

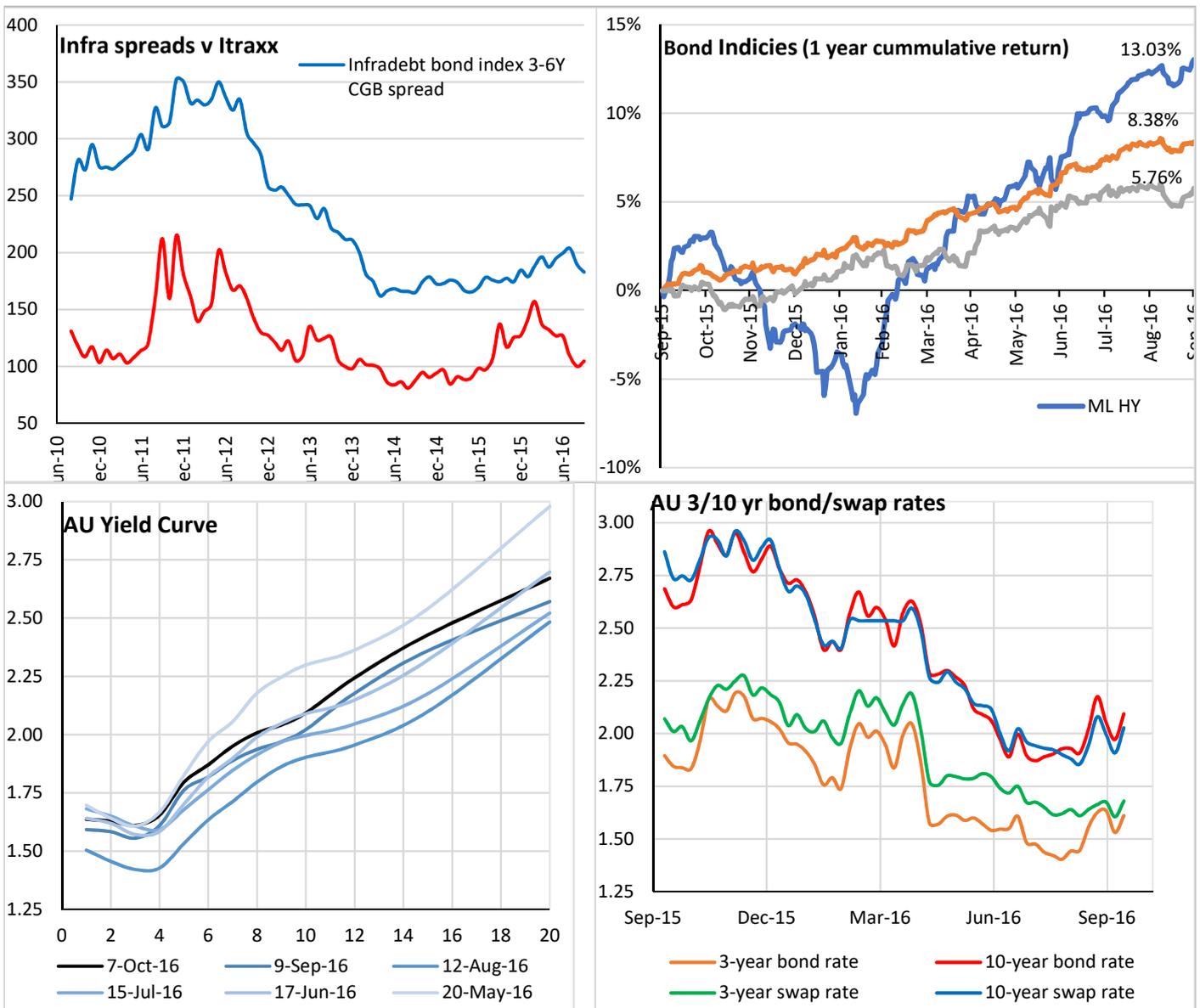
## Introduction

Relative to the last two quarters markets have been more subdued. As Ben Hunt (of Epsilon Theory fame) aptly called it, Brexit was more of a Bear Stearns moment rather than a Lehman moment (after the initial shock, markets recovered very quickly), and as we 'go to print' Deutsche Bank is creating lots of noise (potentially a Lehman's moment) and affecting debt markets in subtle, and not so subtle (e.g. Deutsche CDS) ways.

The first article of this newsletter looks at the low volatility anomaly, which, whilst not directly related to infrastructure, is highly relevant to the asset class. The second article takes a look at disruption within the electricity sector, and the third provides a contemporary recap of the ports sector over the prior years. This quarter's newsletter is longer than normal, principally because our electricity sector article takes a deeper look at disruption within the sector. We thought of synthesising it down to a shorter length article, but the result is an unacceptable loss of detail which dilutes relevance for readers.

## Markets update

Despite a few moments of excitement, debt markets this quarter have been reasonably flat. Specific to infrastructure debt, we continue to see some gradual spread widening, particularly relative to the same period last year



### New issuance and refinancing

The table below provides a list of publicly available deals.

