BIS OXFORD ECONOMICS

Energy Queensland

COST ESCALATION FORECASTS TO 2024/25

JUNE 2018

BIS Oxford Economics

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15 June 2018

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TABLE OF CONTENTS

EXECUTIVE SUMMARY

+3.7%

Annual wage increases expected for employees in the utilities industry

Nominal growth in National Electricity, Gas, Water and Waste Services WPI

+3.2%

Real world copper price growth

World copper price outlook driven by infrastructure spending on renewable energy projects

+3.0%

Non-hydro electricity IPD growth

Non-hydro electricity construction costs set to exceed CPI.

REAL COST ESCALATION FORECASTS TO 2024/25

On 15 May 2018, BIS Oxford Economics was engaged by Energy Queensland to provide price forecasts of labour, materials and construction costs that are relevant to the Queensland electricity distribution industry for the period 2018/19 – 2024/25. Forecasts for wage escalation will be used by Energy Queensland to develop the real price changes over its upcoming regulatory period, which, in turn, will be used by the business to construct its operating expenditure forecasts. Forecasts of price escalation factors for material costs, which are key inputs to various asset classes, and construction costs will be used by Energy Queensland to develop its capital expenditure over the next regulatory period.

BIS Oxford Economics expects total wage costs for the Australian Electricity, Gas, Water and Waste Services (EGWWS or 'Utilities) sector — as measured in the Wage Price Index — will grow (escalate) by an average of 3.7% y/y over the eight years to 2024/25, 0.5% higher than the national 'All Industries' average over the same eight-year period.

The electricity, gas and water sector is a capital intensive industry whose employees have higher skill, productivity and commensurately higher wage levels than most other sectors. Strong union presence in the utilities sector will ensure outcomes for collective agreements, which cover around 60% of the non-managerial full-time workforce, remain above the wage increases for the national 'all industry' average.

The outlook for materials prices to FY25 is mixed. Copper, a key material for the electricity industry, is expected to see particularly strong real price growth (average of 3.2% y/y, although the majority of the increase took place at the start of FY2018) over the eight years to FY25, buoyed by infrastructure spending on renewable energy projects and increased demand from China. The real Brent Crude Spot price is also expected to experience solid growth, averaging 2.5% per annum, supported by the reduction in the current overcapacity but constrained by lower demand growth in developing economies. Real aluminium prices are set to grow at a rate of 1.6% y/y over the forecast period, while Chinese Hot Rolled Coil prices are expected to decline - at an average of 0.8% y/y in real terms.

National Engineering Construction IPD, non-hydro electricity IPD, non-residential bundling IPD and Queensland non-residential building IPD are expected to grow faster than the CPI inflation between FY18 to FY25. The engineering construction and non-hydro electricity IPDs will be driven by oil prices, the recovery in wage growth, and the movement of other materials prices to long run levels, and non-hydro electricity will be particularly affected by strong world copper price growth. Non-residential building costs are expected to be contained in the long run, due to relatively modest wage and inflation growth.

Wages, materials and construction costs experience different levels of volatility, which influences the accuracy of any forecast for these series. Wage growth is

relatively stable, reflecting the rolling nature of collective agreements, the relatively infrequent nature of wage increases for workers not covered by collective agreements, and the link between wage growth and price inflation. Price inflation has become increasingly stable in recent decades, with increased credibility of central bank policy (provided by the inflation targeting framework) anchoring inflation expectations at a relatively low stable rate when compared to previous periods. The anchoring of inflation expectations has translated through to wages, and as can be seen in the data this has led to relatively stable wage growth, with the trend evolving along a relatively smooth profile.

Construction costs, which are strongly influenced by commodity prices in addition to wages, are more volatile. However, there is variation among the various construction IPDs. The Non-Hydro Electricity Construction IPD is considerably more volatile than the engineering construction IPD, predominantly due to the influence of copper prices, which are a key cost for the electricity sector. Commodity prices themselves are subject to both market fundamentals (global economic conditions and shifts in supply) and financial markets, which makes them inherently more volatile than domestic costs. For example, oil prices have shown considerable volatility in recent months, with prices buffetted by rising geopolitical tensions, the threat from a global trade war, and uncertainty around the outlook for OPEC production.

1. INTRODUCTION

On 15 May 2018, BIS Oxford Economics was engaged by Energy Queensland to provide price forecasts of labour, materials and construction costs relevant to electricity distribution networks in Queensland from FY18 to FY25. Forecasts of wages will be used by Energy Queensland to develop the real price changes over its upcoming regulatory period, which, in turn, will be used by the business to construct its operating expenditure forecasts. Forecasts of price escalation factors for material costs, which are key inputs to various asset classes, and construction costs will be used by Energy Queensland to develop its capital expenditure over the next regulatory period. Forecasts of both nominal and real price growth of the relevant inputs are provided.

In keeping with my instructions, I confirm that I have undertaken this engagement having regard to the Guidelines for Expert Witnesses in Proceedings in the Federal Court of Australia and the requisite statement to this effect is included in Appendix 1. I have been assisted in the preparation of this report by Stella McMullen (Economic Analyst) at BIS Oxford Economics. Notwithstanding the assistance from the other economist, the opinions in this report are my own and I take full responsibility for them.

The Australian Bureau of Statistics is the primary data source for the consumer price index, wages, employment, real gross value added and investment (including engineering construction) data, and for a range of other economic variables. The data used in the projections is the latest available at the end of May 2018, and includes the March quarter 2018 WPI data release. Other inflation and interest rate data were sourced from the Reserve Bank of Australia, and forecasts for comparison were sourced from the Reserve Bank of Australia, the Office of the Chief Economist, the Treasury, the Queensland Treasury and Consensus.

Forecasts of the economic variables in this report were mostly sourced from BIS Oxford Economics reports, including *Economic Outlook*, *Long Term Forecasts: 2017 – 2032 update, Oxford Economics Commodity Price Forecasts, Mining in Australia 2017-2032 May 2018 Update, Engineering Construction in Australia 2018* and *Building in Australia 2018-2033*, along with other unpublished forecasts and from BIS Oxford Economics internal research and modelling.

The previous Summary section presents an overview of the outlook for the labour, materials and construction costs including numerical forecasts which are presented in summary tables.

Section 2 provides a macroeconomic outlook for Australia and Queensland. This section also has forecasts of key economic variables plus a discussion of the drivers and logic underpinning the forecasts. Section 2 essentially provides a context for our Australian wage forecasts including wage forecasts by state and by industry.

Section 3 discusses BIS Oxford Economics' national, Queensland and electricity, gas, water and waste services wage growth, and rural versus urban wage growth.

Section 4 discusses BIS Oxford Economics' exchange rate and construction costs forecasts, specifically aluminium, copper, oil and steel.

Section 5 presents construction cost forecasts, including the engineering construction IPD, non-hydro electricity IPD, national non-residential building IPD and Queensland non-residential building IPD.

2. MACROECONOMIC OUTLOOK

2.1 AUSTRALIA OUTLOOK

The Australian economy has experienced 27 years of uninterrupted growth since the FY91 recession. Population growth is among the highest of the developed economies, which has helped underpin household consumption and demand for dwelling and infrastructure construction. Government debt is comparatively low by global standards, with the national (Commonwealth) government and the larger state economies of New South Wales and Victoria maintaining AAA credit ratings. Overall, economic risks are low and the Australian economy is situated in the fast growing Asia Pacific region.

Nevertheless, growth in GDP and particularly domestic demand has been lower over the past five years than the previous two decades. The main factor dragging down growth has been a major decline in mining investment, which has coincided (and contributed to) weakness in non-mining business investment.

The shift in the Australian economy back to broad-based growth—across all sectors of the economy —following the mining boom continues to progress slowly. Growth is still below trend—GDP growth has averaged around 2.5% annually over the last five years, and 2.1% in FY17. There are some positive signs. Net exports are contributing positively to demand and exports have bounced back after a weak finish to 2017, with the global upswing and competitive Australian Dollar helping to drive export volumes growth. Business confidence and activity surveys are still buoyant, suggesting the recovery in non-mining investment is continuing. However, while non-mining business investment has started to pick up, it has not returned to broad based growth across all sectors, and with spare capacity—i.e., an excess of supply—still to absorb in the labour market, wages, household income and consumer spending growth is forecast to remain the weak link in demand this year and next.

Mining is also starting to recover, boosted by higher commodity prices. The continued recovery in mining, concentrated in Western Australia and Queensland and supported by further commodity price rises and an improved investment climate, will contribute to net exports. Major LNG projects in Western Australia will be the key positive contributor.

Overall, growth is expected to remain sluggish for the next two to three years, at 2.7% in FY18, 2.5% in FY19 and 2.5% in FY20. Over the five years to FY25, GDP growth is forecast to average 2.7% per annum.

Population growth picked up slightly over three years to FY17, due to higher levels of overseas migration, and is currently at 1.6% per annum. Although relatively high levels of overseas migration is expected to persist over the medium to long term, the annual rate of population increase is projected to slowly decelerate, easing to 1.3% in FY25.

At the same time, the population is forecasted to continue to gradually age, as the ‘baby boomers’ (those born between 1945 and 1965) move into retirement and life expectancy increases. This means the labour force is expected to

continue to grow at a slower rate than the overall population - although labour force participation among the 65+ age groups is forecast to increase over time, it is not expected to be enough to offset the decline in growth of prime-aged (25-55 year olds) workers. Accordingly, this means that growth in employment is forecast to gradually decelerate.

Productivity growth is also expected to be slower over the long term than the historical average of 1.5% per worker. Indeed, over the past 15 years, non-farm GDP productivity per worker has only averaged 1.0% per annum. However, a large increase in the proportion of part-time workers over this period has understated the productivity improvements. Productivity growth (GDP per employee) is expected to lift from a 0.1% decline in FY17 to +0.3% in FY18, +1.2% in FY19 and +1.4% in FY20, supported by the ramping up of mining production and the recovery in non-mining investment. But structural drags, including diminishing benefits from past positive forces such as globalisation and a slowing pace of technological progress, are expected to weigh on productivity beyond FY20. This will lead to productivity growth falling back to 0.9% in FY25.

With the economy forecast to grow below trend this year and next, BISOE does not expect the Reserve Bank of Australia (RBA) to begin tightening cash rates until the December quarter 2019. The strengthening in economic and employment growth will gradually lead to higher wage and inflationary pressures, resulting in the RBA lifting cash rates to 2.75% by mid-2022.

