

AUSTRALIAN MARKETS WEEKLY

Estimating the probability of QE using market pricing and RBA forecasts



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Analysis – Estimating the probability of QE using market pricing and RBA forecasts

- Last year Governor Lowe said that QE would be considered if the cash rate reached a floor of 0.25%, while he testified that unconventional policy would be an option if the economy materially underperformed relative to the Reserve Bank's outlook.
- Calculating confidence intervals around cash rate futures pricing and the Reserve Bank's economic forecasts, we estimated an average probability of QE through to mid-2021 of about one-third. This assumed QE would be implemented if: (1) the futures market pointed to a cash rate below the Reserve Bank's 0.25% floor; or (2) the economy underperformed with growth in the 1s or less, inflation below target and unemployment of 5.5% or more.
- This reasonable risk of QE reflects the fact that forecasting is difficult, where large forecast errors matter given Australia is stuck in a low-interest rate, low-growth, and low-inflation world. For its part, NAB forecasts the cash rate to reach 0.25% by mid-2020. NAB sees an increased risk of QE in H2 2020 should unemployment deteriorate more than forecast, given inflation poses no barrier to further easing.

The week ahead – AU labour, NZ CPI, ECB, BoJ and BoC meetings; US earnings

- **Local:** Following a very strong November print, NAB expects Australian employment rose by a smaller 10k (market: 15k) and unemployment rose to 5.3% (market: 5.2%) in December. Westpac consumer confidence should show the impact of the bushfires on sentiment. In NZ, BNZ expects Friday's Q4 CPI increased 0.4%, lifting the annual rate of inflation to 1.8% from 1.5% in Q3 – higher than the RBNZ expected in its November MPS, namely 0.2% q/q and 1.6% y/y.
- **Global:** World leaders gather at the 50th World Economic Forum in Davos where climate change will be a focus. US earnings season is in focus, with Netflix reporting on Tuesday, the first big US tech stock to report. The policy meetings of the ECB, BoJ and BoC are this week, with all three central banks expected to remain on hold.

Key markets over the past week

	Last	% chg week		Last	bp/% chg week
AUD	0.6874	-0.4	RBA cash	0.75	0.0
AUD/CNY	4.72	-1.1	3y swap	0.78	0.0
AUD/JPY	75.7	0.2	ASX 200	7064	1.9
AUD/EUR	0.620	-0.2	Iron ore	89.8	2.0
AUD/NZD	1.039	-0.1	Brent oil	64.9	-0.2

Source: Bloomberg

Chart of the week: Estimated probabilities of QE

	Jun-20	Dec-20	Jun-21
(1) Financial indicators			
Cash futures			
- cash rate of zero or below	12	30	34
(2) RBA forecasts			
GDP growth in the 1s or less	31	25	21
Inflation below the target	59	57	50
Unemployment rate of 5.5% or more	28	35	33
(3) Summary stats			
Average	33	37	35
Median	30	33	34

Estimating the probability of QE using market pricing and RBA forecasts

- Last year Governor Lowe said that QE would be considered if the cash rate reached a floor of 0.25%, while he testified that unconventional policy would be an option if the economy materially underperformed relative to the Reserve Bank's outlook.
- Calculating confidence intervals around cash rate futures pricing and the Reserve Bank's economic forecasts, we estimated an average probability of QE through to mid-2021 of about one-third. This assumed QE would be implemented if: (1) the futures market pointed to a cash rate below the Reserve Bank's 0.25% floor; or (2) the economy underperformed with growth in the 1s or less, inflation below target and unemployment of 5.5% or more.
- This reasonable risk of QE reflects the fact that forecasting is difficult, where large forecast errors matter given Australia is stuck in a low-interest rate, low-growth, and low-inflation world. For its part, NAB forecasts the cash rate to reach 0.25% by mid-2020. NAB sees an increased risk of QE in H2 2020 should unemployment deteriorate more than forecast, given inflation poses no barrier to further easing.