Date	Borrower	Instrument	Size (m)	Term (Yrs)	Curr.	Pricing
July	WSO Finance	Bond	400	7	AUD	3.5% fixed
July	WSO Finance	Bond	100	10	AUD	BBSW + 200
July	Transurban	Bond	750	11	NOK	3.00% fixed
July	Dalrymple Bay Coal Terminal	Loan	350	5	AUD	BBSY+ 160
July	NT Airports	USPP	150	10/12	AUD	
July	NT Airports	Loan	527	3/5/7	AUD	
Sept	Transurban	Bond	550	10	USD	3.375% fixed
Sept	Port of Melbourne	Acquisition Loan	4,000	3/5/7	AUD	

### Equity and other news

- QIC and clients, such as the Future Fund, plan to invest in AGL's new flagship Powering Australia Renewables Fund (PARF), with target power generation to be about >3,000 GWh. The fund will acquire AGL's Nyngan and Broken Hill solar plants as seed assets.
- Treasurer, Scott Morrison blocked the sale of AusGrid to both bidders, State Grid Corp of China and CKI on grounds of "national interest concerns". State Grid is a Chinese Government owned state owned enterprise and CKI is a Hong Kong based commercial enterprise. It is unclear why CKI was blocked.
- Adani Abbot Point Terminal announced a tender offer for up to A\$75m of their A\$500m fixed rate notes due 2018. The process was an unmodified Dutch auction, subject to a maximum purchase spread of +635bps. Tenders were accepted to buy back A\$62.931m of 2018 notes.
- The QIC led consortium was announced as the winning bidder for the 50 year lease of the Port of Melbourne. The winning bid was \$9.7 billion, with bids by the two short-listed consortiums rumored to be very, very close.
- Evolution Rail was announced preferred bidder for the High Capacity Metro Train PPP. The project includes delivery of 65 new high capacity trains to be built in Victoria, together with construction of a maintenance facility. The consortium comprises Downer Group, CRRC Changchun Railway Vehicles and Plenary Group.
- ARENA announced that 12 of the 20 shortlisted large scale solar projects have won grants. The 12 projects comprise 480MW of new capacity and a total of \$92 million in grants were awarded across all successful applicants.
- Infratil and CSC have been awarded a 30 year concession and lease arrangement on student accommodation at ANU. The deal is worth ~\$500 million and involves a makeover and expansion of facilities.



## Low volatility anomaly

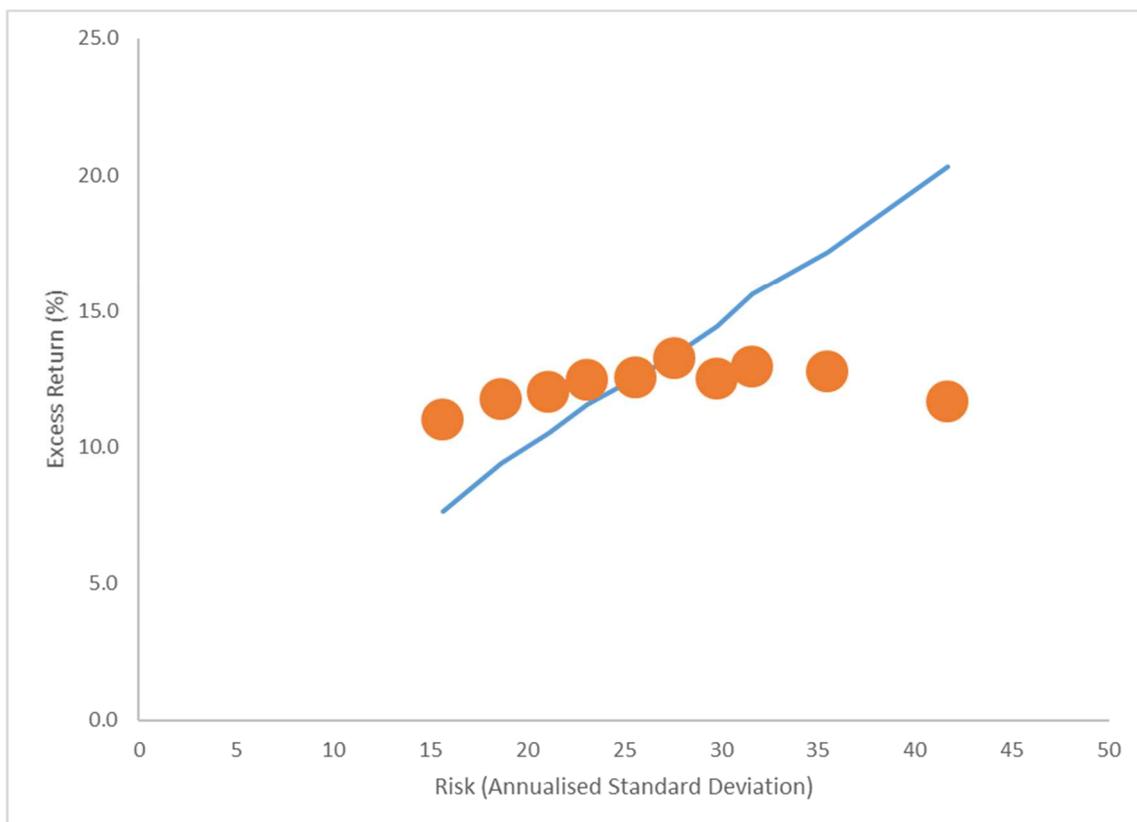
Straying slightly from the topic of infrastructure, one of the anomalies in markets that has proven robust across stocks and bonds, across a multitude of countries, and time, is the low volatility anomaly. That is, that low volatility assets provide higher risk adjusted returns than high risk assets.

Finance theory says that systematic risk is a key driver of long term returns. If you invest in higher risk assets you will, on average, earn higher returns over time. This is usually expressed the other way – that is, to get a higher return you need to take more risk. Implicit in this, is that risk adjusted returns remain reasonably constant across different levels of risk.

