Introduction

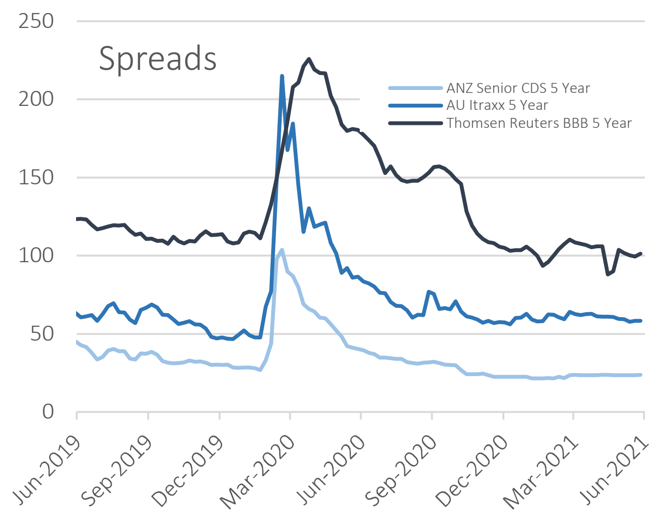
Another quarter……….another lockdown. Sorry, I couldn't help myself.

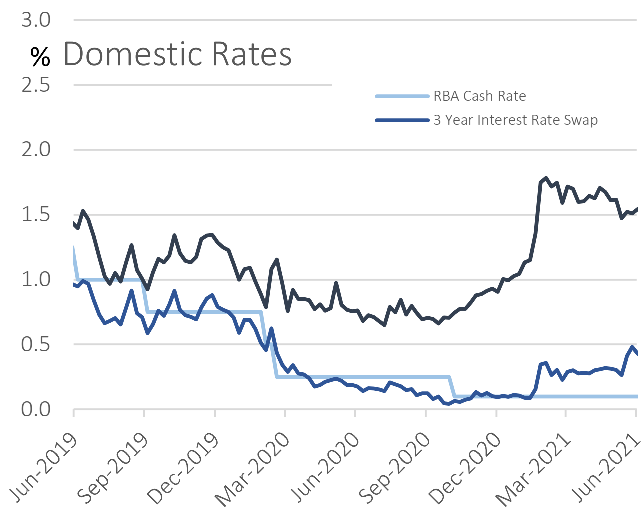
Inflation, inflation and house prices have been the themes of this quarter. Given our interest in housing is fairly low, we've focused on inflation in this edition (yes, surprisingly, this makes us boring conversation at any Aussie BBQ). In addition to inflation, we discuss the impact of electric vehicles (EVs) on the grid; we provide an update to our 2020 valuation analysis of Sydney Airport; and finally, we discuss solar and its medium term 'own goal'.

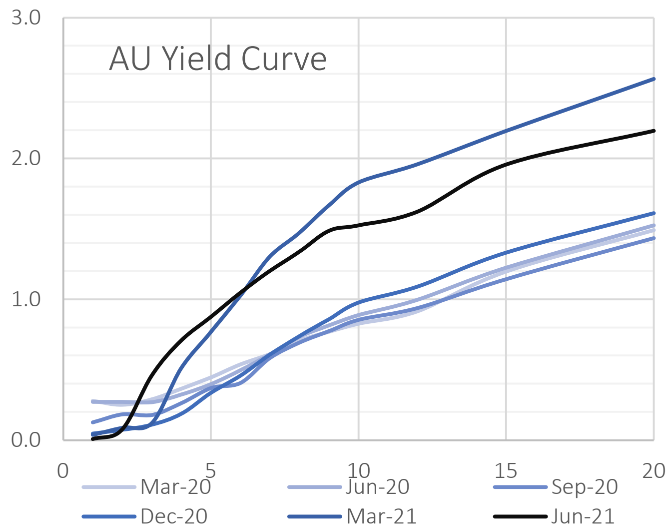
Markets update

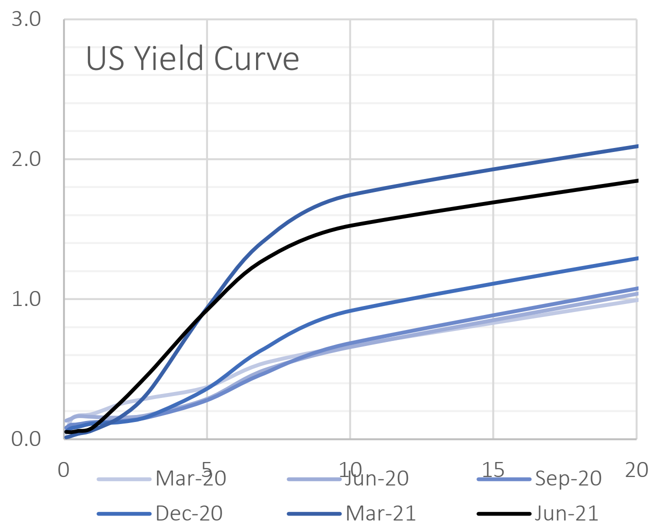
The yield curve twisted over the quarter with the short end rising and the long end falling. Markets are bringing forward their expectations of when central banks will raise interest rates whilst remaining confident that any spike inflation is transitorily and, hence, keeping long-term bonds well bid. We think that the deflationary factors that persisted before Covid will continue in the post Covid world.

Outside of Australia, the vaccine rollout continues. As of writing approximately 22% of the world's population have at least one shot of a Covid19 vaccine. Despite the onset of the delta variant economies are cautiously reopening around the world. The easing of lockdowns and reopening of economies is driving an extraordinary surge in economic growth.