2.2 QUEENSLAND OUTLOOK

The downturn in mining investment was a significant drag on Queensland's economy between FY14 and FY16, with private engineering construction and equipment purchases and exploration in the mining sector dropping sharply. With the mining investment downturn coming to an end and AUD-exposed sectors (such as tourism and education) benefitting from the weaker currency and positive global environment, the economy has begun to recover, although GSP growth remains below the national level, at 1.8% in FY17.

Modest growth in household spending, equipment investment, government expenditure and dwelling investment have also supported GSP growth over the last year. And the jump in coal prices and higher base metals prices over FY17 has caused coal mines in Queensland to re-open and contributed to increases in mining equipment purchases. The recovery in mining, contribution from the three Gladstone LNG plants and coal will contribute to export growth and subsequently GSP.

With conditions continuing to improve we expect momentum to build, with GSP forecast to increase 3.0% in FY18 and FY19 – the fastest of all of the states. Aided by a weaker Australian dollar, Queensland will benefit from strong growth in resource-related exports, with continuing contributions from tourism, education and manufacturing. A downturn in residential construction is expected to be the main negative detracting from growth. In the six years to FY25, Queensland GSP growth is forecasted to average 2.8%, slightly above the national average of 2.7%.

Population growth in Queensland matched the national average in FY17, with both increasing by 1.6%. This growth was supported by net interstate

migration, net overseas migration, and natural increase (births minus deaths). With the economic outlook improving we expect population growth to continue to pick up in the near term, to 1.9% in each of FY19 and FY20 – this trend will be supported by increased net interstate migration and net overseas migration.

However, declining fertility levels will slow the growth rate of natural increase from FY19. Net interstate migration will also fall back between FY20 and FY23 as Queensland's pace of growth converges towards the national average, and net overseas migration is expected to decline in FY22 and FY23. Due to weaknesses in all of its components, population growth is expected to gradually fall back in line with the national average, averaging 1.6% in the five years to FY25.

As in other states, Queensland's labour market staged a dramatic recovery in 2017, with the state adding over 100,000 jobs. Although employment has fallen back slightly in recent months we still expect employment growth of 3.9% in FY18 – the highest of the states. Looking ahead we expect the pace of jobs growth to ease. The downturn in residential construction activity, which will begin once the current pipeline of work is completed, will weigh on employment in the sector and spill over to the broader construction supply chain. But with conditions improving in other sectors, Queensland's labour market is expected to lead the rest of the economy in FY19.

Slowing population growth in the prime age working population will limit increases in supply of labour, which will pull employment growth down. Queensland employment growth is set to average 1.6% over the six years to FY25.

3. WAGES AND INFLATION OUTLOOK

3.1 WHOLE ECONOMY WAGE OUTLOOK

3.1.1 Choice of the Wage Price Index as the measure of Labour Costs

BISOE chose to use the Wage Price Index (WPI) as the key measure of labour costs, and forecasted Electricity, Gas, Water and Waste Services WPI. The key motivations for this are (a) greater data availability, and (b) the WPI is more stable than AWOTE and is a better measure of underlying trends.

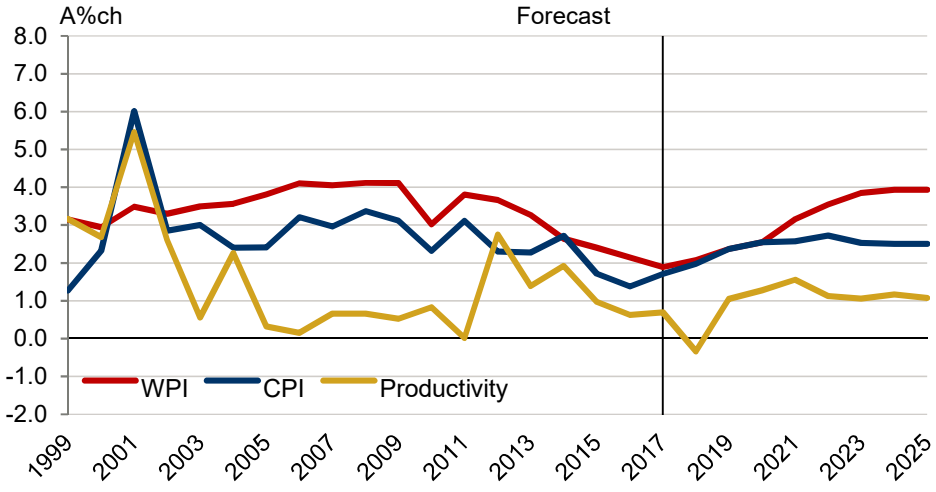
3.1.2 National

Wage growth at the national and state level has fallen back considerably since 2008. The Global Financial Crisis reduced wage growth in many industries including utilities, although mining wages boosted wage growth at the national level. Over the last five years, the mining downturn and the subsequent labour market transition, as well as structural features from abroad such as low tradables inflation have weighed heavily on wage growth.

Spare capacity in the labour market, labour market flexibility, falling union membership, slower labour productivity growth, weak inflation and lower inflation expectations have together slowed wages growth in recent years, to historical lows of 1.9% for the wage price index (WPI) in FY17.

We expect wage growth will pick up as inflation rises, and capacity in the labour market tightens. However, inflation and employment growth will both remain subdued, and continual spare capacity in the labour market will keep a lid on wage growth. Overall, the WPI is forecast to rise by 2.1% in FY18.

Fig. 1. Wage, Inflation and Productivity Growth, Annual Average, Australia



Year Ended June

Source: BIS Oxford Economics, ABS data

Looking ahead, wage growth is expected to strengthen gradually over the next five years, as inflation rises and capacity in the labour market is absorbed. In the long run, wage growth is determined by productivity growth, structural

features of the labour market and inflation. Falling rates of unionisation, increased casualization of the workforce, the ageing population, and a structural decline in the pace of productivity growth will together weigh on wage rises in the long run. However, with many of the forces that reduced wages growth between FY08 and FY17, such as low tradable inflation and the end of the mining boom, diminishing, wage growth will be able to return to near pre-GFC levels by FY25, though remain weaker than its long run average. Wage growth is expected to lift to reach 3.9% in FY23, before holding there through to FY25.

3.1.3 Queensland

Historically, wage growth in Queensland has tracked very closely to the national average, with a correlation coefficient of 0.95 over the past two decades. The sectoral composition of Queensland's economy is very similar to the national economy, and the state will experience many of the same wage pressures, including the mining and non-mining recoveries, and long term drags such as increased casualization, the ageing population and a structural decline in productivity growth. As such, wage growth in Queensland is forecasted to continue to move with national wage growth.

Queensland wage growth is expected to outpace the national average this financial year and next, as Queensland continues to recover from the end of the mining investment boom and economic performance overtakes the other states and territories. Wage growth is then expected to dip below the national average in FY20, then align with the national average out to FY25.

Fig. 2. Wage Price Index Growth, Annual Average, Queensland and National

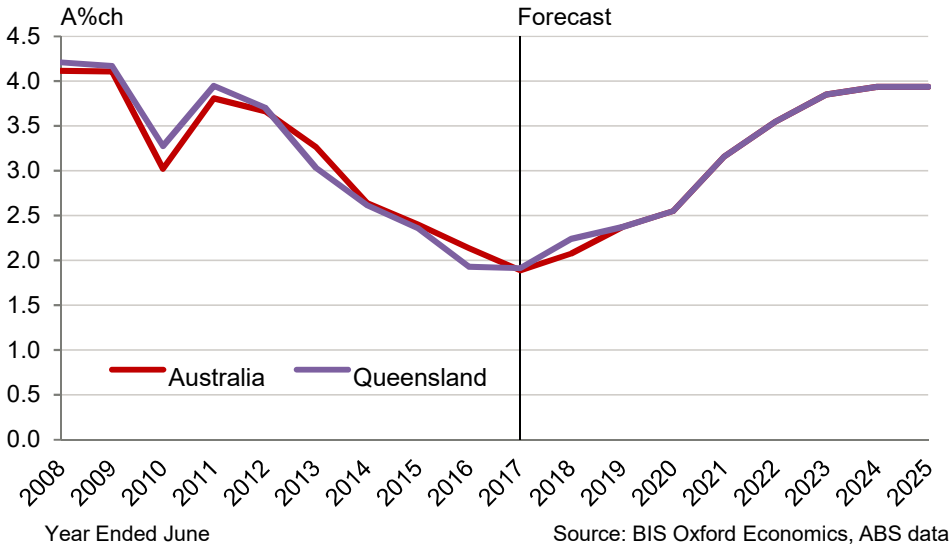
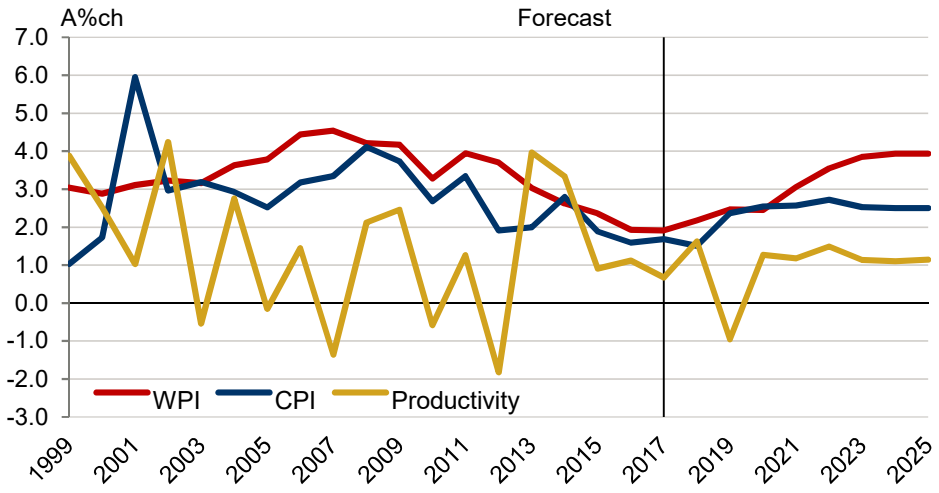


Fig. 3. Wage, Inflation and Productivity Growth, Annual Average, Queensland



Year Ended June

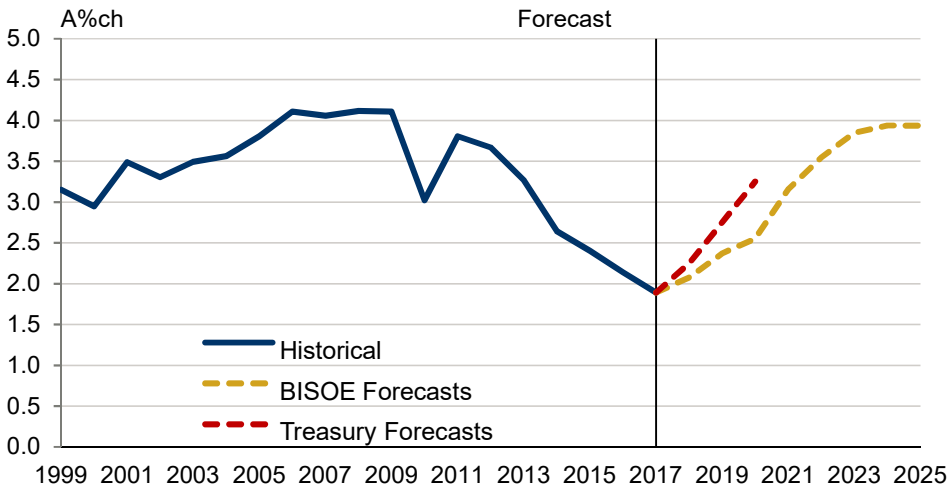
Source: BIS Oxford Economics, ABS data

3.1.4 Comparison to Treasury Wage Outlook

National level

Compared to our projections, The Federal Treasury is forecasting a stronger rebound in wage growth for the whole economy. In the 2018-19 Budget, The Treasury is projecting continued improvements in the economic environment, which they expect will support further growth in employment and an acceleration in wage inflation. We are less optimistic about the outlook, and expect to see a much more gradual acceleration in wage inflation in FY18, FY19 and FY20.