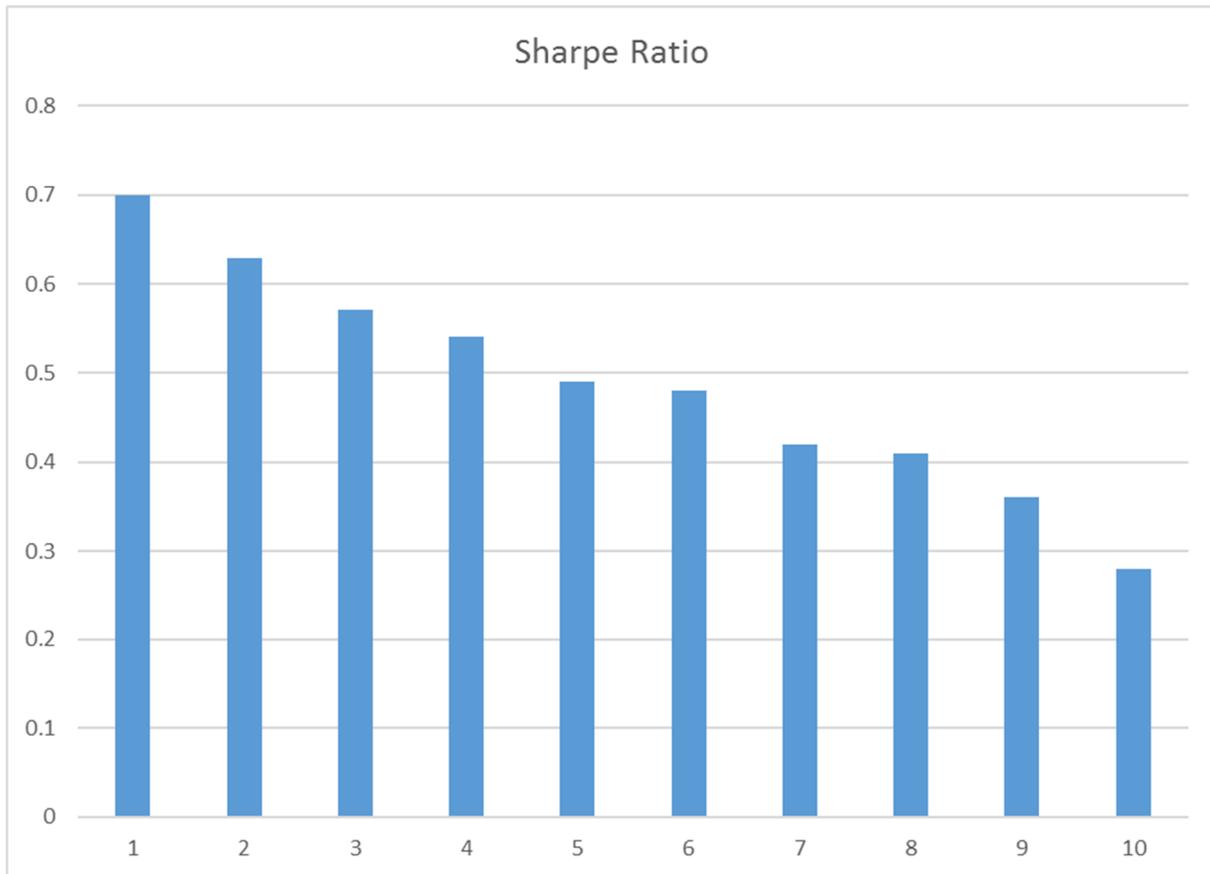
However, the empirical evidence doesn't really support this theoretical notion. In particular, if you construct portfolios where the market is partitioned by risk level, the low risk portfolios do have lower returns, but not by nearly as much as they have lower risk. Thus low risk portfolios offer unusually high risk adjusted returns (for example, measured by Sharpe Ratio), and high risk portfolios offer unusually poor risk adjusted returns.

To illustrate this, the following two charts are based on returns to US stocks between 1926 and 2012 (Frazzini A., Pederson L. 2013: Betting against Beta). The study looks at 10 portfolios where stocks have been ranked on their beta (the observed correlation between their returns and market returns). The lowest risk portfolio consists of the 10% of stocks with the lowest betas and so on.

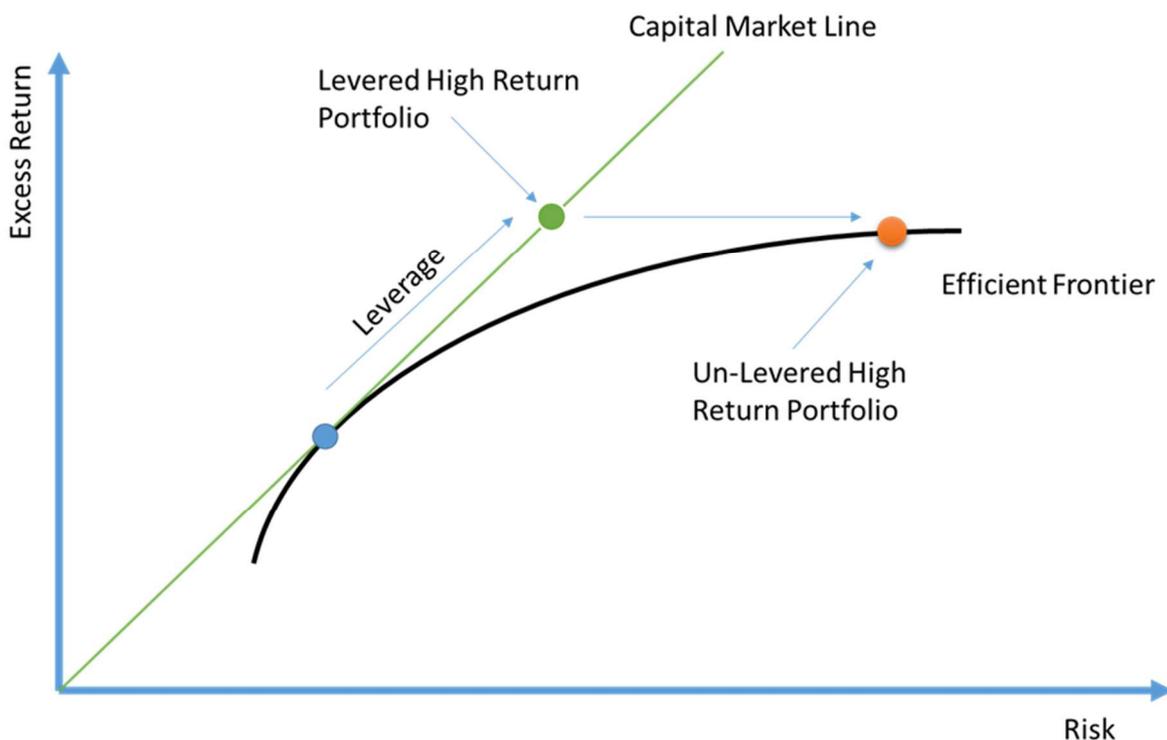
Finance theory would suggest that the lowest risk portfolios should have a lower excess return (over risk free), and the higher risk portfolios should have higher returns. According to the Capital Asset Pricing Model (CAPM), the performance of these portfolios should fall in a line proportionate to their beta (see blue line in chart below). In reality they don't, the low risk portfolios earn significantly more than their risk would dictate and high risk portfolios earn significantly less.