New issuance and refinancing

Date	Borrower	Instrument	Size ($m)	Term (Yrs)
March	Sydney Desalination Plant	Loan	425	10
March	Energy Australia	Guarantee	400	3
March	Transurban/Cross City Tunnel	Loan	282	5
March	Loy Yang B	Loan	440	5/7
April	PARF/Tilt acquisition facility	Loan	1,200	-
April	Transurban/West Gate Tunnel	Loan	1,000	2
April	Genex/Kidston Pump Hydro	NAIF Loan	610	3
April	Transgrid	Bond	300	8
April	Australia Gas Networks	Bond	200/250	7/10
May	Airtrunk	Loan	450	-
May	Port of Newcastle	Loan	666	2/5
May	Plenary Finance	Loan	80	10
May	Transurban/Queensland Motorways	Bond	300	10
May	Endeavour Energy	Bond	350	7
May	Transgrid/EnergyConnect	CEFC Hybrid	295	-
June	Yarranlea Solar Farm	Loan	confidential	5
June	NBNCo	Bond	350	7

Equity and other news

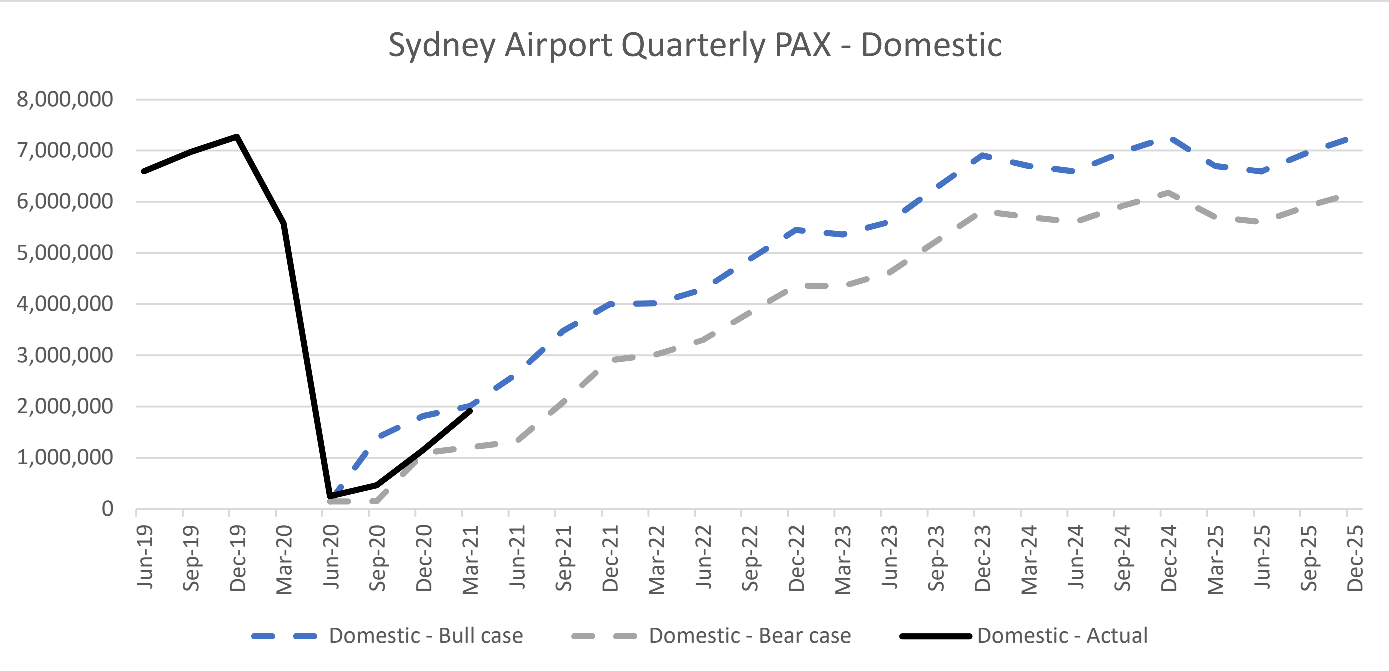
- New Energy Solar (ASX:NEW) has entered an agreement to sell 111MW Beryl Solar Farm and 56MW Manildra Solar Farm to Banpu. New Energy Solar will use to proceeds to pay down debt and undertake share buybacks. New Energy Solar owns a diversified portfolio of solar assets in Australian and the US. Banpu is a Thailand listed company focused on energy resources. Post the sale, all of NEW's remaining projects will be in the US.
- The Australian Energy Regulator has approved EnergyConnect, a new interconnection between South Australia and New South Wales. The project involves a new 900km 330kV transmission line with 800MW of transfer capacity. The project will unlock significant renewable capacity in the region.
- Genex Power's flagship 250MW Kidston Pump Hydro project has reached financial close. Genex has raised approximately $772m comprising a $115m equity raise, a $47m ARENA grant and $610 NAIF debt facility. Other project owned by Genex include the 50MW Kidston Solar Farm and 50MW Jemalong Solar farm funded from bank debt and CEFC finance.
- Tilt Renewables has been bought by the Power Australian Renewables Fund and Mercury at the offer price of $8.1 per share for total consideration of $3.07B. Mercury will acquire Tilts New Zealand assets and PARF will acquire the Australia assets.