Fig. 4. National WPI Forecasts: BIS Oxford Economics and The Treasury



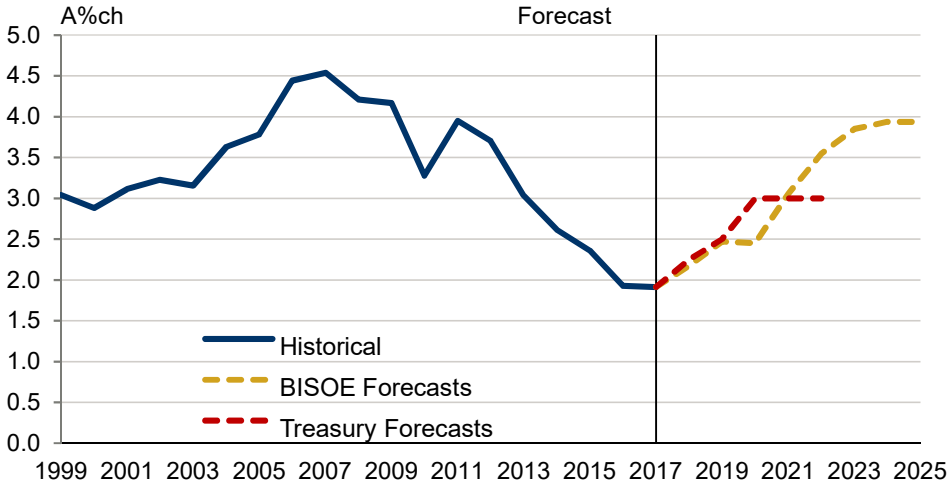
Year Ended June

Source: BIS Oxford Economics, ABS data, The Treasury

Queensland

The Queensland Treasury is also forecasting a comparatively stronger rebound in wage growth between FY18 and FY20. In the 2018-19 Queensland Budget, the Queensland Treasury WPI forecasts align with BISOE over FY18 and FY19. However, the Queensland Treasury forecasts a further pick up in Queensland WPI in FY20, while BISOE expects the pace of growth to hold steady. Beyond FY20, the Queensland Treasury projects WPI holding at 3% until FY22, while BISOE is forecasting wage growth to continue to pick up and reach 4% in FY24.

Fig. 5. Queensland WPI Forecasts: BIS Oxford Economics and the Treasury



Year Ended June

Source: BIS Oxford Economics, ABS data, The Treasury

3.2 ELECTRICITY, GAS, WATER AND WASTE SERVICES WAGE OUTLOOK

Electricity, Gas, Water and Waste Services (EGWWS) WPI growth has consistently tracked above the national average since the index's inception in 1997, with annual growth averaging 0.4% points higher over the last decade (3.4% y/y compared to 3% y/y).

Historically, wage growth in the sector has been underpinned by major capital works programs in the utilities sector since the beginning of the last decade, which has driven demand for labour and hence employment growth over the same period. With strong competition for similarly skilled labour from the mining and construction industries, firms have had to raise wages to attract workers. In other words, the mobility of workers between the EGWWS, mining and construction industries means that demand for workers in those industries will influence employment, the unemployment rate and hence spare capacity in the EGWWS labour market. Although we do not expect construction activity in the mining sector to boom over the forecast horizon, generally improving economic conditions will support demand for labour across Queensland's economy, which will gradually lead to tighter conditions in the EGWWS labour market.

Moreover, the utilities industry is highly capital intensive, employing workers with comparatively high levels of skill and education. While labour productivity growth in the EGWWS is considerably more volatile than the national average, over the five years to CY17, productivity growth averaged 2.6% y/y, compared to the national average of 1.0%.

3.2.1 EGWWS wage growth and unionisation

Wage growth in the EGWWS industry is also highly influenced by the strong trade union presence in the utilities industry. Trade unions, such as the Australian Services Union and the United Services Union, are able to negotiate typically higher-than-average wage outcomes for their members through collective bargaining, resulting in stronger wage growth than the all-industry average. As at May 2016, 60.6% of full-time non-managerial employees in the EGWWS industry have their wages set by collective agreements, considerably higher than the national average of 37.1%. Over the past 10 years, a higher proportion of workers on collective agreements is associated with higher wage growth, with a correlation coefficient of +0.6 (see Fig. 7).

Fig. 6. Proportion of full-time non-managerial employees by wage setting method and industry, Australia, May 2016

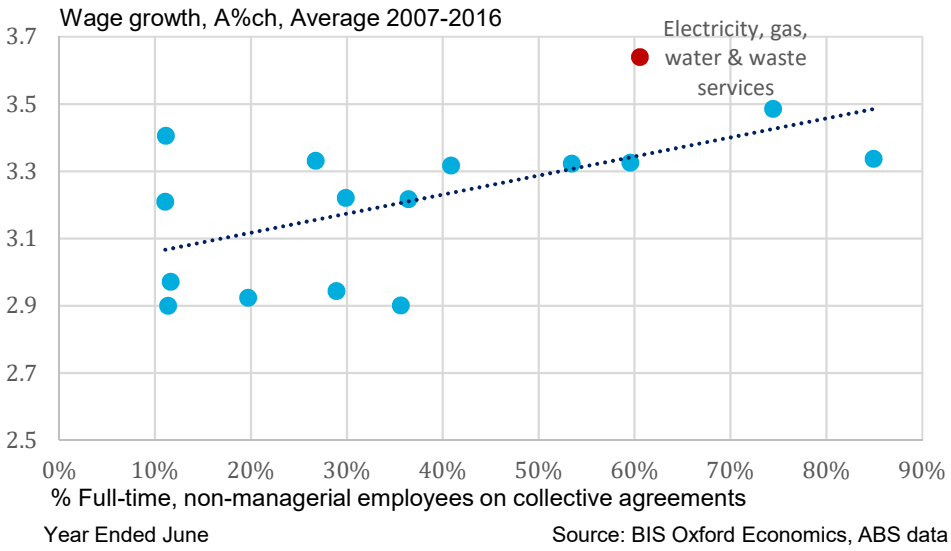
Industry	Award only	Collective agreement	Individual arrangement
Professional, scientific and technical services	5.0%	10.1%	84.9%
Rental, hiring and real estate services	15.4%	11.4%	73.2%
Wholesale trade	10.5%	12.6%	76.9%
Other services	22.0%	13.3%	64.8%
Administrative and support services	30.8%	14.6%	54.5%
Retail trade	24.6%	18.2%	57.2%
Construction	10.7%	26.7%	62.6%
Manufacturing	10.9%	29.9%	59.2%
Arts and recreation services	10.6%	33.9%	55.7%
Information media and telecommunications	3.2%	38.7%	58.1%
Finance and insurance services	0.7%	43.3%	55.9%
Health care and social assistance	30.9%	52.9%	16.2%
Transport, postal and warehousing	12.4%	56.0%	31.5%
Electricity, gas, water and waste services	**5.7%**	**60.6%**	**33.6%**
Education and training	27.3%	64.3%	8.3%
Public administration and safety	17.0%	79.6%	3.4%
All industries	15.9%	37.1%	47.0%

Source: BIS Oxford Economics, ABS Data

As we expect that the EGWWS industry will continue to have higher levels of unionisation than the national average, we expect that unions in the EGWWS industry will continue to be able to negotiate for higher wages for a substantial proportion of EGWWS employees, resulting in EGWWS wages growing faster than the national average. This finding is supported by the terms of the current Energy Queensland Union Collective Agreement 2017, which provides

guaranteed annual salary increases of 3.0% from 1 March 2018, 3.0% from 1 March 2019 and 3.0% from 1 March 2020 – above our forecast for Australian WPI growth over the same period.

Fig. 7. Average wage growth and unionisation rates by industry, 2007-2016



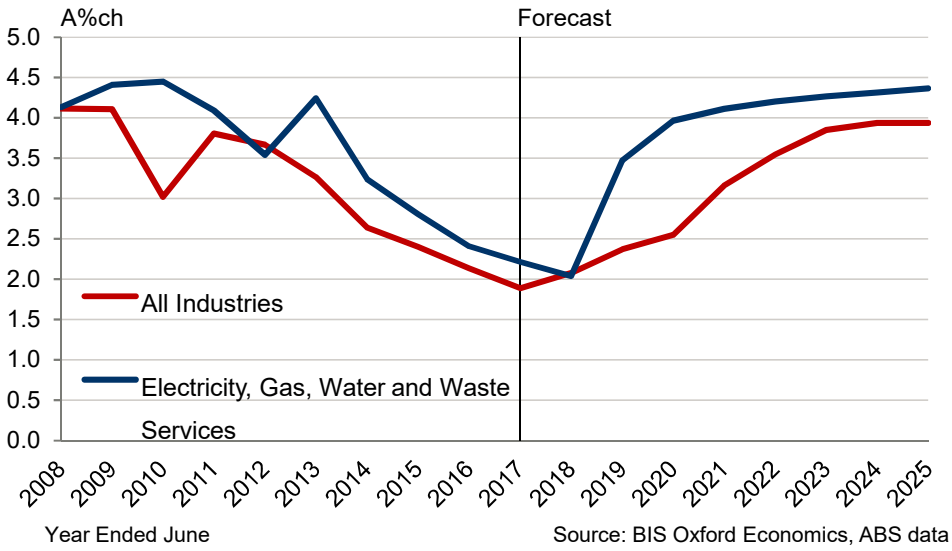
Year Ended June

Source: BIS Oxford Economics, ABS data

Despite the structural features outlined above, in the three quarters of FY18 EGWWS WPI currently available, wage growth in the industry has averaged 1.9%, compared to the all industry average of 2.1%. As such, BISOE is forecasting a 2.0% increase in EGWWS wage growth in FY18, slightly below the national average of 2.1%.