This means low risk portfolios have much higher Sharpe Ratios – that is risk adjusted returns – than high risk portfolios.

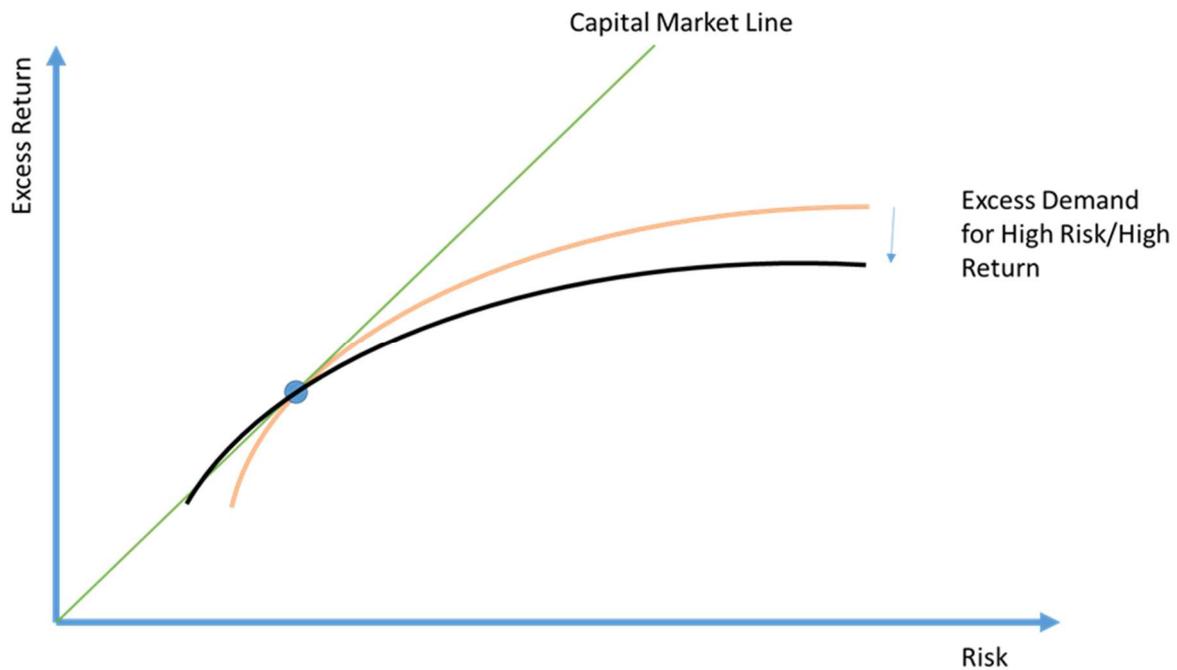


Why does this exist? The most compelling argument is that this is driven by investors return targets and costs/difficulties in leveraging. Finance theory assumes (among other things) that investors can leverage their portfolio at the risk free rate. Thus for investors who need, for whatever reason, a higher average level of returns – CAPM assumes they hold the same portfolio but use leverage to increase returns. This preserves the risk adjusted return, and can be thought of as moving along the capital market line in the figure below.



However, if investors are unwilling to leverage – superannuation funds (except SMSF’s to buy property) aren’t – then this isn’t an option. In this situation, if an investor needs higher returns they are forced to buy only higher returning stocks. By doing so they lose the more complete diversification of the market portfolio (the blue dot) and suffer a deterioration of their risk adjusted return (the orange dot).

Finally, if there are a large number of investors that need high returns, one of the outcomes will be increased competition for these high return (and high risk) stocks further depressing risk adjusted returns. Conversely at the other end of the risk spectrum, low risk assets will have few buyers and, hence, benefit from lower prices and higher returns. This can be thought of as a twisting of the efficient frontier (see below).



You might now be wondering what my point is?

My point is that there is a long history that shows that low risk assets offer excess returns because investors can’t leverage and have high return targets. There is robust evidence of this effect across equity and debt markets around the world. The opposite side of the coin to low risk assets earning excessively favourable risk adjusted excess returns, is high risk assets not earning the returns justified by their risk.

