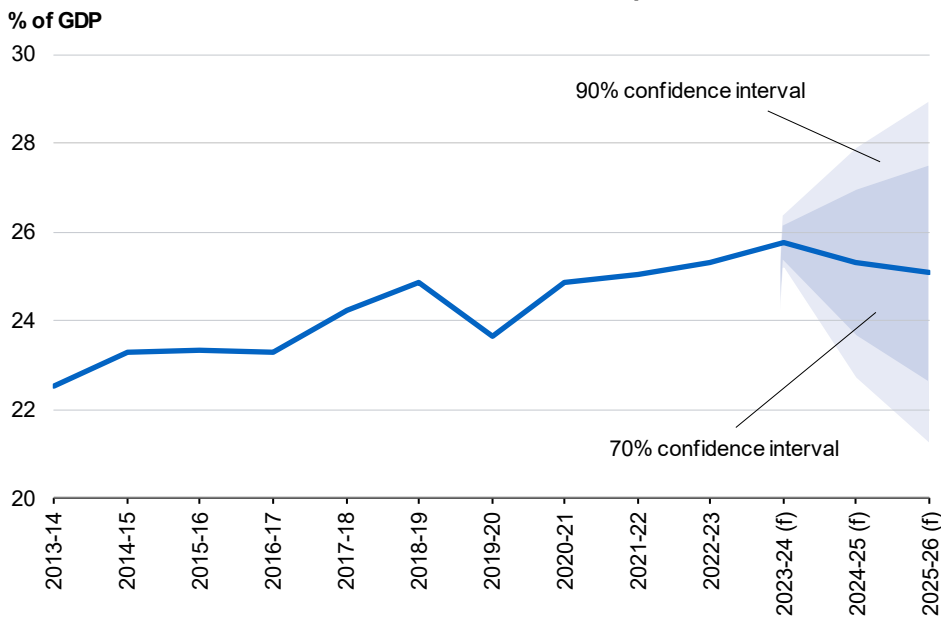
Fiscal estimates are based on economic and demographic forecasts as well as estimates of spending and revenue measures.

Historical variations caused by subsequent policy decisions not known at the time of forecast are excluded because these decisions do not reflect forecasting errors based on available information at the time of preparation. Payment estimates do not exclude the public debt interest associated with these subsequent policy decisions because this cannot be separately identified.

Total receipts

Total receipts (including GST) are expected to be around 25.3 per cent of GDP in 2024–25, with the 70 per cent confidence interval ranging from 23.7 per cent to 27.0 per cent of GDP. The 90 per cent confidence interval ranges from 22.7 per cent to 27.9 per cent in 2024–25. The uncertainty around receipts forecasts increases with time (Chart 8.11).

Chart 8.11: Confidence intervals around total receipts forecasts^(a)



a) Includes Future Fund earnings from 2020–21 onwards.

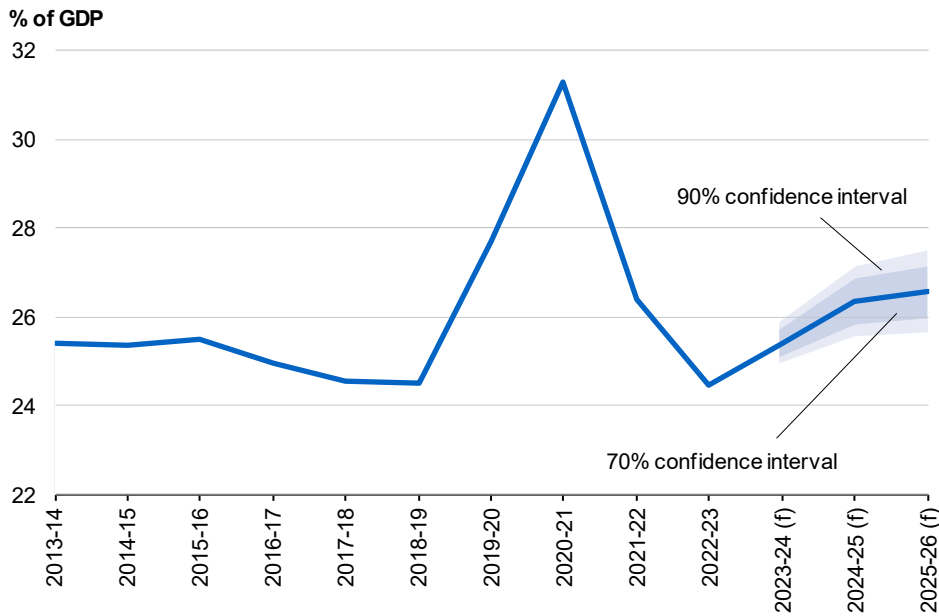
Note: The central line shows outcomes and the 2024–25 Budget forecasts. Confidence intervals use Root Mean Square Errors (RMSE) for Budget forecasts from the 1999–2000 Budget onwards. (f) are forecasts.