Sydney Airport – valuation update

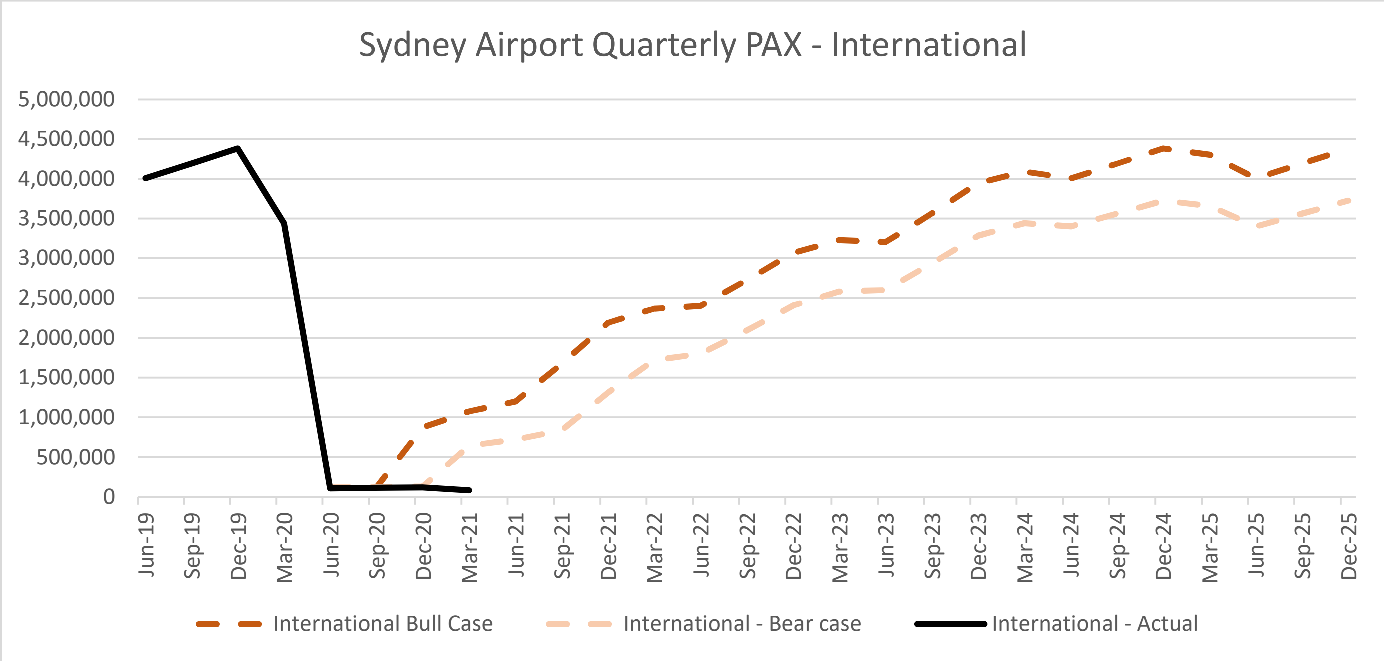
Before starting, this article is not investment advice, and in no way should it be relied upon for informing any investment decision. As they say on Hotcopper – DYOR!

A year ago we wrote a piece on the Sydney Airport valuation and speculated how long it would take to recover from the Covid19 induced shock to air travel. At the time we forecast a gradual increase in passenger traffic over time, starting with domestic air traffic, with international traffic following with a 3-month lag. Our forecast was bookended with a bullish and bearish case. Under the bullish case passenger growth recovered to 2019 levels by 2024 and under the bear case, growth is delayed by a further 3 months as well only returning to 85% of the previous trend. We had assumed that international borders would slowly re-open starting in late 2020!

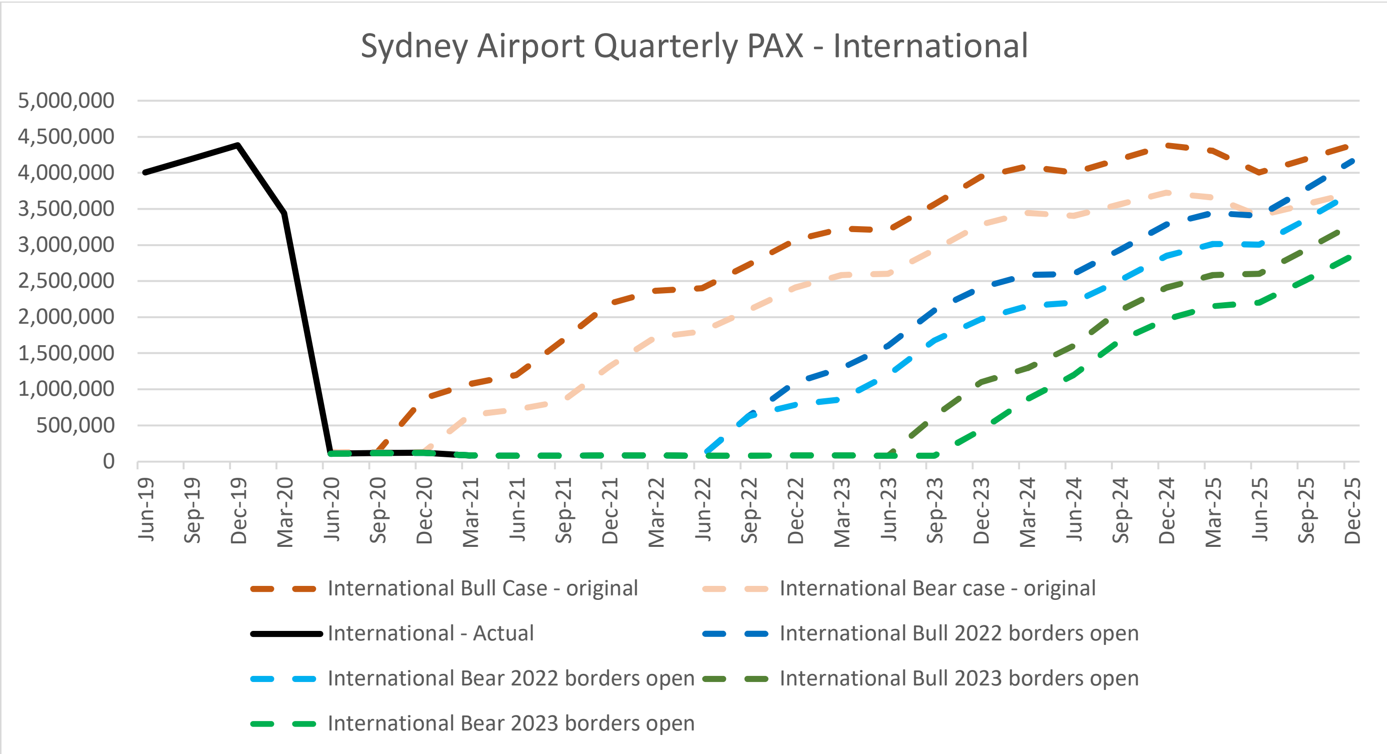
Domestic passenger numbers have been tracking reasonably consistently with our forecasts as lockdown restrictions were progressively released and state borders re-opened (this will take a hit with the current Sydney lockdown).



By contrast, the reality of international passengers (which are much more profitable for airports on a per passenger basis) remains very ordinary.



We have updated our international passenger numbers to be consistent with the current indications from Government that borders will be closed for at least another year. We have run scenarios on international travel resuming slowly from mid-2022 and from mid-2023.



Since our last article on airports Sydney Airport has undertaken a $2b equity capital raise to paydown debt – effectively reducing the net debt and increasing shares outstanding. Our previous price range was $4.60 to $6.90 which assumed international borders would begin opening late 2020.