It is my view that this phenomenon exists at an asset class level today. That is, as risk free rates fall and yet return targets remain much the same, investors are hunting for yield amongst an increasingly narrow set of high risk asset classes. This is bidding these assets up, further driving down the prospective risk adjusted returns on offer. The classic example of this would be the performance of high yield over the past year or two, despite the clearly deteriorating credit quality and default outlook.

## Uncertainty and disruption in the Australian electricity sector

Last month I had the honour of being invited to present at the annual JANA client conference in Melbourne. What follows is an edited synopsis of my conference presentation.

As debt investors, we spend a lot of time worrying about the downside risks in projects and sectors. In particular, we try to assess the potential for a range of downside scenarios and then assess the adequacy of the buffers/protections for debt in the face of these scenarios. One of the areas Infradebt particularly focuses on is the potential for structural breaks – as traditional leverage/DSCR covenants provide limited protection against rapid changes in market dynamics.

The emergence of solar and storage is an example of a structural change in the electricity market.



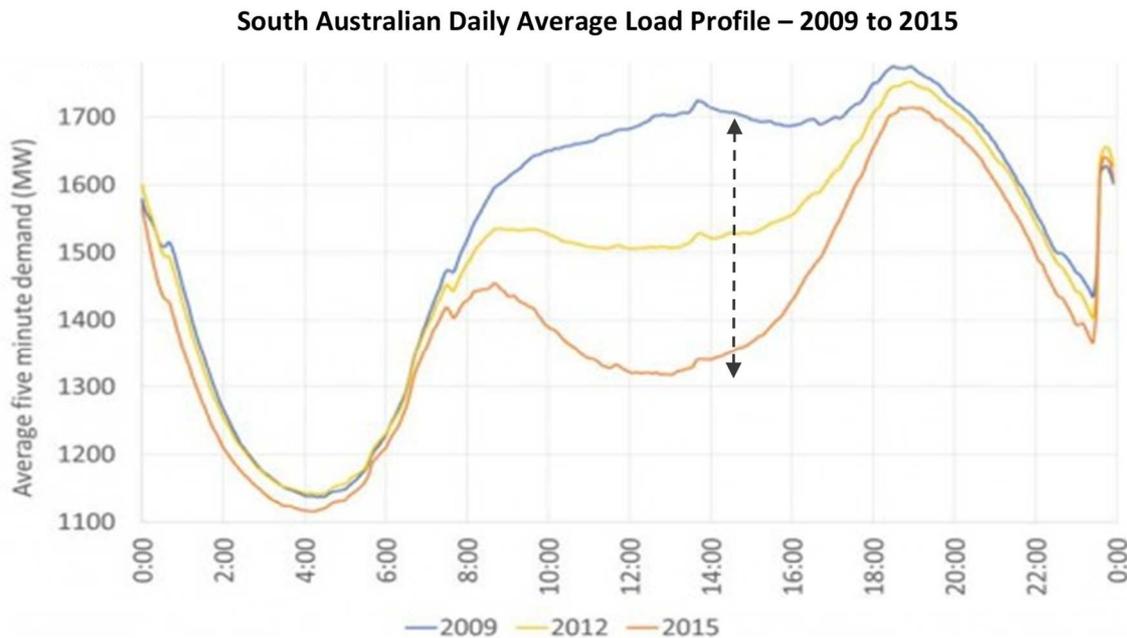
Infradebt launched a detailed research project into the potential impacts of solar at the start of 2015. This specific line of research formed part of our broader and comprehensive analysis of Australia’s regulated utilities, and was particularly motivated by the forthcoming sale of the NSW and Queensland electricity networks. Superannuation fund investors have an advantage – compared to banks – in providing longer term debt finance. As longer term investors, we wanted to look out at the potential impact of solar over the next 10 to 20 years and understand the possible implications for the networks business model.

**Disruptive Impact of Solar**

Solar is a unique generation technology. It allows users the opportunity to generate electricity at the point of use. This may sound like stating the obvious, but it is an important starting point, because only around a quarter of the cost of electricity to a household or business is the actual cost of the underlying power. The largest single component of cost (~50%) is the cost of the network that transmits power from the power station to the end user – embedded solar offers the opportunity to avoid this cost.

Capital costs of solar panels have fallen rapidly. This fall in cost means that embedded solar is now significantly cheaper, on an average cost basis, than grid based power. Embedded solar has an unsubsidised cost of around 12-13 cents per kWh. This compares with 20 plus cents for grid based power. If you include the value of Renewable Energy Target (RET) certificates, this differential is even larger. For daytime power users, solar is extremely cost competitive. It is this cost saving that is driving uptake, even though subsidised feed-in tariffs have stopped, and having significant impacts on the overall electricity market.

To show the impact of solar, the chart below shows the average demand profile for South Australia between 2009 and 2015.