Beyond this, we expect utilities wage growth to outpace the national all-industry average from FY19. BISOE expects that national Electricity, Gas, Water and Waste services WPI growth will pick up to 3.0% in FY19 and 3.5% in FY20 through, then level off at around 4.2% growth from FY22 onwards. Labour market capacity in the industry is expected to tighten in line with the national labour market, and the collective agreement guaranteed wage increases that are already in place will provide a floor for wage rises.

Fig. 8. Wage Price Index Australia Industries and Electricity, Gas, Water and Waste Services



3.2.2 Queensland EGWWS wages v. national EGWWS wages

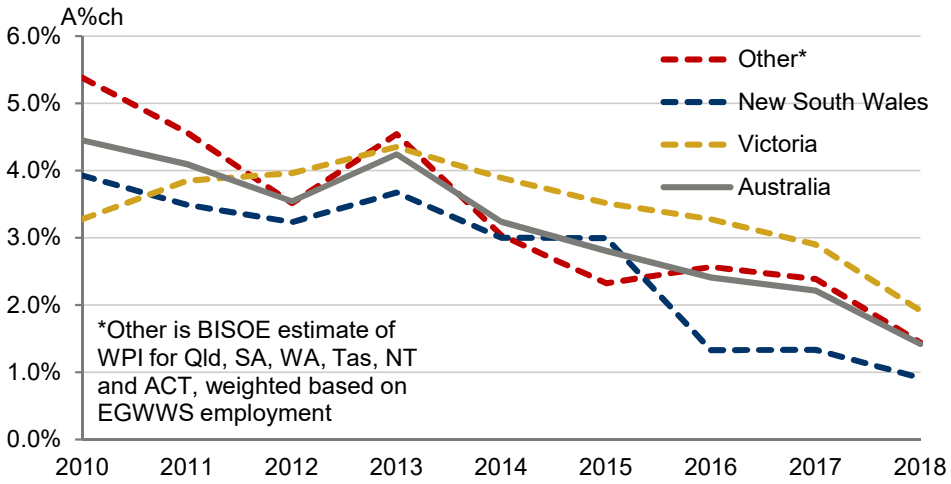
BISOE recommends that national EGWWS WPI growth is used as the primary labour cost escalation forecast. The Queensland EGWWS WPI is not publishable by the ABS, but analysis by BISOE suggests that Queensland EGWWS WPI would move broadly in line with national EGWWS WPI.

BISOE analysed the Victoria, New South Wales and National Electricity, Gas, Water and Waste Services WPI (requested as a customised report from the Australian Bureau of Statistics). Using EGWWS employment as a weighting, BISOE estimated a series for EGWWS WPI for the remaining states and territories (of which Queensland accounts for 44% of EGWWS employment). The computed 'Other States and Territories' EGWWS index moves with the national average, with a growth correlation coefficient of 0.8. As Queensland comprises almost half of this group, it is reasonable to conclude that Queensland tracks closely to the 'Other States and Territories' series, and therefore with the national EGWWS WPI series. BISOE concluded that wages for Queensland's EGWWS workers largely evolve in line with the national average (see Fig. 9).

Furthermore, our research has found that the collective agreements currently in place for EGWWS workers in different states mandate broadly similar wage increases over the short term. For example, the ACTEWAGL and Combined Unions Enterprise Agreement 2017 states that employees in the Australian Capital Territory will have an increase of salary of 3% on or after 1 July 2017, 1 July 2018, and 1 July 2019, very similar to the remuneration agreement negotiated in the Energy Queensland Union Collective Agreement 2017. Further, the Ausgrid offer on the table negotiated with the United Services Union (February 2018), is for a 2.75% wage increase on a successful employee yes vote, 2.5% on the first anniversary of Agreement certification and 2.25% on the second anniversary of Agreement certification.

For these reasons, the national Electricity, Gas, Water and Waste Services Wage Price Index is recommended for use for Queensland utilities labour cost escalation.

Fig. 9. Electricity, Gas, Water and Waste Services Wage Price Index, New South Wales, Victoria and Other



Year Ended June

Source: BIS Oxford Economics, ABS data

3.3 RURAL VERSUS URBAN WAGE GROWTH PATTERNS

The existence of an urban wage growth premium is well established.[1] Theories of the wage premium include cities attracting higher skill and ability workers, the productivity advantage for firms in cities and the job mobility advantage of urban workers.[2]

However, although wage levels in Australia are higher in urban areas than in rural areas in general (with the exception of some high income rural mining areas[3]), the pace of wage growth across the regions has been broadly similar over the past two decades.

A 2017 working paper published by the Grattan Institute found that income growth rates are not 'obviously worse' in regional areas of Australia than in urban areas, and that although cities have higher average incomes, the gap in incomes is not widening between cities and the regions.[4] Further, the 2017 Analysis of Wage Growth published by the Treasury found that although people in Brisbane earn around 5 to 10 per cent more than those in the rest of

[1] Paul Verstraten, Gerad Verweij and Peter Zwaneveld, *Why do wages grow faster in urban areas? Sorting of high potential factors,* (Netherlands: CPB Netherlands Bureau for Economic Policy Analysis, 2018).

[2] Jeffrey Yankow, Why do cities pay more? An empirical examination of some competing theories of the urban wage premium, (Journal of Urban Economics, 2006).

[3] Australian Bureau of Statistics, Perspectives on Regional Australia: Variations in Wage and Salary Income between Local Government Areas (LGAs), 2003-04 to 2008-09, (2012).

[4] John Daley, Danielle Wood and Carmela Chivers, *Regional patterns of Australia's economy and population,* (Melbourne: The Grattan Institute, 2017).

Queensland, growth in capital city and regional area wages have been similar over the past two decades.[4]

Utilities Union Collective Agreements also provide evidence that wage growth in the utilities industry has also been broadly similar between rural and urban areas in Queensland. Prior to the Energex-Ergon merger, both the Energex Union Collective Agreement 2015, which primarily influences utilities wages in urban South East Queensland, and the Ergon Union Collective Agreement 2015, which primarily influences utilities wages in regional Queensland, specified a 3.0% wage adjustment for the following three years.

Hence, there is strong evidence that urban and rural wage growth has been broadly similar in Australia and Queensland over the past two decades, and in the Queensland utilities industry over the past few years. We are forecasting this trend to continue, and therefore do not expect to see a significant divergence in labour cost escalation between rural and urban areas over the forecast horizon.

3.4 VOLATILITY IN WAGE FORECASTS

Wage growth is determined by capacity in the labour market, inflation, export and import prices, unionisation and political forces. Historically, wage growth has been relatively stable. Since the WPI was first published in 1997, wage growth peaked at 4.3% in December 2008 and troughed at 1.9% in March 2017, and over the past two years it has remained within a 0.22 percentage point band. A number of forces related to the determinants of wage growth contribute to lower volatility, the two key being the frequency of wage increases and stable inflation.

Firstly, the rolling nature of collective agreements tend to be negotiated every three years, and individual agreements and awards tend to be negotiated annually, with the Fair Work Commission reviewing the minimum wage each year. The frequency of wage increases contributes to the stability of the WPI.

Secondly, wage growth and inflation are closely linked, with higher wages driving up prices and vice versa. Inflation has become increasingly stable in recent decades, due to the greater credibility of central bank policy, as a result of implementing inflation targeting, and subsequently lower inflation expectations. This has contained wage growth, and we expect this trend to continue over the forecast period.

3.5 CPI OUTLOOK

3.5.1 National

Consumer price inflation has been subdued for three years, with the substantial depreciation of the Australian dollar (which would normally increase inflation) between 2013 and 2016 coinciding with a sharp correction in oil prices and falling internal price pressures – as a result price inflation has not accelerated. Underlying inflation fell below the Reserve Bank's target 2-3% band in March 2016 and has stayed there, while headline inflation has also remained (mostly) below 2% since late 2014.

Tradeables inflation has been especially weak, and has been virtually non-existent since the June quarter 2014. Stagnant world prices for manufactured goods, reduced transport costs, margin compression by exporters, and potential hedging by importers have combined to limit price rises for imported consumer goods. Furthermore, a small appreciation in the Australian dollar over the past year has contributed to lower import prices, and high levels of retail and supermarket competition have also reduced price rises.

Meanwhile, non-tradeables inflation – which now constitutes almost two-thirds of the CPI – has doubled over the past 21 months, from a low of 1.6% (annual growth) through-the-year to June 2016 to 3.1% in the recent March 2018 quarter. Driving non-tradeables inflation have been sharp rises in electricity and gas prices, cigarettes and tobacco (due to hikes in excise taxes), child care, house purchases, health services, education and insurance services. Other areas of non-tradeables inflation have been contained by dismal wages growth, which has kept down unit labour costs, limiting cost-push inflationary pressures and helping to keep a lid on underlying inflation.

Overall, the headline CPI inflation rate increased slightly to 1.9% in the March quarter, 2018, with underlying (or core) inflation at 2.0%. Looking ahead, weak wage growth and subdued price rises globally will keep core inflation at the bottom end of the RBA's target band. With the economy still absorbing spare capacity in the labour market we expect it to take another 12-18 months before we see a substantial pick up in price pressures.

Outside of core inflation, above average utilities price increases are expected over the next two years as higher wholesale energy prices are passed on to consumers. Also putting upward pressure on the headline rate will be further planned increases in tobacco excise duty over the next three years, and the recent bounce up in oil prices, as a result of geopolitical tensions and Venezuelan supply concerns.

Offsetting these inflationary pressures will be soft growth in wages and the competitive retail environment, which will limit final price rises over the next two years. Headline CPI inflation is forecast to gradually pick up to 2.5% by late 2018, with the underlying rate drifting up to around 2.0%.

We are expecting inflation to stay within the Reserve Bank's target band for the next decade. The improving economic environment in the early 2020s is expected to lead to a rise in inflation to above the 2.5% mid-point of the RBA's band. However, lower productivity gains, the ongoing impact of increasing globalisation and competition within supply chains, credible monetary policy and well-anchored inflation expectations will keep final output prices in check.