To recap, the valuation process we used was a 25-year DCF model with a WACC of 4.5%, inflation of 1.5% and a terminal value of 15x EBITDA. We have revised our original valuation numbers to take into account the delay in international travel, with the following results:

- If international borders open in mid-2022 fair value would be $4.70 to $6.20.
- If international borders open in mid-2023 fair value would be $3.50 to $5.00.

The current price of Sydney Airport shares is around $6.00 which we see as fair value if borders open in 2022 and international travel recovers to 2019 levels over the subsequent next 3 years. However, this is very sensitive to the timing (and pace) of the restart of large scale international travel. In rough terms, our model suggests that for every year the borders remain shut Sydney Airport will lose 10-15% of equity value. Ouch!

	Borders open mid 2022		**Borders open mid 2023**	
	Bull case	Bear case	Bull case	Bear case
Enterprise value ($m)	24,267	20,224	21,040	16,935
Net debt ($m)	7,500	7,500	7,500	7,500
Equity value ($m)	16,767	12,724	13,540	9,435
Shares outstanding (m)	2,699	2,699	2,699	2,699
Implied share price ($)	**6.2**	**4.7**	**5.0**	**3.5**

At Infradebt we have no deep insights on the science behind virus mutations and vaccines. The market seems to be pricing in a mid-2022 re-opening as guided by the Government with a return to pre-Covid passenger numbers.

The decision on when to re-open international borders will be difficult and will probably depend on how the virus is spreading and mutating outside Australia rather than simply the pace of vaccination rollout within the country. There is likely to be substantial divergences between different countries and regions in their success in suppressing/vaccinating against Covid. The divide is likely to be particularly sharp between developing and advanced economies. Given the inherently interconnected nature of airline travel – this creates further complexities in reopening. There is a big difference between a simple pairwise arrangement like the trans-Tasman bubble with NZ and opening Australia's borders to major global hub airports.

This creates a material risk that the re-opening of borders takes longer than might be expected.

EVs and grid demand

The three biggest sources of Australia's carbon emissions are stationary energy, transport and agriculture. We are making good progress in decarbonising grid electricity in Australia, with renewables accounting for almost 30% of electricity supply. Wind and solar are the lowest cost form of energy and it makes sense that electrification of transport is the next step in rapidly reducing carbon emissions. This article looks at the implication of this and, in particular, the potential for substantial increases in electricity demand on the back of the introduction and mainstreaming of electric vehicles.

Will EVs drive a material increase in demand for electricity?

Passenger EVs currently account for 1% of new car sales in Australia. Compared to global standards Australia lacks stringent environmental regulations or Government support that has resulted in more accelerated adoption of EVs in other markets. Combined with being in the smaller right hand-drive car market (along with Japan, UK and NZ) there are few incentives for car manufacturers to offer EVs in Australia, which leads to a limited range of EVs offered to Australian consumers. Globally Europe and China are doing the heavy lifting in terms of EV adoption where one tenth of all new cars sold are EVs.

The ABS collects statistics on the vehicle fleet and fuel consumption. Passenger vehicles, motorcycles, light commercial vehicles and buses would be the most likely to electrify within the next 10 years. For these use cases, existing battery technology is sufficient to offer compelling EVs. In our view, long distance and heavy trucking is likely to take longer, as the cost and weight of batteries needs to improve substantially.

However, passenger and light commercial vehicles represent the vast majority of vehicles and kilometres driven in Australia. Electrifying these vehicles represents an opportunity to displace about 75% of total fuel consumption in Australia or 25 megalitres of fuel (which for the geopolitical strategists in the audience, it is also worth noting, is imported either as refined fuel or crude oil).

Table: Fuel consumption in 2020

Type of vehicle	km travelled (m)	Megalitres of fuel	Litres per 100 km	% of total fuel
Passenger vehicles	162,983	18,094	11.1	55%
Motorcycles	1,683	102	6.1	0%
Light commercial	52,229	6,678	12.8	20%
Rigid trucks	10,976	3,138	28.6	10%
Articulated trucks	8,181	4,342	53.1	13%
Non-freight truck	321	75	23.2	0%
Buses	2,126	591	27.8	2%
Total/Average	**238,499**	**33,019**	**13.8**	**100%**

To provide a rough and ready analysis of what electrification of the entire passenger and light commercial fleet could mean, we compare the hypothetical scenario of all passenger vehicle kilometres being driven by Tesla model 3s. Tesla does not officially release the capacity of its batteries but unofficially we understand that the following are the stats for each of the model 3 variants available in Australia. The Performance can travel 628 km on a 79.5 KWh battery; the Long Range AWD can travel 657 km on a 79.5 kWh battery and the Standard Plus can travel 490 km on a 54 kWh battery. We assume that these are the standard automaker claims for combined driving use with the driving range in real world conditions likely to be lower.

Taking the specifications of the Standard Plus model at face value, this would equate to about 11 kWh per 100 km driven. Applying this to 2020 distance travelled this equates to 18 TWh of electrical load. However, we should adjust the numbers for optimistic claims by automakers on efficiency as well as for charging losses. For this, we have included a 20% overall discount. This implies that electrification of the entire passenger and light commercial fleet would result in 22-23 TWh of electrical demand. Relative to the grid load of 203 TWh in 2020, this is a surprisingly small 11% uplift in energy demand across the NEM. Given that electrification of the fleet would likely take 10-20 years (the average car in Australia is 10 years old), this implies an annual boost to electricity demand of around 1%. For us, this was a surprising result.

Why is it so? The key driver is that EVs are vastly more efficient than internal combustion engines. Thus, the reductions in energy use (joules) through petrol will be much larger relative to the increase in energy use from electricity.

Clearly the impact would become larger if/when heavy commercial vehicles are electrified given how intensively they are used. There is also a technological element. If the decarbonisation of heavy transport is achieved through battery powered trucks, then the high efficiency will be maintained. However, if hydrogen is the dominant technology for decarbonising transport, then it is worth noting that hydrogen supply chain is reasonably inefficient with large losses in each part of the electrolysis, liquification, transport and conversion back into electricity phases. Thus, if green hydrogen becomes a widespread replacement fuel it almost guarantees very strong growth in the demand for electricity.

Sidebar: What is the NPV of the fuel cost saving for EVs (or how much extra should you be willing to pay for an EV)?