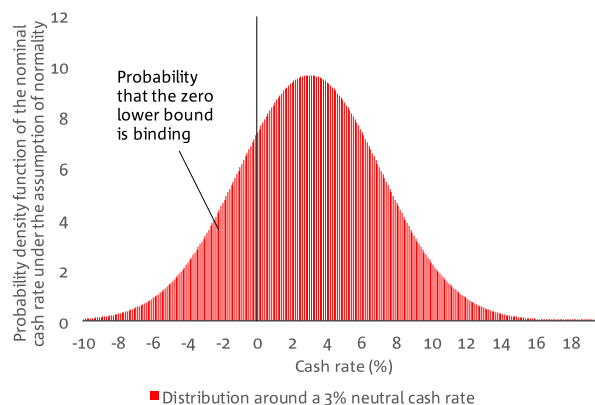
Last year, we calculated a 25% probability that the cash rate would fall below the then-RBA threshold of 0.25-0.5%

In a weekly last year, we examined the odds that the cash rate would fall below the 0.25-0.5% floor cited by the Reserve Bank at the time.¹

We did this by first calculating the distribution around the cash rate in the pre-global financial crisis era, where the cash rate averaged 7.5% with a standard deviation of 4.1%. On the strong assumption that the distribution is normal around a lower neutral rate of 3%, we used the same standard deviation to calculate that there was a 25% chance that the cash rate falls below the 0.25-0.5% range cited by the Reserve Bank and around a 20% chance it falls below zero.²

This suggested to us that there was a reasonable chance that at some point unconventional monetary policy would be on the table.

Chart 1: A lower neutral cash rate increases the risk that conventional monetary policy will be exhausted



Source: Reserve Bank of Australia, National Australia Bank

Market pricing implies an end-2020 probability of about 40% that the RBA considers QE as “an option”

Immediately after we calculated those estimates, Reserve Bank Governor Lowe spoke at length on unconventional monetary policy. Lowe refined the bank's view on the floor for the cash rate to a point estimate of 0.25%, adding that “our current thinking is that QE becomes an option to be considered at that [level]”.³

Using this updated information, we have estimated the probability of QE using a different approach. Rather than rely on the historical distribution of the actual cash rate, we constructed confidence intervals for market pricing for the cash rate. We then calculated the probability that the cash rate fell to 0.25% or less using this information.

For market pricing, we relied on the cash futures curve, which is available from 2003 onwards. Firstly, we compared the implied cash rate for each contract over a time horizon of about one-and-a-half years with the actual rate. We then used these forecast errors to construct a confidence interval around the current futures curve. Based on that information, we estimated the probability that the cash rate falls to 0.25% or below over the next one-and-a-half years.

If the market's forecast errors are normally distributed, then with the market currently pricing a 0.47% cash rate in a year's time, this means that there is about:

- A two-thirds probability that the actual cash rate is within a range of -0.6% to 1.5%; and
- A 95% probability that the actual cash rate is within a range of -1.7% to 2.6%.

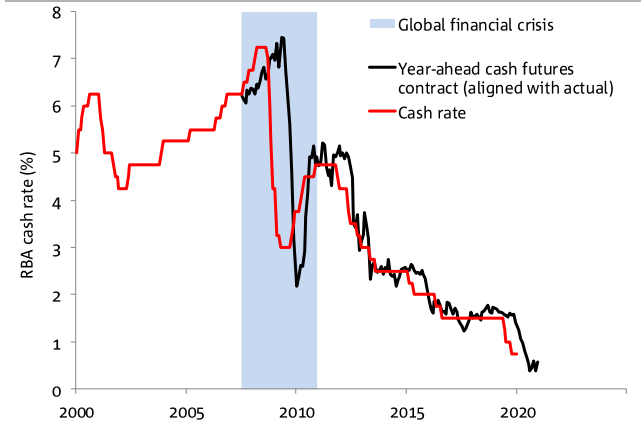
Note that although market pricing tends to be more accurate than consensus economist estimates, the errors around market pricing are large and increase in line with the forecast horizon. For example, the root mean squared error for the year-ahead futures contract is about 1.1pp.

¹ See Kieran Davies, *Revisiting the odds of QE*, Australian Markets Weekly, 25 November 2019.

² We adapted work by Michael Kiley and John Roberts, *Monetary policy in a low interest rate world*, Brookings Papers on Economic Activity, Spring 2017.