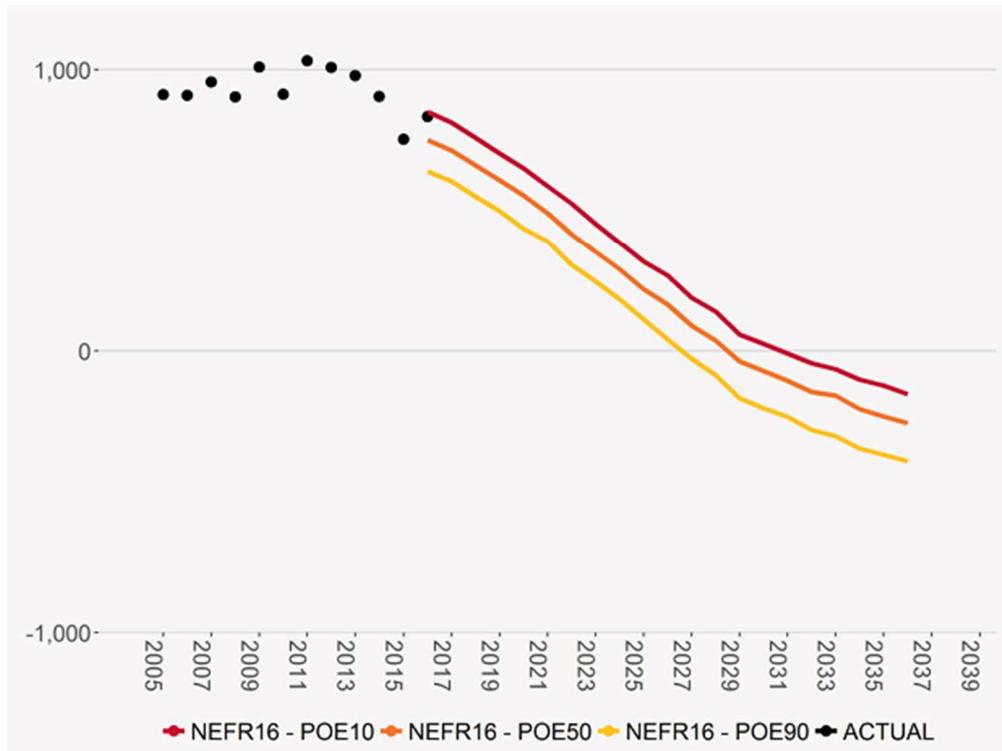
source: AEMO 2015

The take-up of embedded solar shows up as lower demand at noon. Over a six year period, solar has driven a 25%+ fall in lunchtime demand. In the context of electricity infrastructure, where most investments are evaluated over 20-30 year periods, this is significant change.

What does this look like further out? The Australian Energy Market Operator (AEMO) as part of its regular forecasting of electricity demand produces forecasts of demand. These forecasts pick up population and economic growth trends, long-term estimates of energy usage patterns, and energy efficiency. Historically, the focus of these studies has been on maximum demand because networks are sized to meet forecast peak, not average, demand. But AEMO also forecasts minimum demand. Continuing with South Australia, the chart below shows the actual minimum demand

over the last 10 years as well as the forecast for the next 20 years (for the electricity/solar geeks, minimum system demand is forecast to occur at noon on Boxing day – when a significant portion of manufacturing is shut down, roof top solar production is at a summer peak, residential air-conditioning is not yet running full blast (that occurs much later in the day) and no one is silly enough to have their oven running full tilt cooking a turkey!)

**Forecast Minimum South Australian Demand**



source: AMEO 2015

To leave you in no doubt about the above chart, AEMO is forecasting negative minimum net demand from the late 2020s – that is around 10 years from now. What does negative net demand mean? It means that embedded generation from solar is exceeding all the underlying usage from businesses, industry and households. That is, in theory, the SA grid could operate without a single utility scale generator operating. That’s not just coal or gas fired power stations. It’s also without any output from any of SA’s windfarms. This represents significant disruption within the electricity sector.

Why focus on SA? SA has the highest uptake of embedded solar in Australia, and is seen by many market analysts as a portent for the nation in the years to come.

**What about Batteries/Storage?**

Batteries allow surplus solar power to be stored for to offset the night-time peak and will have a significant impact on the electricity supply chain.

Batteries are not currently economic. The 7 kWh Tesla Powerwall, with an installed cost of \$8,000-10,000, has an implied cost of around \$0.50/kWh. This is clearly higher than the cost of power for the majority of consumers. Thus, at this price, Powerwalls are for early adopters rather than users pursuing a cost saving. But battery prices have, and are expected to continue, to fall significantly. Predicting future price falls is hard, but the history of solar may be analogous. Solar module costs fell by a factor of 100 between 1977 and 2013 – in no uncertain terms this is a massive fall.

What will drive this fall in battery prices? One area is the auto sector – the take-up of electric cars will drive manufacturing scale and thus lower production costs. To provide a real example of this, the Chevrolet Bolt will be

released later this year, it has a 60 kWh battery at a reported cost of US\$145 per kWh. If this pricing were able to be matched for a battery for home use, it represents a per kWh cost of 7 cents. At this pricing, solar and storage is cheaper than grid based electricity.

A 60 kWh battery represents three days usage for the average Australian household. It provides real potential for many detached dwelling households to go fully off the grid.

### Network Response

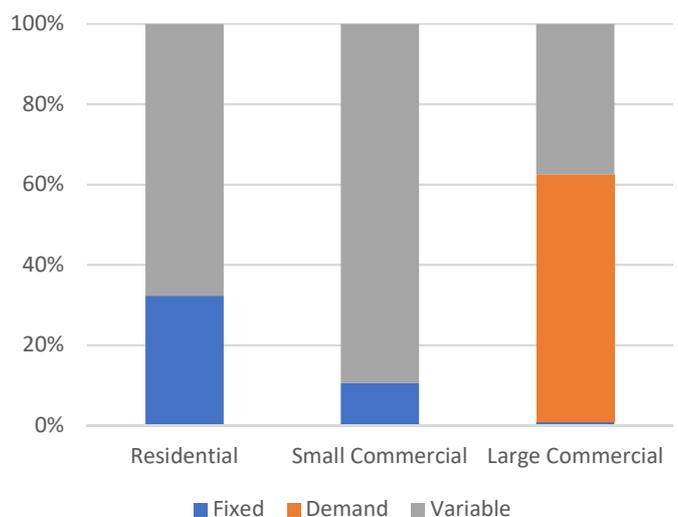
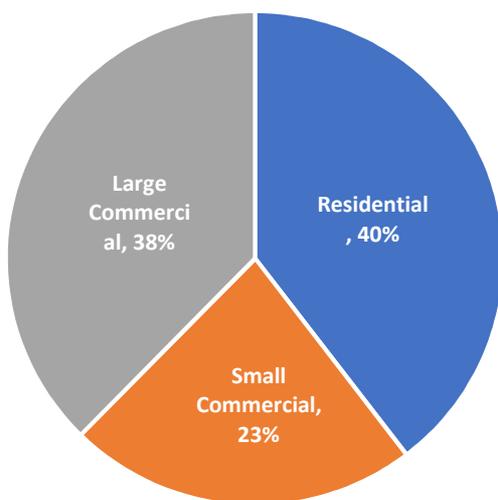
Embedded generation and storage is a significant challenge for the networks – what will they do in response?