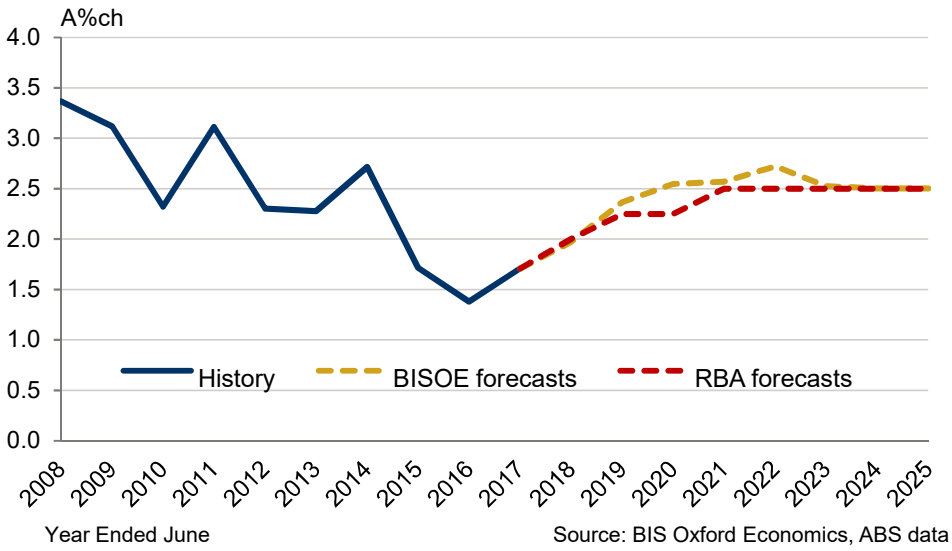
3.5.2 Comparison to Reserve Bank of Australia Outlook

The Australian Energy Regulator adopt the RBA's inflations for the short-term (FY18-FY20) and the mid-point of the RBA's inflation band in the long run. We compare BIS Oxford Economics' inflation forecasts to this trajectory.

BISOE and RBA forecasts of headline inflation are broadly similar. With three quarters of data published for FY18, both BISOE and the RBA are forecasting headline inflation of 2.0% this financial year. BISOE forecasts for inflation are higher in FY19 (+2.4% versus +2.3%) and FY20 (+2.5% versus +2.3%).

Beyond FY20, we used the AER inflation method of using the mid-point of the RBA's published inflation band (2 to 3%) to generate the RBA inflation projection. Both BISOE and RBA inflation forecast converge to 2.5% - the midpoint of the RBA's target band – beyond FY20.

Fig. 10. CPI Forecasts: BIS Oxford Economics and Reserve Bank of Australia



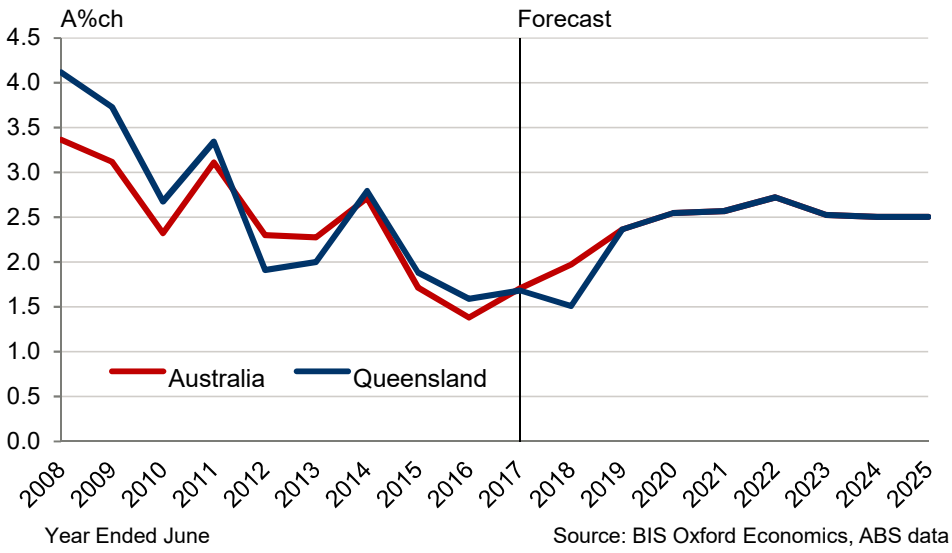
3.5.3 Queensland

Historically, Queensland inflation has tracked closely to the national average, with an inflation correlation coefficient of 0.95 over the past two decades.

However, in the first three quarters of FY18, Queensland inflation has averaged 1.7% y/y, compared to the national average of 1.9% y/y. Although the Queensland economy is recovering, momentum in the state continues to lag other states (particularly NSW and VIC). Hence, Queensland inflation is expected to be 1.8% in FY18, 0.2 percentage points below the national average of 2.0%.

However, the inflation gap is expected to close over 2018, and Brisbane CPI is forecast to align with the national average from FY19.

Fig. 11. CPI Forecasts: Australia and Queensland



4. MATERIALS COSTS OUTLOOK

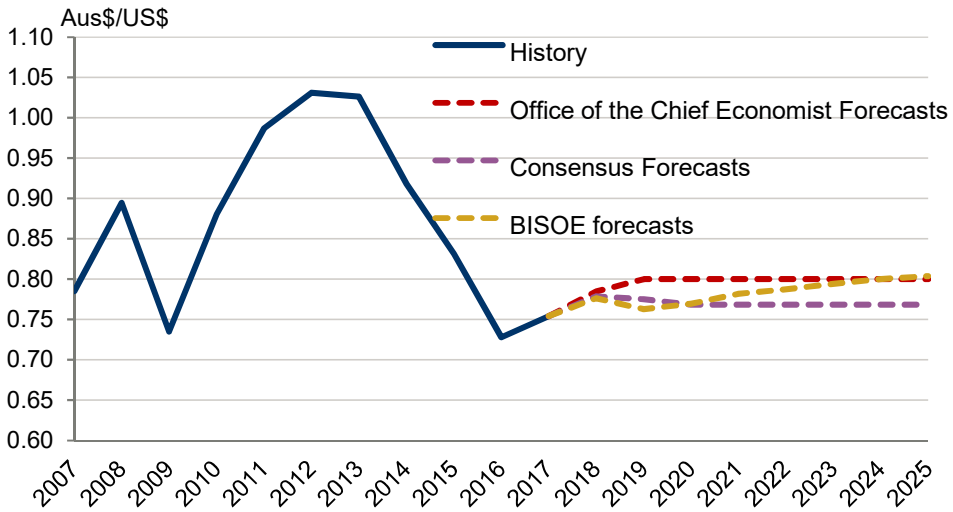
4.1 EXCHANGE RATE OUTLOOK

The key drivers of the exchange rate in the short-run are commodity prices, particularly iron ore, coal and natural gas, financial market sentiment, and the interest rate differential, primarily with the US.

After strengthening at the start of the year, the AUD has steadily lost value against the trade weighted basket of currencies and is currently[5] sitting close to its lowest level in two years. A recent shift by markets back to positive US sentiment and the relatively subdued domestic outlook and falls in commodity prices are weighing on the currency.

Looking ahead, commodity prices, primarily base metals, have now stabilised and are trending down (although some fossil fuel prices are being supported by the bounce back in oil prices). This weakness in commodity prices will continue to weigh on the AUD, while volatility will remain in the short term as political uncertainty lingers.

Fig. 12. Exchange Rate Forecast Comparison



With a weaker AUD supporting export services we do not expect the RBA to respond, with the AUD expected to remain around 76 US cents for the rest of the year.

The medium term trajectory for commodity prices is mixed. While we have already factored in a softening Chinese economy, the magnitude of unexpected changes to indicators such as PMI or investor sentiment would have the potential to roil commodity markets. In fact, after gathering pace during synchronised economic growth, momentum in the manufacturing sector

[5] As-of end-May 2018.

(measured using the Purchasing Managers' Index) has recently declined including in the US and Eurozone.

In the longer term the currency will be supported by a recovery in commodity prices and Australia's relatively strong growth outlook, which will lead to a gradual appreciation. We forecast that the AUD will reach US80 cents by FY25.

4.2 BASE METAL PRICE OUTLOOK

Base metal prices recorded multi-year lows in late 2015/early 2016 as a result of an easing in global demand and especially chronic oversupply in a number of commodities. However, since that period, base metals prices have staged a strong recovery. More recently, marginally weaker global economic growth in recent months has dampened base metals across the board, although specific commodities (owing to supply constraints) have remained elevated.

China's economic prospects and uncertainty around how much growth will slow this year are a key determinant of metal prices in the short term. Concerns include China's housing sector, timing and the magnitude of future government stimulus (and the response of private sector to these policy announcements) and the extent of private sector investment in capital assets. Prices could also be weighed down by the strain of higher global output and risks of lower consumption – particularly if the factors which are driving current demand growth in China, such as housing sales, trend downwards in 2018.

Solid global economic growth will support demand for base metals in 2018. However, the gradual slowdown in the world economy will dampen demand growth out to FY25. The outlook varies for each of the base metals, with copper prices set to be particularly strong, benefiting from increased industrial activity in the US and increased demand from China and India.

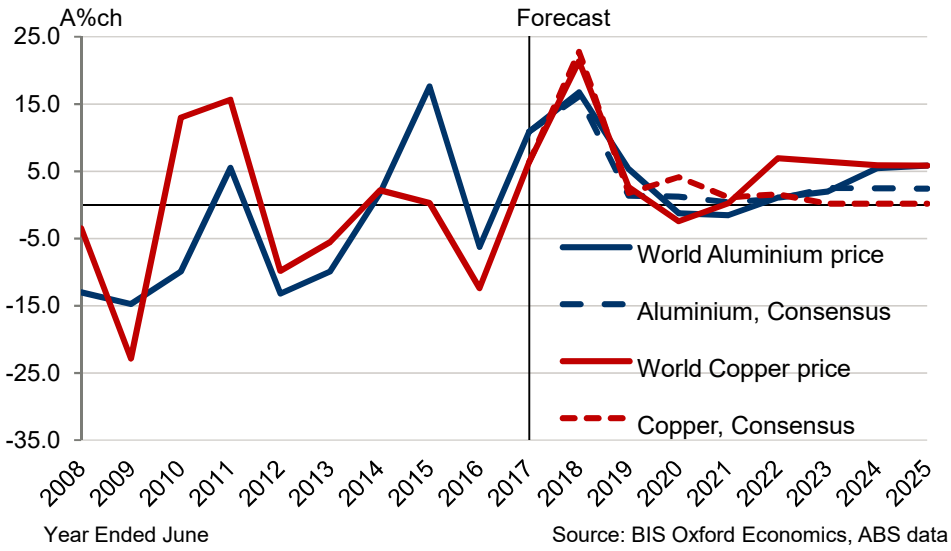
4.2.1 World Aluminium Prices

The aluminium market has struggled to keep up with rapidly-changing rules regarding US trade policy, tariffs and Russia. In early April 2018, the US stated that in response to Russian aggression in a number of areas it would impose sanctions on Oleg Deripaska and UC Rusal, which produces 6% of world aluminium. This led to panic about potential shortages and prices jumped. The sanctions were initially severe as they prevented US companies from dealing with Rusal, but also stopped non-US companies from using the US$ when trading with Rusal (secondary sanctions). But it quickly became clear that consumers globally would struggle to source alternative metal by the initial deadline of June. The deadline was then extended to October and secondary sanctions were removed; prices have tumbled as a result.