All of this analysis of the efficiency of EVs triggers us to look at EVs from a consumer's point of view. That is, focusing on the economics of EV versus an internal combustion engine we compared the running cost of an EV to an equivalent petrol car. To drive 10,000 km (the annual average distance travelled in a passenger car) in a Model 3 requires 14,000 kWh of electricity or 11,100 litres of petrol for the typical combustion engine car. At $1.40 per litre of petrol this is $1,554 per year. The equivalent cost for an EV is $344 if charged from the grid or $55 if charged from rooftop solar. Assuming the levelised cost of rooftop solar is about $0.04/kWh net of STCs.

Vehicle and charge type	Fuel volume per 100 km	Fuel cost	Cost per 100 km	Cost per 10,000 km
Internal combustion engine	11.1 litres	$1.4/litre	$15.54	$1,554
EV charged from grid	13.8 kWh	$0.25/kWh	$3.44	$344
EV charged from solar	13.8 kWh	$0.04/kWh	$0.55	$55

Over 10 years the EV would accrue a $15,000 in fuel cost savings at current petrol prices if charged from solar. Even if charged from the grid, the savings would be $12,000. There would be further intangible benefits of the convenience of never having to go to a petrol station as well as reduced maintenance costs. On this basis, it would be rational to pay $10,000-$15,000 extra for an equivalent EV based purely on fuel cost savings.

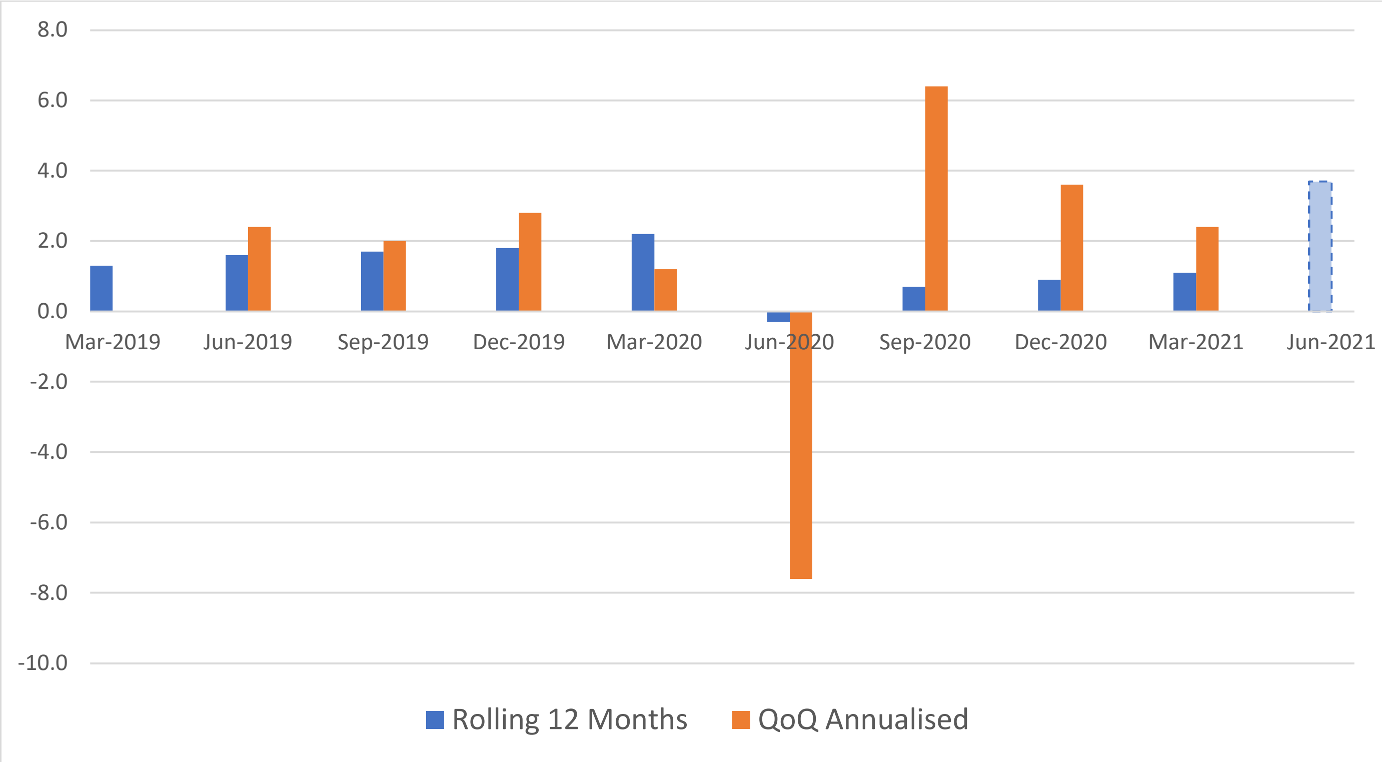
A key limitation in this analysis is that a significant portion of road funding is raised through petrol excise. Thus, a mass adoption of EVs will result in a significant erosion of this part of the tax base. This might result in government imposing a road tax or registration charge on EVs to try and recoup this lost revenue.

EV's will be a larger share of the market over the next 5 years and will likely be near 100% of all new cars sold in 10 years time. The incremental load on the grid is smaller than what we expected, however there would be additional benefits if car batteries can be used to reduce peak load (and more broadly have load more flexible – matching peaks in renewable generation). There is unlikely to be a surge in demand of EVs unless EV prices reduce to the $40-60k driveaway price level where it would be financial sense for a household to buy an EV absent a Government subsidy. We would hope there is opportunity for a more forward-looking government policy in this area. In particular, a progressive EV policy would seem to have both environmental and resilience benefits and, in particular, be a better use of government money than subsidising the continued operation of local petrol refineries.