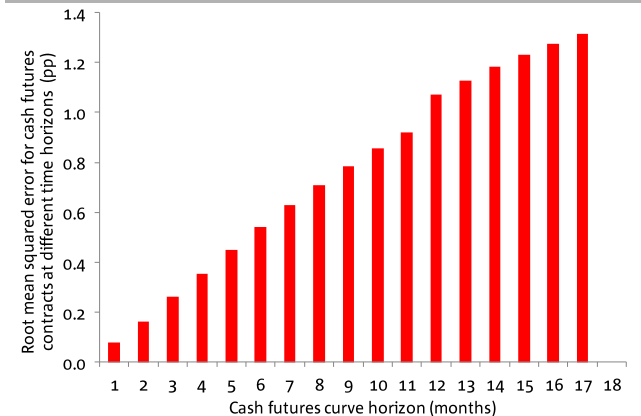
³ See Reserve Bank Governor Lowe, *Unconventional monetary policy: some lessons from overseas*, Sydney, 26 November 2019.

Chart 2: The market finds it hard to forecast the cash rate



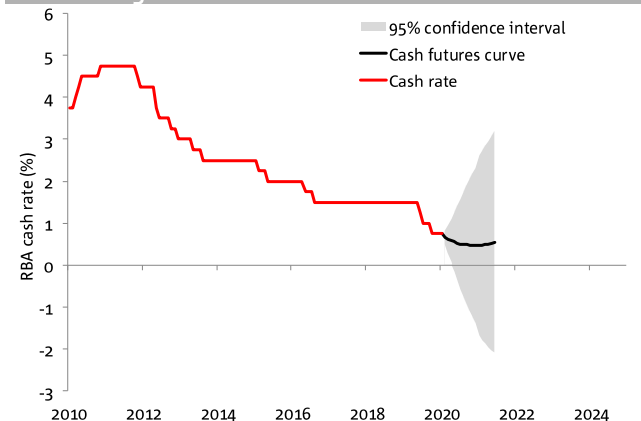
Source: Bloomberg, Reserve Bank of Australia, National Australia Bank

Chart 3: The forecast error for market pricing of the cash rate increases in line with the forecast horizon



Source: Bloomberg, Reserve Bank of Australia, National Australia Bank

Chart 4: The confidence interval around the cash futures curve is large



Source: Bloomberg, Reserve Bank of Australia, National Australia Bank

Based on this confidence interval, we calculated that:

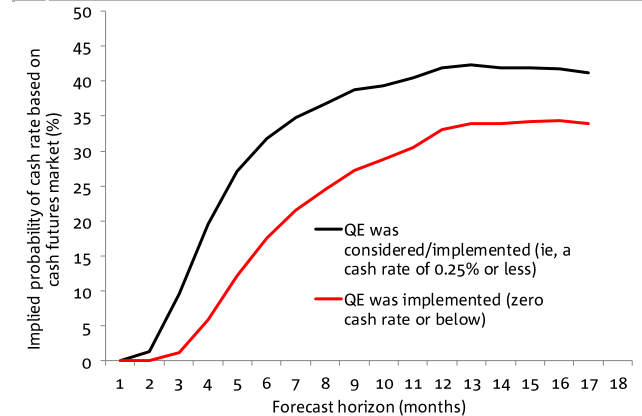
- The estimated probability that the cash rate falls to the Reserve Bank’s floor of 0.25% or less, thereby triggering a consideration and potential

⁴ See Commonwealth of Australia House of Representatives Standing Committee on Economics, *Reserve Bank of Australia annual report 2018*, Official Committee Hansard, 9 August 2019.

implementation of QE, is currently 27% by mid-2020, 41% by end-2020 and the same as at mid-2021; and

- The estimated probability that the market prices a cash rate should be zero or below – which would be a scenario where QE was implemented given the Reserve Bank’s floor of 0.25% – is 12% by mid-2020, 30% by end-2020 and 34% by mid-2021.

Chart 5: There is a roughly 40% chance the RBA will reach the point where it considers and possibly implements QE



Source: Bloomberg, Reserve Bank of Australia, National Australia Bank

We also calculated the probability of “material” economic underperformance of the Reserve Bank’s outlook