Fundamentally networks will need to earn more of their profits from fixed charges and less from volume based charges. This would reduce the impact of declining grid volumes. This also allows networks to capture the value to consumers of the reliability of grid based electricity.

But the maths of a switch to higher fixed charges is not easy.

First, a very substantial portion of network charges is paid by residential and small commercial users.

If we use the ActewAGL customer base as an example (see chart below), you can see that two thirds of revenues come from small commercial and residential customers. For these customers, you will note that a very small proportion of grid charges are fixed (Residential: 33%, Small Commercial: 9%) – the rest of network revenues is recovered from volume charges. For a material portion of these user groups embedded solar and storage is a viable option subject to cost.



Thus to ensure network revenue stability in the face of increased embedded technology, requires a switch from volume to fixed charges. In practical terms this would require an increase in fixed charges by around a factor of five. While this might seem easy to an economist, at a social and political level it would be extremely difficult to implement as increased fixed charges hits some of our poorest community members, including:

1. Pensioners
2. Low income earners
3. Renters
4. Current beneficiaries of solar subsidy schemes

You need only drift your mind back to the 2013 federal election to see how politically charged electricity prices can be. One key element of the LNP’s 2013 electoral platform was the removal of the Carbon Tax –much of the campaigning and justification for removal of the Carbon Tax focused on the cost to electricity users.

## Implications for Infrastructure Investors

As a debt investor we focus on the downside. A key part of our investment process is identifying key risks for a project and then testing the buffers/protections for debt investors, ensuring they are appropriate for the potential consequences of identified risks.

What are the implications of the rise of solar and storage on the electricity sector? Dealing with each of the segments of the sector in turn:

### Generation assets

Investors should think very carefully about pool prices.

Australia has a significantly oversupplied generation market – there is currently 7,400 MW of excess capacity or 15%-20% of total generation capacity. At the same time, demand has been flat for a number of years. There are additional forces that are likely to exacerbate this situation.

The RET has the potential to drive the creation of 5,000 to 6,000 MW of additional renewable generation. The RET mechanism provides an effective subsidy on top of pool prices – thus it encourages new generation to enter the market even though it would not be viable on the basis of pool prices alone.

On top of this, rooftop solar is expected to continue to grow strongly. While the residential segment has slowed down due to end of subsidies, commercial solar is starting to take off. Depending on your source, rooftop solar is expected to add a further 7,000 to 10,000 MW of capacity over the next decade.

While Australia has a significant fleet of old coal fired power stations that are near the end of their economic lives, in the short term, the only driver of closures of these plants – which would help offset the new renewable generation – is low pool prices.

In addition, smart technologies, the continued drive by manufacturers to make consumer durables more energy efficient, and the exit of large energy intensive industries, results in power consumption forecasts being relatively flat over the medium term.

In summary, we would encourage investors to be quite cautious about pool price assumptions – particularly for solar. That is not to say pool prices will be consistently low – in fact quite the reverse, I would expect volatility of pool prices will be higher as an increasing proportion of power is sourced from renewables. It is just that the spikes in prices will, on average, occur when renewables are not generating, and the troughs in prices will occur when they are.

### Networks

The networks unassailable monopoly is under threat. In my view the world where networks could automatically capture additional revenue through expansions in their capital base is gone. That said, I don't think networks will disappear. In particular, sizeable segments of the market will struggle to supply their power needs with embedded generation. Those who live in apartments, operate within central business districts, or are heavy commercial users are unlikely to ever be able to operate on an off-grid basis. Furthermore, there are significant efficiency benefits from the operation of a network as a network allows the pooling of individual spikes in usage such that a smaller total level of redundancy is required across the pool.

In summary, networks will need to recover more of their costs from fixed charges. For smaller users this will mean paying more to access the grid. Larger users, and in particular, those users with the physical space and load profile to tap into the potential of solar and storage, have an alternative. As this alternative falls in price, it puts a ceiling on the prices networks can charge. We believe networks will be wedged between political/community reactions against higher fixed charges versus competitive pricing pressures from new alternatives.

### Storage



Our view is that batteries will eventually overtake gas peaking plants as the source of flexible supply.

Batteries will be able to benefit from periods of excess generation – whether that’s excess solar at lunchtime or excess wind generation in the middle of the night. Batteries will effectively become distributed peaking plants and be able to trade the volatility in pool prices and, hence, increased volatility will actually help battery economics.

Savings in network charges mean that batteries have better economics on an embedded basis rather than utility scale. This means mass take-up will occur on an embedded basis first.

### Conclusion

Let me apologise for the focus on risk throughout this piece. That is the nature of a debt investor’s mindset. I don’t want to discourage investors from involvement in the electricity sector. The next decade will bring a raft of investment opportunities as renewable and storage technologies are embraced and the structure of electricity supply is fundamentally changed. In fact, if Australia is to meet our emission reduction commitments it is unavoidable. However, in participating in this flow of opportunities, I would encourage investors to have their eyes open to the range of risks and uncertainties involved.