Source: Budget papers and Treasury.

Payments

The confidence interval for payments is narrower than receipts because there is greater certainty around payments forecasts. Payments (including GST) are expected to be around 26.4 per cent of GDP in 2024–25, with the 70 per cent confidence interval ranging from 25.8 per cent to 26.9 per cent of GDP. The 90 per cent confidence interval ranges from 25.5 per cent to 27.2 per cent in 2024–25 (Chart 8.12).

Chart 8.12: Confidence intervals around payments forecasts^(a)



a) Includes GST payments.

Note: The central line shows outcomes and the 2024–25 Budget forecasts. Confidence intervals use Root Mean Square Errors (RMSE) for Budget forecasts from the 1999–2000 Budget onwards. (f) are forecasts.

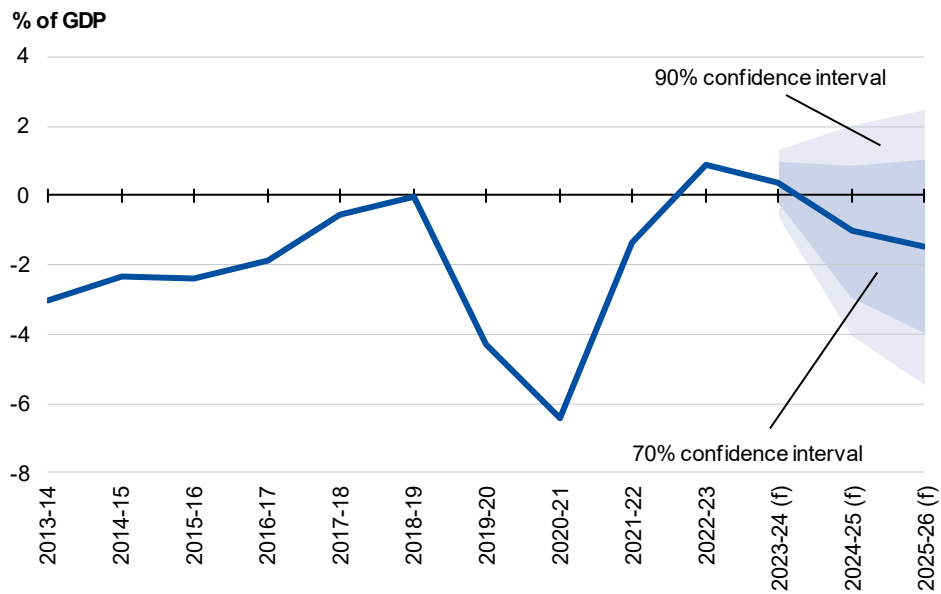
Source: Budget papers and Treasury.

Underlying cash balance

The underlying cash deficit in 2024–25 is expected to be 1.0 per cent of GDP, with the 70 per cent confidence interval ranging from a deficit of 2.9 per cent to a surplus of 0.9 per cent of GDP. The 90 per cent confidence interval ranges from a deficit of 4.0 per cent to a surplus of 2.0 per cent in 2024–25.

The uncertainty around underlying cash balance forecasts reflects forecast errors in receipts and payments which increase with time (Chart 8.13).

Chart 8.13: Confidence intervals around the underlying cash balance forecasts



Note: The central line shows outcomes and the 2024–25 Budget forecasts. Confidence intervals use Root Mean Square Errors (RMSE) for Budget forecasts from the 1999–2000 Budget onwards. (f) are forecasts.

Source: Budget papers and Treasury.

Assessing current forecasts through sensitivity analysis

Sensitivity analysis allows for an assessment of the impact of key assumptions. The following sensitivity analyses are considered due to their variability and importance for the Budget:

- Higher and lower iron ore prices.
- Higher and lower yields over the medium term.

For illustrative purposes, the upper and lower sensitivities are broadly symmetric, even where not equally probable.

Movements in iron ore prices

The forecasts for nominal GDP and tax receipts are sensitive to commodity price assumptions, particularly iron ore prices. Iron ore is Australia’s largest export by value, representing around 18.0 per cent of the total value of goods and services exports in 2022–23. See *Budget Statement 2: Economic Outlook* for more information on developments in commodity prices.