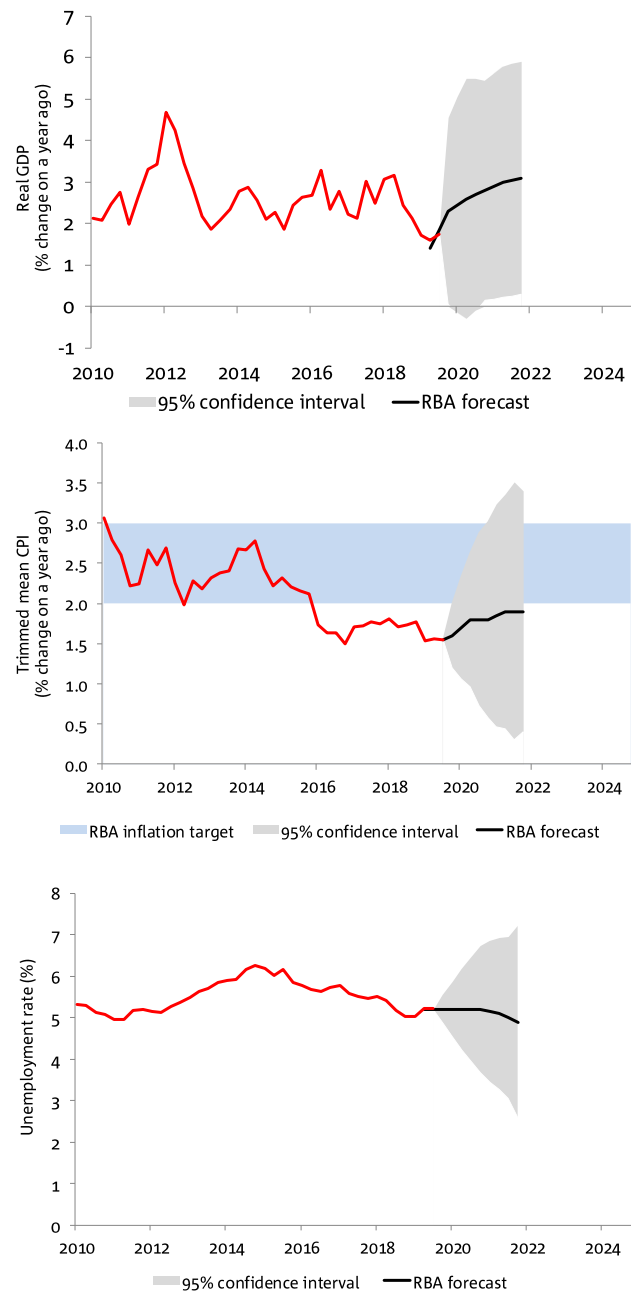
Taking a different approach, we also looked at the probability of QE implied by the Reserve Bank’s economic forecasts. This is because Governor Lowe testified in August that “if the economic underperforms materially our central scenario, growth is very weak—it stays in the 1% range for a longer [...] time — the unemployment rate starts rising, wages growth doesn’t pick up and inflation’s falling short, then we’ll need to look at all monetary options, fiscal options and structural options”.⁴

Using the Reserve Bank’s latest economic forecasts, we estimated probabilities for “material” economic underperformance, namely:

- Annual growth in real GDP stuck in the 1s or less — the estimated probability was 31% for mid-2020, 25% by end-2020 and 21% for mid-2021;
- Annual underlying inflation remaining below the Reserve Bank’s 2-3% target — the estimated probability was 59% for mid-2020, 57% by end-2020 and 50% for mid-2021; and
- An unemployment rate of 5.5% or more — the estimated probability was 28% for mid-2020, 35% by end-2020 and 33% for mid-2021.⁵

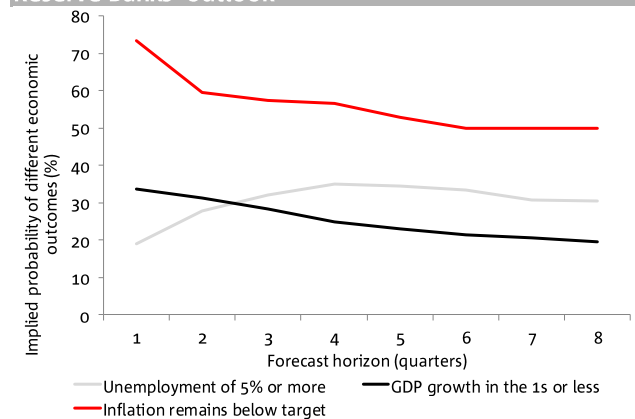
⁵ The probabilities were derived from confidence intervals constructed using root mean squared errors from Peter Tulip and Stephanie Wallace, *Estimates of uncertainty around the RBA’s forecasts*, Reserve Bank of Australia Discussion Paper RDP 2012-07, November 2012.