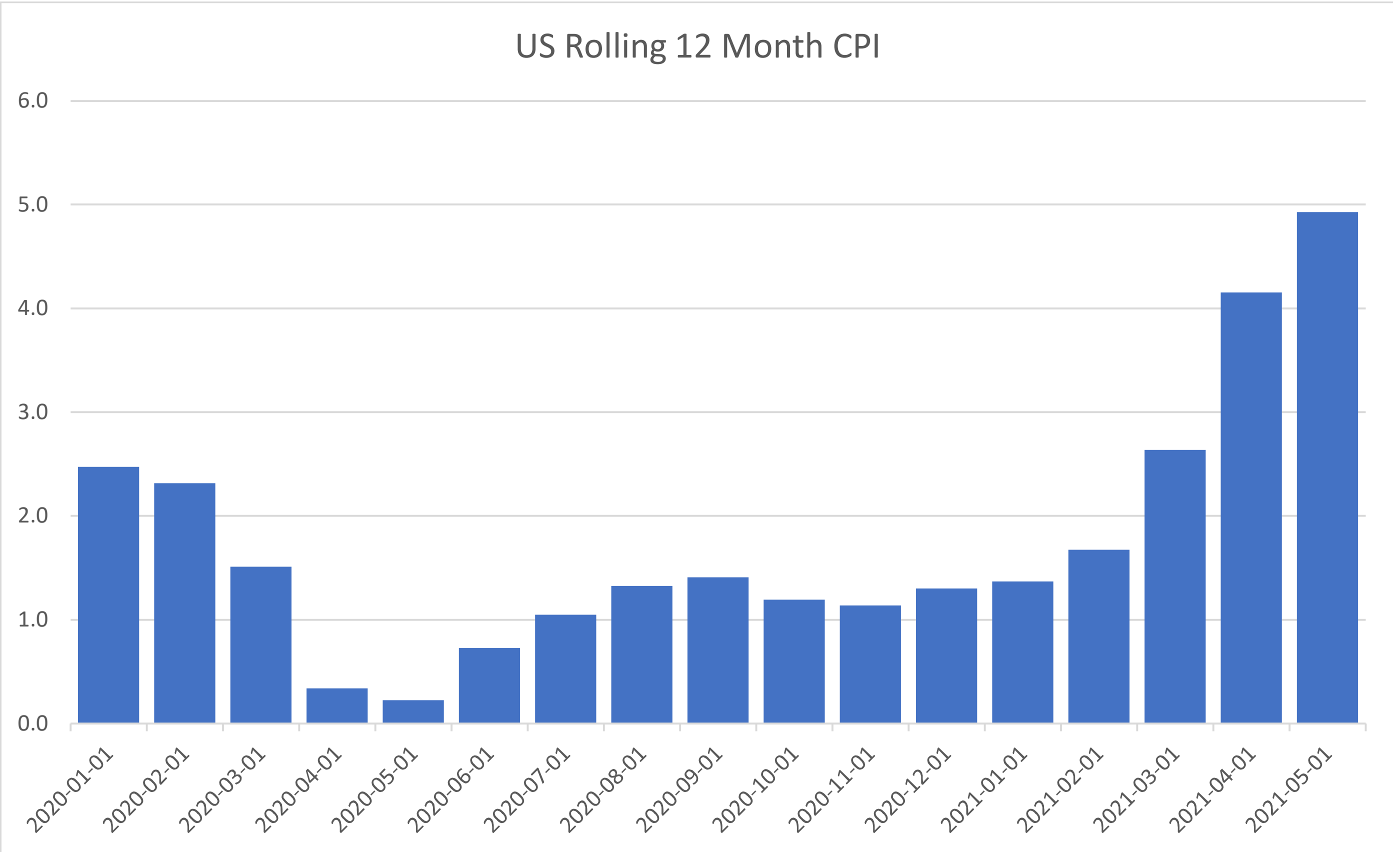
Inflation and Bond Rates – Moving in Opposite Directions

As investors in infrastructure assets, with their long-dated cash flows, we spend a fair bit of time worrying about changes in bond rates or the inflation outlook and their potential implications for asset values. It is easy to get caught up in quarter to quarter changes in outlook – which really aren't that actionable for investors in illiquid long lived assets.

Inflation is rising. For example, in Australia the 12 month inflation rate is expected to rebound to 3.7% when the June quarter reading is released (see chart below).



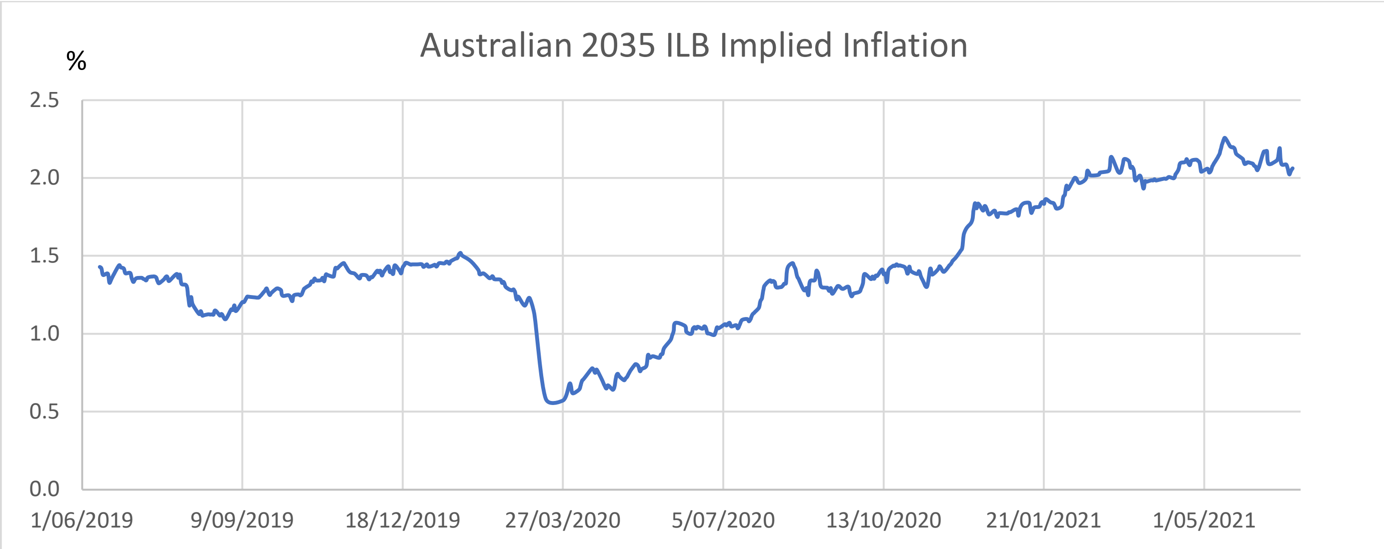
This reflects base effects – that is the rolling 12 month figure is now based on the post pandemic trough rather than the pre-pandemic peak. But there are also higher oil and commodity prices as well as emerging supply bottlenecks as the economy rebounds. The picture is very similar in the US – which has the benefit of monthly CPI statistics – which hit just under 5% on a rolling 12 month basis at end April.