Iron ore prices are volatile and sensitive to global market developments. Table 8.1 considers the impact of a permanent US\$10 per tonne increase and decrease in the iron ore price on nominal GDP and tax receipts relative to the Budget baseline forecast.

Table 8.1: Scenario analysis of a US\$10 per tonne movement in iron ore prices

	US\$10/tonne FOB ^(a) increase				US\$10/tonne FOB decrease			
	2024-25	2025-26	2026-27	2027-28	2024-25	2025-26	2026-27	2027-28
Nominal GDP (\$billion)	5.3	2.7	5.9	11.0	-5.3	-2.7	-5.9	-11.0
Tax receipts (\$billion)	0.5	0.5	0.5	1.9	-0.5	-0.5	-0.5	-1.9

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

Source: Treasury.

The effects of a US\$10 per tonne increase and decrease in the iron ore price are broadly symmetric. The following discussion focuses mainly on an increase for illustrative purposes. The US\$10 per tonne increase in the assumed price for iron ore exports is expected to result in an increase in nominal GDP of around \$5.3 billion in 2024–25, rising to around \$11.0 billion in 2027–28.

The economic response to a permanent change in the price of iron ore is derived from a commodity price shock in Treasury’s Macroeconometric Model of Australia.⁴⁰ The model incorporates forward-looking financial markets, which anticipate the permanent increase (or decrease) in commodity prices. An increase in iron ore export prices leads to a higher terms of trade, which leads directly to higher output prices and nominal GDP. However, the appreciation in the exchange rate partially offsets the increase in exports prices and acts

⁴⁰ See Treasury Paper: *The Macroeconometric Model of Australia: Modelling Approach* (2021).

to reduce domestic inflation through lower import prices. In comparison, *Box 2.4: Commodity prices* illustrates the effect of changing the short-term commodity price assumptions on the forecasts for nominal GDP and tax receipts while maintaining the Budget forecasts for economic activity, the exchange rate and other prices. This methodology is more consistent with how short-run movements in commodity prices would impact the forecasts for nominal GDP and tax receipts in the budget.

The volume of output and exports of the mining sector increase in response to higher iron ore prices. The higher exchange rate leads to a substitution towards imports, which partially offsets the increase in exports and GDP.

A US\$10 per tonne increase in the assumed price for iron ore exports is expected to result in an increase in tax receipts of around \$0.5 billion in 2024–25, 2025–26 and 2026–27, before increasing to \$1.9 billion in 2027–28. An increase in iron ore prices increases mining company profits and therefore company tax receipts. This builds over time as receipts fully incorporate the lag between when profits are realised and tax is paid by companies, with the largest increase occurring in 2027–28. Lower domestic prices result in lower individuals and other withholding taxes and indirect tax receipts, partially offsetting the increase in company tax.

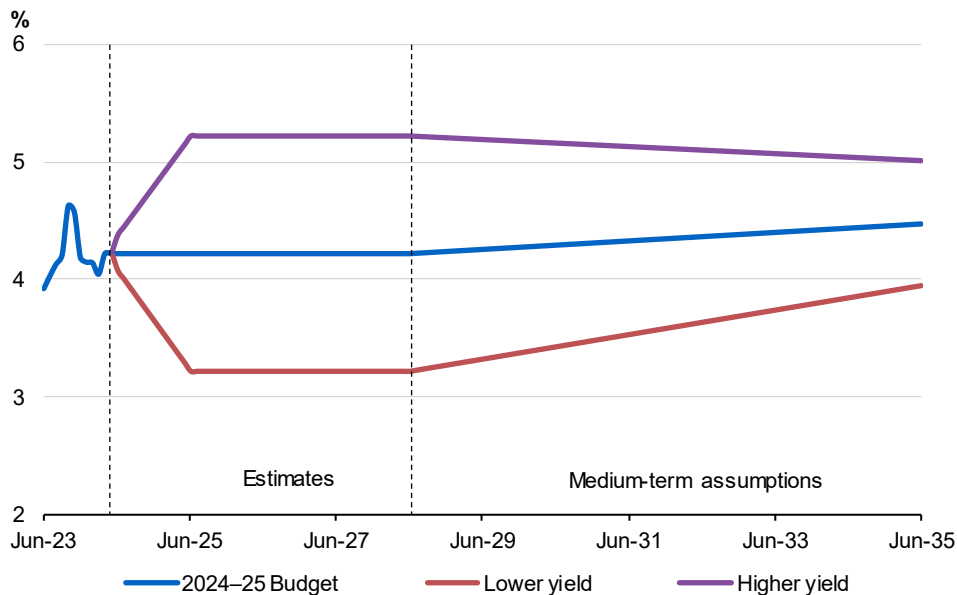
Movements in yields

Government borrowing costs are sensitive to yields on Australian Government Securities and the level of debt. See *Budget Statement 7: Debt Statement* for further information on yields. Given the uncertainty surrounding the global and domestic outlook and the impact on yields, Treasury makes the following technical assumptions:

- Over the forward estimates, government bond yields are fixed at rates observed immediately prior to the Budget update. In the 2024–25 Budget, the 10-year yield, which approximates the average yield on new issuance, is assumed to be 4.2 per cent over the forward estimates.
- After the forward estimates, the 10-year bond yield converges linearly towards the long-run nominal GDP growth rate over 15 years. This is broadly consistent with the long-run approaches of comparable advanced economies. The yields on other bond tenors are assumed to maintain their historical relative to the 10-year bond yield.

The higher yield assumption has bond yields increasing by 100 basis points by 30 June 2025. Yields are then held constant over the remainder of the forward estimates to 2027–28, before linearly converging to the long-run yield assumption of nominal GDP growth over 15 years. The lower yield sensitivity is symmetric (Chart 8.14). Other economic parameters are assumed to remain unchanged from baseline forecasts to isolate the direct impact on fiscal aggregates.

Chart 8.14: Baseline and alternative movements in the 10-year bond yield



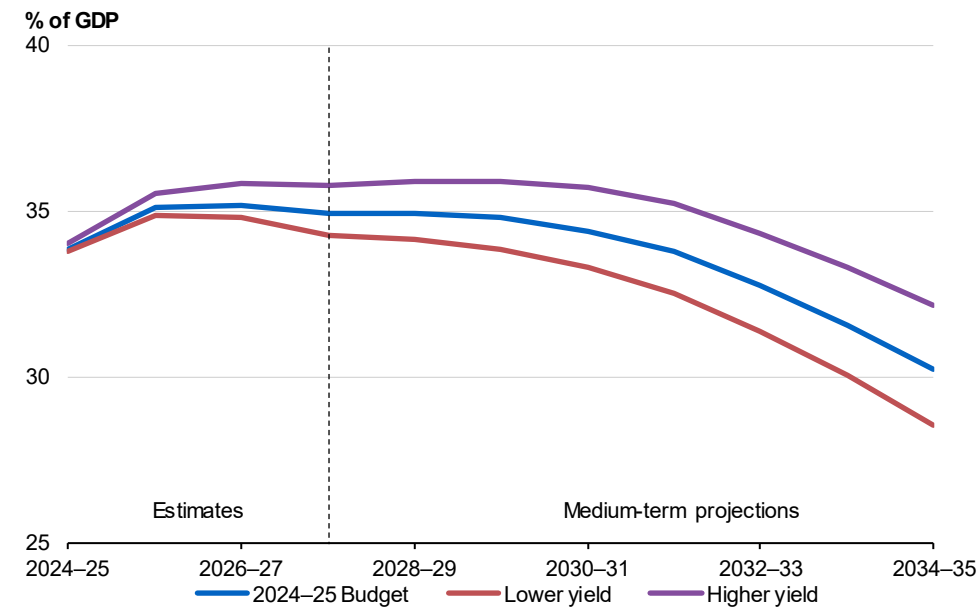
Source: Treasury.

Higher yields increase public debt interest payments and receipts earned on investments. As government interest bearing liabilities usually exceed interest bearing assets, higher yields lead to a deterioration in the underlying cash balance. Lower yields have the reverse effect, improving the underlying cash balance.

The higher yield assumption results in a deterioration to the underlying cash balance of 0.3 percentage points of GDP by 2034–35 and increases gross debt by 1.9 percentage points of GDP at 30 June 2035 (Chart 8.15).

The lower yield assumption results in an improvement to the underlying cash balance of 0.2 percentage points of GDP by 2034–35. Under the lower yield assumption, cumulative improvements to the underlying cash balance reduce gross debt by 1.7 percentage points of GDP at 30 June 2035.

Chart 8.15: Gross debt



Source: Australian Office of Financial Management and Treasury.

Even under the higher yield assumption, projected Commonwealth gross debt as a share of GDP is less than 30 per cent of the average general government gross debt in the G7 countries today.