Chart 6: There are large confidence intervals around the Reserve Bank’s economic forecasts



Note: The forecasts are from the November 2019 Statement on Monetary Policy.
 Source: Australian Bureau of Statistics, Reserve Bank of Australia, Tulip and Wallace, National Australia Bank

Chart 7: The estimated probability of “material” economic underperformance relative to the Reserve Bank’s outlook



Source: Australian Bureau of Statistics, Reserve Bank of Australia, National Australia Bank

The average probability of QE over the next year and a half from this work is about one-third

This work suggests that market pricing and the Reserve Bank’s own economic forecasts point to a solid risk of about one-third that the bank will implement QE at some point over the next year and half.

There is some imprecision around the estimates because the work hinges on the assumption that the distribution of interest rates and errors is normal, which is the assumption adopted by the Reserve Bank when analysing its own forecasts.

The more important point is that QE may be implemented because the market and economists both make large errors in predicting the future and Australia is close to exhausting conventional policy amid low growth and low-inflation.

As for NAB’s view, we expect the Reserve Bank will cut the cash rate twice more, reaching 0.25% in June 2020. We then see an increased risk of a move to unconventional policy in the second half of 2020 should the labour market deteriorate more significantly than we forecast, with low inflation posing little constraint to further easing.

Table 1: Summary of estimated probabilities

	Jun-20	Dec-20	Jun-21
(1) Financial indicators			
Cash futures			
- cash rate of zero or below	12	30	34
(2) RBA forecasts			
GDP growth in the 1s or less	31	25	21
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Source: Australian Bureau of Statistics, Reserve Bank of Australia, National Australia Bank

Kieran Davies

CALENDAR OF ECONOMIC RELEASES

Country	Economic Indicator	Period	Forecast	Consensus	Actual	Previous	GMT	AEDT
Monday 20 January 2020								
US	Martin Luther King Jr Public Holiday							20 January
JN	Industrial Production YoY	Nov F		--		-8.1	4.30	15.30
Tuesday 21 January 2020								
NZ	Performance Services Index	Dec		--		53.3	21.30	8.30
JN	BOJ Policy Balance Rate	Jan 21		-0.1		-0.1		around 2pm
UK	ILO Unemployment Rate 3Mths	Nov		3.8		3.8	9.30	20.30
GE	ZEW Survey Current Situation	Jan		-10		-19.9	10.00	21.00
Wednesday 22 January 2020								
AU	Westpac Consumer Conf Index	Jan		--		95.1	23.30	10.30
CA	CPI NSA MoM / YoY	Dec		--		-0.1 / 2.2	13.30	0.30
CA	CPI Core- Common YoY%	Dec		--		1.9	13.30	0.30
CA	Bank of Canada Rate Decision	Jan 22		1.75		1.75	15.00	2.00
Thursday 23 January 2020								
NZ	Net Migration SA	Nov		--		4120	21.45	8.45
AU	Consumer Inflation Expectation	Jan		--		4	0.00	11.00
AU	Employment Change	Dec	10	15		39.9	0.30	11.30
AU	Unemployment Rate	Dec	5.3	5.2		5.2	0.30	11.30
AU	Participation Rate	Dec	66	66		66	0.30	11.30
JN	All Industry Activity Index MoM	Nov		0.4		-4.3	4.30	15.30
EC	ECB Main Refinancing Rate	Jan 23		0		0	12.45	23.45
EC	ECB Marginal Lending Facility	Jan 23		0.25		0.25	12.45	23.45
EC	ECB Deposit Facility Rate	Jan 23		-0.5		-0.5	12.45	23.45
EC	Consumer Confidence	Jan A		-8		-8.1	15.00	2.00
Friday 24 January 2020								
CH	Lunar New Year Public Holiday							24 to 30 January
NZ	CPI QoQ / YoY	4Q	0.4 / 1.8	0.4 / 1.8		0.7 / 1.5	21.45	8.45
JN	Natl CPI YoY	Dec		0.7		0.5	23.30	10.30
JN	Jibun Bank Japan PMI Mfg	Jan P		--		48.4	0.30	11.30
NZ	Credit Card Spending YoY	Dec		--		4.5	2.00	13.00
GE	Markit/BME Germany Manufacturing PMI	Jan P		44.2		43.7	8.30	19.30
EC	Markit Eurozone Manufacturing PMI	Jan P		46.7		46.3	9.00	20.00
CA	Retail Sales MoM	Nov		--		-1.2	13.30	0.30
US	Markit US Manufacturing PMI	Jan P		52.8		52.4	14.45	1.45
Upcoming Central Bank Interest Rate Announcements								
Japan, BoJ		Jan 21	-0.10	-0.10		-0.10		
Canada, BoC		Jan 22	1.75	1.75		1.75		
Europe, ECB		Jan 23	-0.50	-0.50		-0.50		
US, Federal Reserve		Jan 29	1.5/1.75	1.5/1.75		1.5/1.75		
UK, BOE		Jan 30	0.75	0.75		0.75		
Australia, RBA		Feb 4	0.50	0.75		0.75		
New Zealand, RBNZ		Feb 12	1.00	1.00		1.00		