A material uptick in inflation is clearly here. The *$64,000* question is whether this surge is temporary or does this herald a shift to a higher inflation regime?

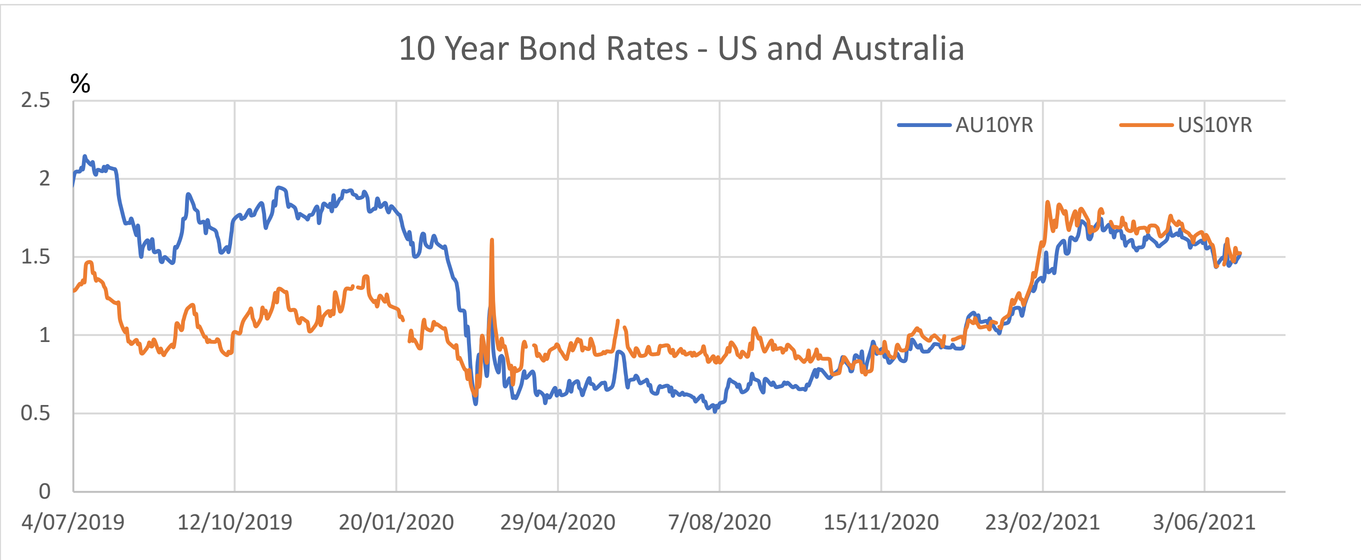
Central bankers are saying this is temporary and are promising to be slow in raising rates – but should we believe this?

One approach is to track how markets are reacting. In late 2020 and early this year, bond rates shot up as markets priced in the strength of the post Covid recovery. Over this period – see chart below – market implied inflation expectations have steadily marched up from Covid lows. Market expectations are now materially higher than pre-Covid. Albeit – still below the midpoint of the RBA target range.



This is consistent with investors being increasingly worried about inflation – rather than the deflation that has dominated the post GFC world.

While inflation is garnering more attention, and more market pundits are predicting dire inflation scenarios, I would argue that the bond market seems to be telling a different story. After rising in late 2020 bond rates (see chart below) have held steady/fallen over last three months as evidence of inflation surge has emerged.



This means bond market participants are telling a different story to the newspaper inflation headlines. The market is betting that current surge in growth and inflation is temporary and the on the other side of the current short term rebound, monetary policy will need to remain very accommodative (and real interest rates remain deeply negative) for an extended period.

Solar showdown

Australian electricity markets are a war zone. There is a battle for survival going on between different generation technologies for a viable ongoing position in Australia's electricity supply chain. Rooftop solar is the hidden giant killer in this mix. Rooftop solar is small solar PV systems on the roofs of houses and commercial premises (rooftop solar is differentiated from utility scale solar farms). Rooftop is shaking up the market and landing some killer blows, including some on its own 'side'

While individual systems might be small, rooftop solar is massive. Based on end March 2021 APVI data, since 2007 there has been 14.5GW of rooftop solar installed across something like 2.8 million separate locations. To put this in context, this is roughly the same in power terms, as all the coal fired power stations in NSW and Victoria (15GW).

Furthermore, rooftop is growing rapidly. Over the 12 months to end March, there were 358,667 new installations with an aggregate capacity of 2.9GW. That is, in the last year Australia added rooftop solar that is 1.5x the size in power terms of Liddell coal fired power station (which is scheduled to close over the next couple of years). While the new rooftop solar will produce higher peak output than Liddell, in MWh terms it won't fully replace it, as rooftop solar typically has a capacity factor (i.e., MWh of production compared to MW of capacity based on 365x24 operation) of around 15% where a 'base load' generation like Liddell may have a capacity factor of 60-70%. That said, this is a massive amount of new generation hitting the grid each year (for example, Liddell took nine years from announcement to full commissioning).

The growth in rooftop solar reflects the choices of millions of Australians taking direct charge of sourcing some of their own electricity. While policy uncertainty has hampered the growth of utility scale renewables, that same uncertainty has probably encouraged Australians to install rooftop solar.

One of the reasons rooftop take-up is so strong is that the economics are fantastic.