Rusal is also a crucial part of the raw material supply chain through its alumina production – accounting for 7% of global output. While there is plenty of spare capacity in aluminium, alumina is much tighter due to a recent partial shutdown at Alunorte in Brazil, the world's largest alumina refinery. As a result, alumina prices rose by 65% in May 2018, pushing up the cost of aluminium production. For now, we have a relatively neutral view on aluminium prices, but volatility is likely to continue while the picture around Rusal remains unpredictable. The world aluminium price is expected to reach $3,238 AUD/tonne in FY25, with growth averaging 4.1% y/y over the eight years to FY25. As experienced

historically, aluminium prices are expected to be considerably more volatile than CPI, and will average above inflation over the forecast period.

Fig. 13. Nominal World Aluminium and Copper Metals Prices (AUD), Annual Average Growth



Year Ended June

Source: BIS Oxford Economics, ABS data

4.2.2 World Copper Price

Copper is an industrial metal and its usage is seen as a barometer of industrial activity and economic growth. A number of factors are boosting prices at the moment, including the prospects of increased industrial activity under the Trump presidency and increased demand from China.

The latest data for China showed that electricity production rose by a strong 9% y/y in Q1, pointing to decent demand growth for copper wire and cable. The copper-intensive air-conditioning sector also saw production remain robust in Q1 with 11% y/y growth. However, copper production in Chile is trending up from a strike-hit 2017, with output in January/February up 14% y/y.

With China being the largest global consumer of copper, the medium term outlook will be dominated by growth in the construction industry as well as national infrastructure. Consumption in India is also expected to drive global demand for copper as the government creates infrastructure to support its policy measure to lift access to electricity in various regions – a program which was pursued in earnest under the Modi government. Copper is also expected to be buoyed by infrastructure spending on renewable energy projects, which are picking-up momentum internationally as a result of shifts in climate change policy.

The world copper price is expected to reach $11,095 AUD/tonne in FY25, with growth averaging 5.7% over the eight years to FY25. The world aluminium price is expected to reach $3,238 AUD/tonne in FY25, with growth averaging 4.1% y/y over the eight years to FY25. As experienced historically, copper prices are expected to be considerably more volatile than CPI, and will average above inflation over the forecast period.

4.3 WORLD OIL PRICE (BRENT OIL SPOT)

The Brent oil price rallied again in May 2018, to reach US$75pb, reflecting improving fundamentals as well as speculation about supply risks around Iran, Libya and Venezuela. We now expect the price to average $64pb in FY2018 and $71pb in 2019, with the price falling back gently to average $66pb in FY21 before rising to an average of $78 pb in FY25.

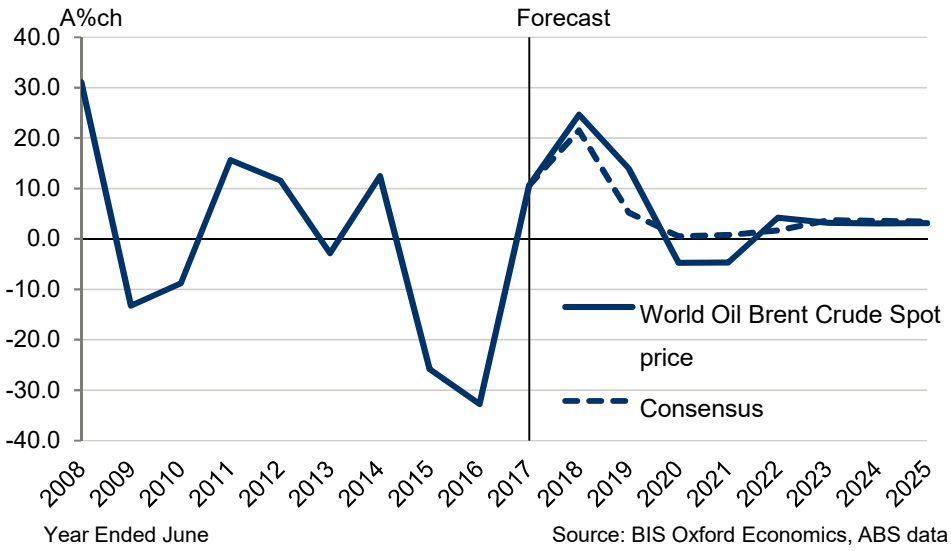
There are four reasons for being bearish. Firstly, for the short term, it seems that there is a high chance that Iranian sanctions relief will be extended in some form as once again we expect to see that Trump's bark is worse than his bite. Mid-June will see this issue either resolved or kicked further down the road.

Secondly, at some point soon OPEC and Saudi Arabia will start to think about the "sweet spot" for oil prices ie the level that will make many producers comfortable, but without encouraging excess growth in the US and other non-OPEC countries. It is difficult to know exactly where this is, but prices above US$80pb seem very high given that many producers are already well above break-even levels, and even US shale producers were profitable enough in Q1 2018 to support sustainable drilling activity (WTI price was US$63pb in Q1 v US$68pb in late April). Saudi Arabia still has plenty of spare capacity to turn back on should it decide to do so. The potential IPO for Saudi Aramco is likely to be encouraging a view within the country that high prices are a good thing for now, despite the traditional view that high prices might threaten oil demand over the medium term.

Thirdly, demand growth itself is likely to be close to a peak. Global manufacturing PMIs have turned lower recently, China is moving away from oil and energy-intensive growth and high oil prices will start to chip away at demand growth in the months ahead. Fourthly, US oil production is now growing strongly, threatening to push the oil market into oversupply.

In AUD terms, the Brent crude spot rate is expected to average $97 AUD/barrel in FY25, and with the currency broadly stable the cyclical pattern of near term rises, medium term falls and finally long term gains outlined previously is replicated. As experienced historically, oil prices are expected to be considerably more volatile than CPI, and will average above inflation over the forecast period.

Fig. 14. Nominal World Oil Brent Crude Spot Price (AUD), Annual Average Growth



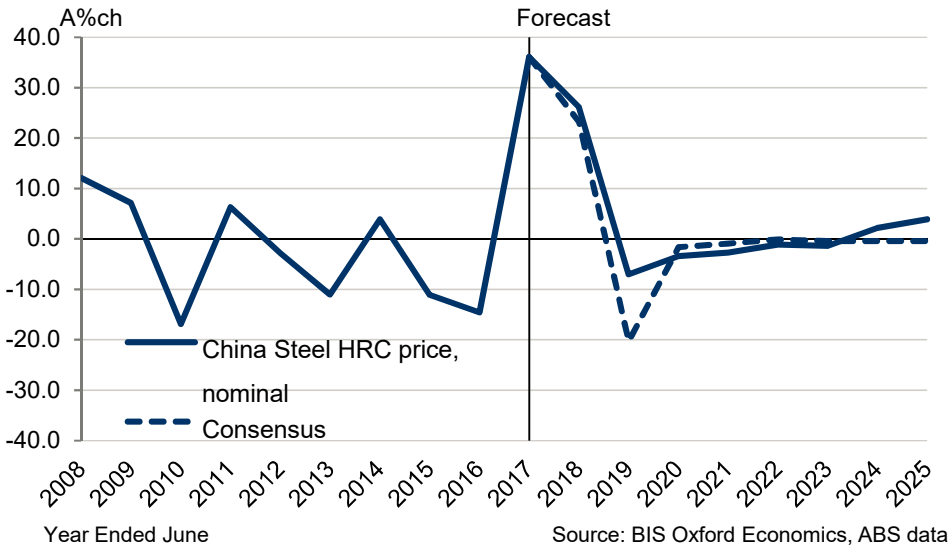
4.4 STEEL PRICE, HOT ROLLED COIL, CHINA

Steel prices are strongly tied to the price of its raw materials (iron ore and coking coal) which often provide the floor to the price of steel. Steel prices are also influenced by global construction activity, supply to the seaborne trade and, in the short term, supply side restrictions, inventory levels and labour policy changes (particularly in China). Steel prices are also influenced by other factors such as transports costs and the exchange rates.

Asian hot rolled coil steel prices more than doubled over the six years to FY09 (in US dollars), reflecting the acceleration in global construction activity. However, the onset of the GFC saw global steel demand plummet, bringing prices with it. Prices recovered slightly before weakening again over the past three years as demand fell. More recently, the turn in the investment cycles in the US and Europe have resulted in an increase in construction activity, and a recovery in iron ore and coking coal prices. This has caused a slight uptick in steel prices.

Looking forward, movements through the first part of FY18 will drive steel prices up by 26%, although the absolute level is well below previous peak. But with both iron ore and coking coal prices expected to fall back as a result of rising supply and moderating demand growth, the steel price is expected to decline in real terms between FY18 and FY25 as demand for steel, particularly from China, slows. Chinese hot rolled coil steel price is expected to reach $726 AUD/tone (nominal price) in FY25, with growth averaging 1.7% over the eight years to FY25. As experienced historically, steel prices are expected to be considerably more volatile than CPI, and will average below inflation over the forecast period, meaning declining prices in real terms.

Fig. 15. Nominal China Steel Hot Rolled Coil Price (AUD), Annual Average Growth



4.5 MATERIALS COSTS OUTLOOK RISKS

Commodity prices are subject to the global economy and influenced by financial markets, which makes them inherently more volatile than wages, discussed in Section 3.

We have identified a number of risks around our commodity price outlooks, including geopolitics in Iran and potential trade wars. Oil prices have shown considerable volatility in recent months. The price has been boosted by fear of sanctions and the likelihood of stricter sanction, particularly on Iran. Considerable geopolitical risks also remain around Iran, and further supply risks exist around Libya and Venezuela. On the demand side, there are risks regarding whether demand growth will be sustained from China and other emerging markets. These risks create uncertainty around the growth outlook.