GMT: Greenwich Mean Time; AEDT: Australian Eastern Daylight Time

FORECASTS

Economic Forecasts																				
	Annual % change				Quarterly % change															
	2018	2019	2020	2021	2018				2019				2020				2021			
Australia Forecasts	2018	2019	2020	2021	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Household Consumption	2.7	1.4	1.4	2.0	0.5	0.8	0.3	0.4	0.3	0.3	0.1	0.2	0.3	0.5	0.6	0.5	0.4	0.4	0.5	0.6
Underlying Business Investment	1.3	-3.0	-2.4	3.2	1.0	-1.0	-1.4	-0.4	0.9	-1.2	-2.9	-1.3	-0.1	-0.1	0.5	0.9	0.9	0.9	0.9	1.0
Residential Construction	4.7	-7.1	-7.8	-0.7	3.4	2.5	0.4	-3.0	-1.6	-3.7	-1.7	-2.4	-2.2	-2.0	-1.2	-0.4	0.4	-0.2	0.6	0.7
Underlying Public Spending	4.4	4.8	4.6	3.6	1.4	-0.5	2.0	0.7	1.0	1.7	1.7	0.8	1.1	1.1	0.9	0.9	0.9	0.9	0.8	0.8
Net Exports (a)	0.9	1.4	0.1	0.0	0.6	0.0	0.4	-0.1	0.4	0.5	0.2	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Inventories (a)	0.1	-0.3	0.1	0.0	-0.1	0.3	-0.3	0.1	-0.1	-0.4	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Domestic Demand (q/q %)	--	--	--	--	0.9	0.3	0.5	0.1	0.3	0.3	0.2	0.1	0.3	0.4	0.6	0.6	0.6	0.6	0.7	0.7
Dom Demand (y/y %)	2.9	1.0	1.4	2.4	3.7	3.3	2.6	1.8	1.2	1.2	0.9	0.9	1.0	1.0	1.4	2.0	2.3	2.4	2.5	2.6
Real GDP (q/q %)	--	--	--	--	0.9	0.7	0.3	0.2	0.5	0.6	0.4	0.4	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.7
Real GDP (y/y %)	2.7	1.8	2.0	2.4	3.1	3.2	2.5	2.1	1.7	1.6	1.7	2.0	1.9	1.8	1.9	2.1	2.2	2.3	2.4	2.5
CPI headline (q/q %)	--	--	--	--	0.4	0.4	0.4	0.5	0.0	0.6	0.5	0.6	0.4	0.4	0.5	0.6	0.5	0.5	0.6	0.7
CPI headline (y/y %)	1.9	1.6	2.0	2.2	1.9	2.1	1.9	1.8	1.3	1.6	1.7	1.8	2.2	1.9	1.9	1.9	2.1	2.2	2.3	2.4
CPI underlying (q/q %)	--	--	--	--	0.5	0.5	0.4	0.4	0.2	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.5
CPI underlying (y/y %)	1.8	1.4	1.6	2.0	1.9	1.8	1.8	1.8	1.5	1.4	1.4	1.4	1.6	1.6	1.7	1.7	1.8	1.9	2.0	2.1
Private wages (q/q %)	--	--	--	--	0.5	0.6	0.5	0.6	0.5	0.5	0.5	0.6	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
Private wages (y/y %)	2.1	2.3	2.5	2.8	1.9	2.1	2.1	2.3	2.4	2.3	2.2	2.2	2.3	2.5	2.6	2.6	2.7	2.7	2.8	2.8
Unemployment Rate (%)	5.3	5.3	5.5	5.6	5.5	5.6	5.1	5.0	5.1	5.2	5.4	5.3	5.4	5.4	5.5	5.6	5.6	5.5	5.6	5.6
Terms of trade	1.8	5.4	-6.5	-1.8	3.3	-1.2	0.7	2.6	3.3	1.4	0.3	-4.5	-1.9	-1.9	0.0	-1.9	-0.3	0.2	0.2	0.6
Current Account (% GDP)	-2.1	0.7	-0.1	-0.5	-2.1	-2.6	-2.1	-1.3	-0.4	0.9	1.6	0.7	0.4	0.0	-0.1	-0.5	-0.6	-0.5	-0.5	-0.4