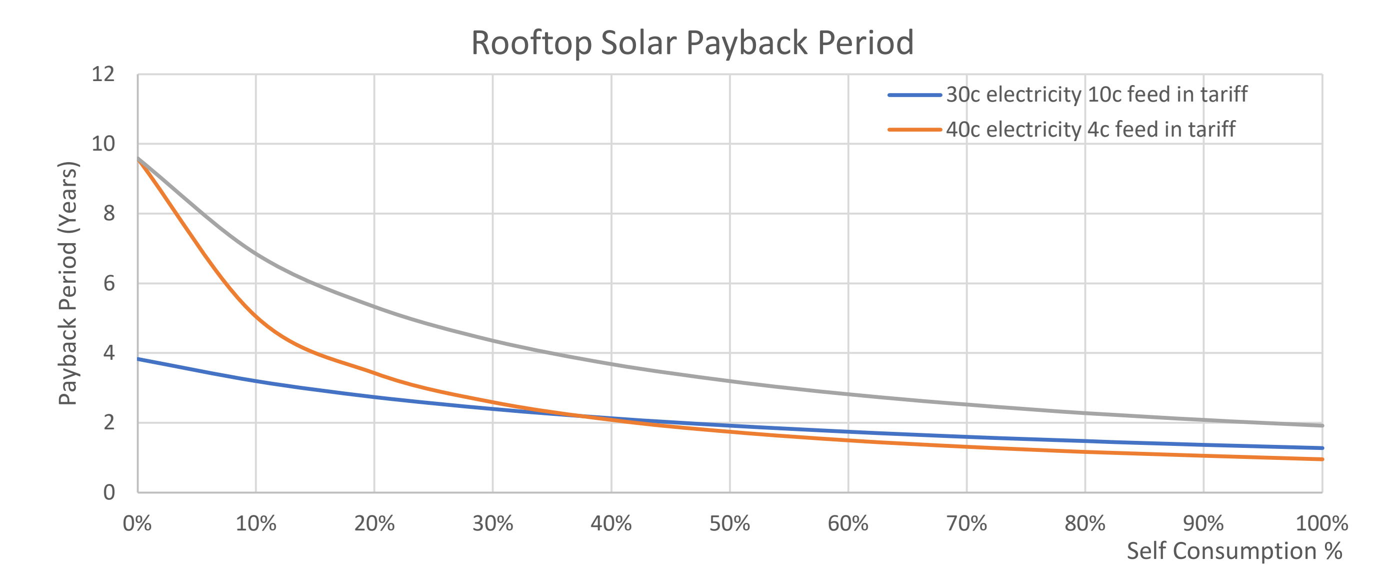
Rooftop solar is slightly cheaper than grid scale solar to build. This lower cost reflects the savings from not having to build a grid connection, as well as a much simpler physical structure to support the panels. Furthermore, for sub 100KW systems, the value of small generation certifications (STCs) is paid out up front – reducing the effective capital cost by around 45%. This is much more attractive than for large scale renewables where large generation certificates are paid out with generation (and, hence, projects are taking significant risk about the value of LGCs over time).

Rooftop solar has a lower capacity factor than utility scale solar (15% compared to capacity factors in the circa 22% for utility scale) because rooftop systems don't have the tracking systems that utility scale plants use (which boost output by around a fifth). Thus, while rooftop solar is (on a pre STC basis) slightly cheaper to build, this is roughly offset by lower generation.

In addition to STCs – which have a massive impact on their own – the other big driver of a difference between rooftop and utility scale solar economics relates to the structure of electricity tariffs. A utility scale solar project's revenue will be determined by average wholesale electricity prices at the time it operates (so called solar dispatch weighted prices). For a rooftop project, its revenue is driven by savings in power the owner would otherwise have bought from the grid, and once all self-consumption is satisfied receives a price for exports to the grid (so called feed in tariffs).

Depending on where you live and the arrangements you have with your retailer, self-consumption in Australia typically saves 20 to 40 cents per kWh. That is $200 to $400 per MWh. This is more than five times higher than typical wholesale solar dispatch weighted price (for example, for the last 12 months the average solar weighted dispatch price across the NEM according to OpenNEM was $43 per MWh). The higher self-consumption price reflects that electricity tariffs bundle together the cost of wholesale energy, network costs, green scheme recoveries and retailer margins into a single volumetric rate. Network charges are typically more than half of this. At noon, the actual cost/value of the underlying electricity is a reasonably small share of the of the per kWh charge.

The chart below shows the payback period of a rooftop solar system for different combinations of self-consumption and FIT tariffs as well as different levels of self-consumption. The key message from this chart is that as long as you have a decent level of self-consumption, payback periods of less than 2-4 years are likely. That is, equivalent to an IRR over say a 20 year life of the system of more than 40%. In a world of a 6 basis point cash rate and home mortgage rates in the 2% range, this is a pretty compelling incentive. It is no wonder that households are responding!



While ever STC arrangements and volumetric tariffs (where network charges are recovered based on kWh or usage rather than on a fixed or peak demand basis) remain in place, we should expect continued rapid growth in rooftop solar. At a 2-3GW per annum run rate, this continued growth will have material implications for the national electricity market – almost irrespective of what is happening at the utility scale end of the market.

What are the implications:

- There will be abundant supply in the middle of day, and this means weak wholesale energy prices at these times. This will be particularly the case, in spring and autumn, when solar performs strongly but underlying demand is not particularly high.
- Networks and retailers will suffer shrinking grid demand as an increasing share of electricity is supplied behind the meter.
- Increased ramping challenges as dispatchable generators need to ramp from minimum output at lunchtime to maximum output in the late afternoon as solar output falls off with the setting sun at the same time as load naturally rises with the evening peak. This is a physical challenge for coal generators and is expected to create increasing reliability challenges.

While much of the focus has been on the implications for coal generators, which were never designed to operate in market with this much ramping, rooftop is also going to create serious challenges for utility scale solar.

Rooftop solar will effectively undercut the revenues of utility scale solar. Rooftop solar has a fundamental advantage as a result of STCs and saved network costs on self-consumption, that utility scale just can't match. Furthermore, given the abundance of rooftop solar exports at noon, most retailers aren't incentivised to enter into solar PPAs, making the contracting market for utility scale solar projects more challenging.

While rooftop hits the revenues of both utility scale solar and coal plants at lunchtime, the coal plants do benefit from much higher pricing during the evening peak (by which time utility scale solar has ceased generating). Thus, while Infradebt remains very confident that low-cost renewables are going to force coal fired generation out of the

Australian electricity market over the next decade, the intervening period is likely to involve tough times for utility scale solar projects – which in the absence of storage – are stuck generating in an increasingly saturated portion of the day.