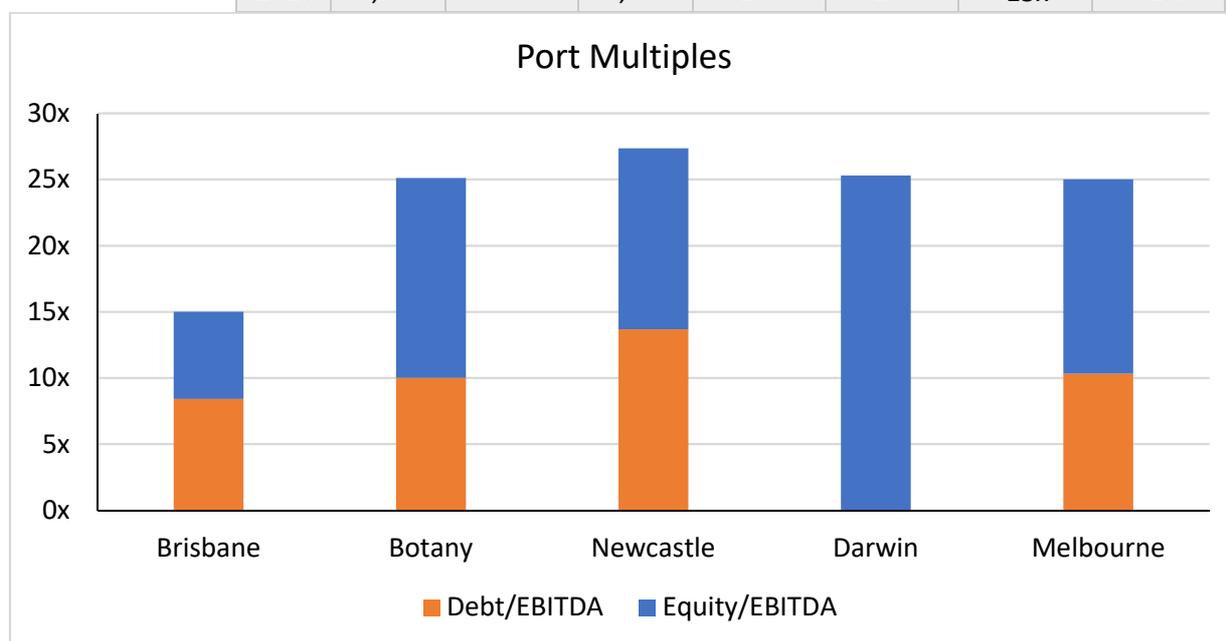
## Port valuations

### Port of Melbourne

The winning bidder for the 50 year lease of the Port of Melbourne was announced late this quarter. The winning bid was \$9.7 billion by the QIC led consortium. It is rumoured that the final bids were very, very close. Curiously, the Government did not call for a second round of best and final offers to extract even more from the bidding process.

The Consortium has lined up a \$4 billion loan with 17 lenders split into three, five and seven year tranches. There is expected to be a sell down of positions by banks after financial close.

	Year	EV	EBITDA	Debt	EV/ EBITDA	Debt/ EBITDA	Equity/ EBITDA	Gearing
<i>Brisbane</i>	2010	2,100	140	1,179	15x	8x	7x	56%
<i>Botany</i>	2013	5,070	202	2,020	25x	10x	15x	40%
<i>Newcastle</i>	2014	1,750	64	875	27x	14x	14x	50%
<i>Darwin</i>	2015	506	20	0	25x	0x	25x	0%
<i>Melbourne</i>	2016	9,700	388	4,000	25x	10x	15x	41%



## Hanjin Shipping

Sticking with ports, one situation port investors should be watching closely is the bankruptcy of Hanjin Shipping. Hanjin Shipping is one of the world's top 10 shipping companies by capacity and filed for bankruptcy protection in August. This has left its fleet of 200+ container, bulk and LNG ships stranded (as well as their cargoes) stranded at ports around the world due to the inability to pay port and terminal fees.

Hanjin's bankruptcy is a symptom of chronic overcapacity in the shipping industry as the rebound in trade growth post GFC has failed to materialise and shipping lines have been left with substantial overcapacity. This has seen cutthroat competition and weak freight rates across the world.

The reason why we recommend watching Hanjin closely, is the parallels with the airline industry post 9/11. There are two distinct examples from that era:

- In Australia, Ansett collapsed and there was a period of substantially weaker completion in the Australian domestic airline segment (as Qantas absolutely dominated the market). During this period airfares rose - which restored airline profitability - but at the expense of weaker than trend growth in domestic passenger travel (as real fares were higher). This weaker growth was a headwind for airports.
- In the US, both United and American Airlines filed for bankruptcy and were able to significantly write down their debt as well as reset wage deals with unions. This "creative destruction" drove down costs and actually allowed a cut in real airfares which underpinned faster growth in domestic travel in the US. This boosted passenger growth over the period that followed.

This highlights that a big customer bankruptcy - which always has short term costs - can have positive or negative long-term impacts for port (or airport) providers. Which scenario is emerging here - and how the unsustainably low profitability of the shipping industry is resolved - is an important issue for port investors. My personal view is that Hanjin is more like the US example above (for one, the market share at Australian ports of Hanjin is nothing like Ansett's pre-collapse market share).

One to keep an eye on.

## Contact Us

We're always happy to chat (and learn new things!) if you want to know more, contribute more on a particular topic, or wish to discuss any of the above topics in greater detail feel free to drop us a line. Also, please don't hesitate to send us ideas for future articles.