Source: NAB Group Economics; (a) Contributions to GDP growth

Exchange Rate Forecasts						
	20-Jan	Mar-20	Jun-20	Sep-20	Dec-20	Mar-21
Majors						
AUD/USD	0.687	0.68	0.69	0.70	0.71	0.71
NZD/USD	0.66	0.65	0.65	0.66	0.67	0.67
USD/JPY	110.1	109	109	108	110	108
EUR/USD	1.11	1.14	1.16	1.16	1.17	1.17
GBP/USD	1.30	1.35	1.35	1.35	1.33	1.36
USD/CNY	6.86	7.05	7.00	6.90	6.85	6.85
USD/CAD	1.31	1.31	1.30	1.30	1.31	1.32
USD/CHF	0.97	0.98	0.96	0.96	0.96	0.96

Australian Cross Rates						
	20-Jan	Mar-20	Jun-20	Sep-20	Dec-20	Mar-21
AUD/NZD	1.04	1.05	1.06	1.06	1.06	1.06
AUD/JPY	75.7	74	75	76	78	77
AUD/EUR	0.62	0.60	0.59	0.60	0.61	0.61
AUD/GBP	0.53	0.50	0.51	0.52	0.53	0.52
AUD/CNY	4.72	4.79	4.83	4.83	4.86	4.86
AUD/CAD	0.90	0.89	0.90	0.91	0.93	0.94
AUD/CHF	0.67	0.67	0.66	0.67	0.68	0.68

Interest Rate Forecasts						
	20-Jan	Mar-20	Jun-20	Sep-20	Dec-20	Mar-21
Australian Rates						
RBA cash rate	0.75	0.50	0.25	0.25	0.25	0.25
3 month bill rate	0.87	0.60	0.35	0.35	0.35	0.35
3 Year Swap Rate	0.79	0.65	0.50	0.45	0.35	0.45
10 Year Swap Rate	1.35	1.15	1.02	1.02	0.92	1.02
Offshore Policy Rates						
US Fed funds	1.75	1.75	1.75	1.75	1.75	1.75
ECB deposit rate	-0.50	-0.50	-0.50	-0.50	-0.50	-0.50
BoE repo rate	0.75	0.75	0.75	0.75	0.75	0.75
BoJ excess reserves rate	-0.10	-0.20	-0.30	-0.30	-0.30	-0.30
RBNZ OCR	1.00	1.00	1.00	1.00	1.00	1.00
China 1yr lending rate	4.35	4.10	4.10	4.10	4.10	4.10
China Reserve Ratio	12.5	12.0	12.0	12.0	12.0	12.0
10-year Bond Yields						
Australia	1.19	1.00	0.90	0.90	0.80	0.90
United States	1.82	1.80	1.80	1.80	1.80	1.90
New Zealand	1.54	0.95	1.05	1.10	1.30	1.45

Sources: NAB Global Markets Research; Bloomberg; ABS

Global GDP				
	2018	2019	2020	2021
Australia	2.7	1.8	2.0	2.4
United States	2.9	2.3	1.7	1.8
Eurozone	1.9	1.2	1.1	1.4
United Kingdom	1.4	1.3	1.0	1.5
Japan	0.3	1.1	0.6	0.9
China	6.6	6.1	5.9	5.8
India	7.4	5.1	6.2	7.1
New Zealand	2.8	2.2	2.2	2.0
World	3.6	3.0	3.2	3.5

Commodity prices (\$US)						
	20-Jan	Mar-20	Jun-20	Sep-20	Dec-20	Mar-21
Brent oil	64.9	65	66	67	68	68
Gold	1557	1490	1510	1520	1540	1550
Iron ore	na	79	76	72	68	71
Hard coking coal*	150	145	150	152	150	153
Thermal coal	75	72	70	68	70	72
Copper	6247	5700	5725	5750	5850	5900
Aus LNG**	10	11	11	11	11	11

* FOB quarterly contract prices (thermal coal is JFY contract)

** Implied Australian LNG export prices

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