5. CONSTRUCTION COSTS OUTLOOK

5.1 ENGINNERING CONSTRUCTION COSTS IN AUSTRALIA

The engineering construction IPD has accelerated over the past year. While rising oil prices is playing a role, so too are pressures on local resources such as quarry products, concrete and labour. BISOE forecasts that engineering construction IPD growth will lift from 0.5% in FY17 to 3.2% in FY18.

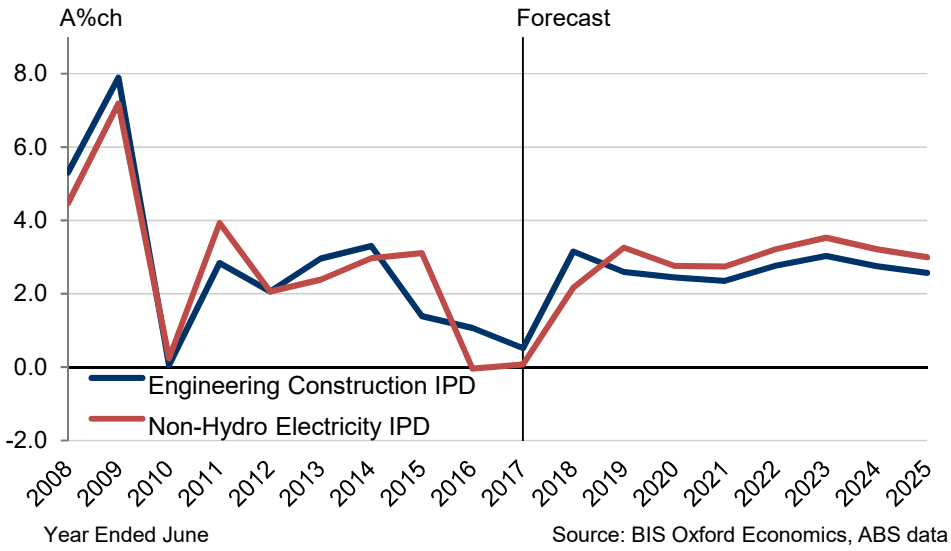
Engineering construction cost growth is expected to fall back over the following three years, to 2.6% in FY19, 2.4% in FY20 and 2.3% in FY21. The gradual recovery in wage growth will lead to a moderate build in pressure from the wage component of engineering construction costs. But raw materials price inflation is expected to moderate, in line with a declining pace of commodity price rises over this period, and this will weigh on the overall sector IPD.

Engineering construction IPD growth will lift to 2.8% in FY22 and 3.0% in FY23, before dipping back slightly to 2.8% in FY24 and 2.6% in FY25, as oil price growth recovers, wage growth levels out, and other materials prices growth move to long run levels.

5.1.1 Non-Hydro Electricity Costs in Australia

The Non-Hydro Electricity Construction IPD is a measure of construction costs in the electricity sector, which covers transmission, distributions and generation related construction.

Fig. 16. Engineering Construction and Non-Hydro Electricity Implicit Price Deflator Growth



The Non-Hydro Electricity Construction IPD has historically aligned broadly with construction costs, i.e., the national engineering construction IPD, with a growth rate correlation coefficient of 0.87 over the past three decades. However, Non-Hydro Electricity Construction IPD is considerably more volatile than the engineering construction IPD, with variance 3.9 times higher between 1987 and

2017. The higher level of volatility is predominantly explained by the influence of copper prices, which are a key cost for the electricity sector. This can lead to considerable spikes in the non-hydro electricity IPD, such as a 25.3% y/y spike in FY07. Furthermore, non-hydro electricity costs have increased faster than general engineering construction costs, with growth averaging 4.2% y/y over the past three decades, compared to 3.3% y/y.

Non-hydro electricity IPD growth has fallen behind engineering construction costs in FY16 and FY17. We expect growth will lift from a stagnant 0.0% in FY16 and 0.1% in FY17 to 2.2% in FY18 and 3.3% in FY19, exceeding general engineering construction growth from FY19. With copper the only metal for which BISOE forecasts real price rises over the outlook period to FY25, non-hydro electricity IPD growth is expected to exceed general engineering construction IPD growth from FY19 to FY25, growing at 3.1% y/y on average compared to 2.6% y/y.

5.2 NON-RESIDENTIAL BUILDING COSTS IN AUSTRALIA

With non-residential building activity lifting, price pressures are forecasted to build moderately as greater demand for materials and labour drives up non-residential building costs. This will drive forecasted average annual growth in the non-residential building IPD of 2.6% between FY18 and FY25. This is a notable increase from the subdued cost growth of 1.2% y/y over the five years to FY17.

However, growth in the non-residential building IPD has fallen in trend terms since 1975, from average annual growth of 10.5% in the ten years to FY85 to 1.5% in the ten years to FY17. The forecasted average growth rate of 2.6% per annum is below the long-term historical average of 5.1%.

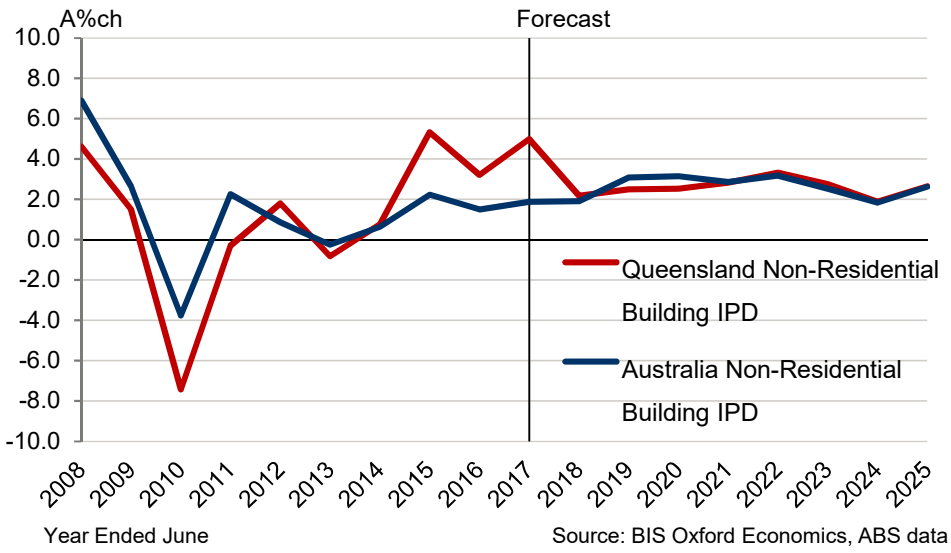
5.3 NON-RESIDENTIAL BUILDING COSTS IN QUEENSLAND

Growth in the Queensland non-residential building IPD exceeded the national IPD in FY14 (0.8% versus 0.6%), FY15 (5.3% versus 2.2%), FY16 (3.2% versus 1.5%) and FY17 (5.0% versus 1.9%), due to relatively stronger growth in high density residential building, which competes with the non-residential sector for resources.

Greater competition for resources including materials and labour will keep non-residential building cost growth above the national average in FY18, although the gap is expected to shrink as competition pressures ease in Queensland with the end of the residential construction boom. The Queensland IPD is expected to increase 2.2%, compared to the national average of 1.9%.

Growth in the Queensland non-residential building IPD will fall behind the national average in FY19 and FY20, growing at 2.5% compared to the national average of 3.1%, as the downturn in residential construction reduces pressure on resources. Growth in Queensland costs will continue to align with the national level, growing at 2.7% y/y on average compared to 2.6% at the national level between FY21 and FY25.

Fig. 17. Non-Residential Building Implicit Price Deflator



6. APPENDIX 1: STATEMENT OF COMPLIANCE WITH EXPERT WITNESS GUIDELINES

I have read the Guidelines for Expert Witnesses in Proceedings of the Federal Court of Australia and confirm that I have made all inquiries that I believe are desirable and appropriate and that no matters of significance that I regard as relevant have, to my knowledge, been withheld from the Court from this report.

7. APPENDIX 2: ESCALATION TABLES

Fig. 18. Labour Cost Escalation

Nominal Labour Price Changes	Forecast Provider	Actual		Forecasts							
		2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Australia Wage Inflation											
All Industries											
Average Weekly Earnings	BISOE	1.7	1.6	2.3	2.7	2.6	3.2	3.5	3.9	3.9	3.9
Average Weekly Ordinary Time Earnings	BISOE	1.9	2.0	2.6	3.1	3.2	3.7	4.4	4.4	4.4	4.4
Wage Price Index	BISOE	2.1	1.9	2.1	2.4	2.6	3.2	3.5	3.9	3.9	3.9
Electricity, Gas, Water and Waste Services Wages											
Wage Price Index	BISOE	2.4	2.2	2.0	3.0	3.5	4.0	4.2	4.1	4.2	4.2
Queensland Wage Inflation											
All Industries											
Wage Price Index		1.9	1.9	2.2	2.5	2.5	3.1	3.5	3.9	3.9	3.9
Australia Consumer Price Index (headline)	BISOE	1.4	1.7	2.0	2.4	2.5	2.6	2.7	2.5	2.5	2.5
	RBA			2.0	2.3	2.3	2.5	2.5	2.5	2.5	2.5
Queensland Consumer Price Index (headline)		1.6	1.6	1.8	2.4	2.5	2.6	2.7	2.5	2.5	2.5
Real Labour Price Changes											
Australia Wage Inflation											
All Industries											
Average Weekly Earnings	BISOE	0.3	-0.1	0.4	0.3	0.1	0.6	0.8	1.3	1.4	1.4
Average Weekly Ordinary Time Earnings	BISOE	0.5	0.3	0.7	0.7	0.6	1.2	1.7	1.9	1.9	1.9
Wage Price Index	BISOE	0.8	0.2	0.1	0.0	0.0	0.6	0.8	1.3	1.4	1.4
Electricity, Gas, Water and Waste Services Wages											
Wage Price Index	BISOE	1.0	0.5	0.1	0.7	0.9	1.4	1.5	1.6	1.7	1.7
Queensland Wage Inflation											
All Industries											
Wage Price Index	BISOE	0.3	0.3	0.4	0.1	-0.1	0.5	0.8	1.3	1.4	1.4

Source: BIS Oxford Economics, RBA, ABS Data

Fig. 19. Materials Cost Escalation

Nominal Price	Forecast Provider	Unit	Actual		Forecasts							
			2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
World Aluminium Price	BISOE	AUD/tonne	2119	2350	2744	2891	2856	2812	2843	2900	3059	3238
		A%ch	-6.2	10.9	16.8	5.3	-1.2	-1.5	1.1	2.0	5.5	5.8
	Consensus		2119	2350	2730	2768	2802	2813	2839	2911	2983	3055
			-6.2	10.9	16.2	1.4	1.2	0.4	0.9	2.5	2.5	2.4
World Copper Price	BISOE	AUD/tonne	6713	7140	8668	8897	8679	8701	9304	9900	10483	11095
		A%ch	-12.4	6.4	21.4	2.7	-2.5	0.3	6.9	6.4	5.9	5.8
	Consensus		6713	7140	8767	8923	9293	9400	9547	9565	9583	9601
			-12.4	6.4	22.8	1.8	4.2	1.2	1.6	0.2	0.2	0.2
World Oil Price (Brent Crude Spot)	BISOE	AUD/barrel	59.4	65.7	81.9	93.4	89.0	84.9	88.5	91.3	94.1	97.1
		A%ch	-32.8	10.6	24.6	14.0	-4.7	-4.7	4.2	3.2	3.1	3.2
	Consensus		59.4	65.7	79.9	84.1	84.5	85.2	86.6	89.8	93.0	96.2
			-32.8	10.6	21.5	5.2	0.5	0.8	1.7	3.7	3.6	3.5
China Steel Price, Hot Rolled Coil	BISOE	AUD/tonne	467.2	635.9	802.2	745.9	720.5	701.0	693.2	683.6	698.5	725.6
		A%ch	-14.5	36.1	26.2	-7.0	-3.4	-2.7	-1.1	-1.4	2.2	3.9
	Consensus		467.2	635.9	783.3	624.4	614.3	608.8	608.1	605.6	603.2	600.8
			-14.5	36.1	23.2	-20.3	-1.6	-0.9	-0.1	-0.4	-0.4	-0.4

Source: BIS Oxford Economics, RBA, ABS Data

Fig. 20. Construction Cost Escalation

Implicit Price Deflator	Actual		Forecasts							
	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Engineering Construction (National)	1.1	0.5	3.2	2.6	2.4	2.3	2.8	3.0	2.8	2.6
Non-Residential Building (Queensland)	3.2	5.0	2.2	2.5	2.5	2.8	3.3	2.7	1.9	2.7
Non-Hydro Electricity (National)	0.0	0.1	2.2	3.3	2.8	2.7	3.2	3.5	3.2	3.0

Source: BIS Oxford Economics, RBA, ABS Data

8. APPENDIX 3: METHODOLOGY

8.1 THE OXFORD ECONOMICS GLOBAL ECONOMIC MODEL

The Oxford Global Economic Model (GEM) is the most widely used commercial International Macro Model, with clients including international institutions, Ministries of Finance and central banks around the world, and a large number of blue-chip companies. In addition, the GEM is used internally within Oxford Economics, for both baseline forecasting and simulating alternative scenarios for the world economy and individual economies.

The GEM has constantly evolved over the past three decades, reflecting continuous interaction between the Global Economic Model and changing conditions in the policy sphere, private sector, and global institutions. It is intended for use both by Oxford Economics and by clients to produce forecasts for a wide range of international macroeconomic and related variables, and for "what-if" scenario analysis. Clients can produce forecasts using the model either with a detailed internal forecasting exercise or simply by taking the Oxford Economics baseline and adjusting a small number of key inputs/assumptions. Scenario analysis can focus on the expected impact of a particular event or policy change, or cover a wider range of alternative outcomes for stress testing.

It has long been one of Oxford Economics' guiding principles that many of the most important and interesting macroeconomic issues are inherently international. Globalization means that policy makers and analysts must form judgements about developments in their domestic economy and in the economies of countries with which they have trade and financial ties. For instance, a shift in US monetary policy has global repercussions; fossil fuel and commodity price shocks are significant source of terms of trade movements in Europe; governments increasingly collaborate over monetary, fiscal and environmental policies. These stylized facts imply that single country econometric models, which treat world trade, world prices and exchange rates as exogenous, are not best suited to analysing some of the most important issues of interest to financial and business economists.

The root cause of this integration is the massive increase in trade and capital flows between countries in the post-war period, and Oxford Economics' client base is testament to the growth in interest in international issues. With offices throughout the world, in the UK, elsewhere in Europe, the US and Asia, Oxford Economics aims to combine access to local information and expertise with a global outlook to provide a truly international service. The Oxford Global Economic Model reflects this priority, as coverage of the major trading countries has deepened and widened.

The current Oxford Model covers 80 individual countries, including Australia. The model is "well-behaved" in the sense that it has a coherent long-run equilibrium embedded which the model will tend to converge to in the long run for a wide range of sensibly calibrated shocks.

It maintains the tradition of allowing for significant cross-country differences in economic structure, but ensures that those differences truly reflect economic,

as opposed to economic model-builders', idiosyncrasies. Where possible, and it is possible in the majority of cases, the functional form for equations is left the same across countries. The exceptions chiefly reflect examples where countries are heavily dependent on particular sectors such as oil and emerging market countries where Foreign Direct Investment (FDI) plays a major role in the economy. Where the data allow, some countries have more detail on trade, distinguishing fuel and non-fuel and modelling profit and dividend receipts.

Parameters across countries differ, and this means that different countries exhibit different behaviour in response to shocks (although economy structure also accounts for variations). Now, however, tracing the root cause of these differences, and attributing them to underlying behaviour or structure, is much simpler. For instance, real wage rigidity is higher in some countries than others, and specific coefficients in wage and price equations reflect this. Unemployment will tend to rise further and faster in these countries in response to an adverse demand shock, even though the functional form of wage and price equations is identical across countries.

8.1.1 Structure of the GEM

Very broadly, the Oxford Global Economic Model is Keynesian in the short-run and monetarist in the long-run. This means that increased demand will lead to higher output and employment initially, but eventually this feeds through into higher wages and prices. Given an inflation target, interest rates have to rise, reducing demand again ('crowding out'). In the long run, output and employment are determined by 'supply side' factors. Interactions between countries through trade, exchange and interest rates, capital flows and oil/commodity prices are modelled in detail.

Within this theoretical framework, the structure of each country in the Oxford Global Economic Model can be generalized as follows:

- Consumption - function of real income, wealth and interest rates.
- Investment - 'q' formulation with accelerator terms.
- Exports - depend on world demand and relative unit labour costs.
- Imports - depend on total final expenditure and competitiveness.
- Real wages depend on productivity and unemployment relative to NAIRU.
- Prices are a mark-up on unit costs, with profits margins a function of the output gap.
- Monetary policy endogenised. Options include Taylor rule, fixed money and exchange rate targeting.
- Exchange rate determined by uncovered interest parity (UIP) in the short run and equilibrium exchange rates in the long run.
- Expectations are generally adaptive, with an option to use forward-looking expectations on a model-consistent basis for certain key financial variables.

Countries are linked in the Oxford Global Economic Model via:

- Trade (Exports driven by weighted matrix of trading partners' import demand).

- Competitiveness (IMF relative unit labour costs where available, relative prices elsewhere).
- Interest Rates and Exchange Rates.
- Commodity Prices (e.g. oil, gas and coal prices depend on supply/demand balance; metal prices depend on growth in industry output).
- World Price of Manufactured Goods.

8.1.2 Country model detail

The structure of each of the country models is based on the income-expenditure accounting framework. However, the models have a coherent treatment of supply. In the long run, each of the economies behaves like the classic one sector economy under Cobb-Douglas technology (production function). Countries have a natural growth rate, which is determined by capital stock, labour supply adjusted for human capital, and total factor productivity. Output cycles around a deterministic trend, so the level of potential output at any point in time can be defined, along with a corresponding natural rate of unemployment.

Firms are assumed to set prices given output and the capital stock, but the labour market is characterized by imperfect competition. Firms bargain with workers over wages but choose the optimal level of employment. Under this construct, countries with higher real wages demonstrate higher long-run unemployment, while countries with more rigid real wages demonstrate higher unemployment relative to the natural rate.

Inflation is a monetary phenomenon in the long run. All of the models assume a vertical Phillips curve, so expansionary demand policies place upward pressure on inflation. Unchecked, these pressures cause an unbounded acceleration of the price level. Given the negative economic consequences of this (as seen in the 1970s in developed economies and more recently in some emerging markets), most countries have adopted a monetary policy framework which keeps inflation in check. The model mirrors this, by incorporating endogenous monetary policy. For the main advanced economies, monetary policy is underpinned by the Taylor rule, captured using an inflation target, such that interest rates are assumed to rise when inflation is above the target rate, and/or output is above potential. The coefficients in the interest rate reaction function, as well as the inflation target itself, reflect assumptions about how hawkish different countries are about inflation. (A by-product of this system is that scenarios under fixed interest rates only make sense in the short-run. A scenario which imposes a fixed interest rate, and therefore assumes a lack of monetary policy, in conjunction with a vertical Phillips curve, would result in accelerating - or decelerating - inflation after several years.)

Demand is modelled as a function of real incomes, real financial wealth, real interest rates and inflation. Investment equations are underpinned by the Tobin's Q Ratio, such that the investment rate is determined by the return relative to the opportunity cost, adjusted for taxes and allowances. Countries are assumed to be "infinitely small", in the sense that exports are determined by aggregate demand and a country cannot ultimately determine its own terms of trade. Consequently, exports are a function of world demand and the real exchange rate, and the world trade matrix ensures adding-up consistency

across countries. Imports are determined by real domestic demand and competitiveness.

8.2 THE AUSTRALIAN STATES MODEL

To generate the forecasts for the Queensland economy, BIS Oxford Economics used the Australian States Model. In this model, forecasts for the states are generated relative to the national outlook based on state specific structural features, such as the prevalence of the mining industry in Queensland.

8.3 ELECTRICITY, GAS, WATER AND WASTE SERVICES WAGES

To generate forecasts for Electricity, Gas, Water and Waste Services, BIS Oxford Economics used an econometric model based on a comparison of all sectors wage growth and EGWWS wage growth, as well as the influence of current wage agreements that will drive wage growth over the next three years.

8.4 NON-HYDRO ELECTRICITY IMPLICIT PRICE DEFLATOR

To generate Non-Hydro Electricity Implicit Price Deflator forecasts, BIS Oxford Economics used an econometric model based on a comparison of the total engineering construction IPD to the non-hydro electricity IPD, as well as copper price forecasts, which drive spikes in non-hydro electricity costs.

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