Introduction

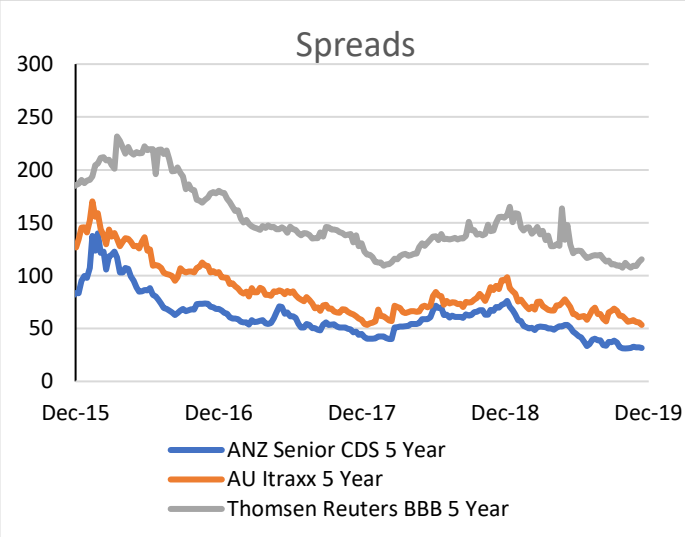
The decade is rapidly drawing to a close and what a decade it has been! We decided to get our regular newsletter out early this quarter given the usual festivities that this time of year brings.

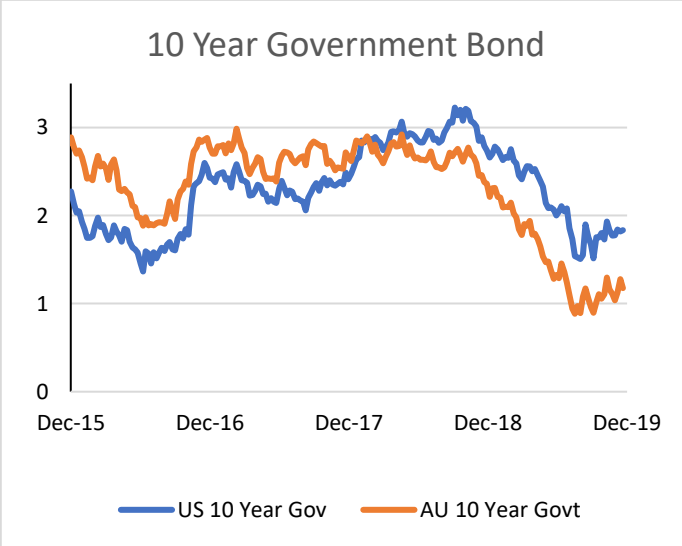
As we go to print, the UK elections have been run and won, and on the same day, 'phase 1' of a US/trade deal has been inked – with this in mind, this quarter we have a piece looking at trade volumes and the impact on Australian ports. From a superannuation fund angle, we discuss return objectives over the last 10 years and the implications for retirement income. We also look at APRA's new heatmap rating approach – looking at the growth versus defensive split. Finally, on an energy related note, we provide a short overview on hydrogen and its applications, together with some of the key challenges in bringing it to market.

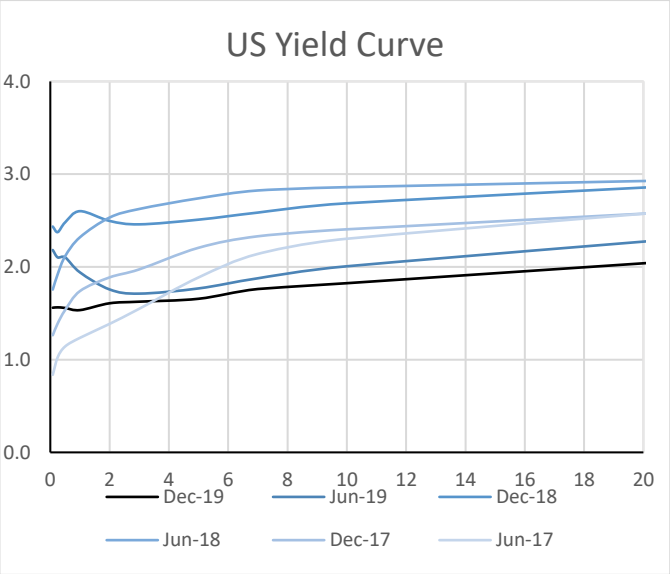
As this is the end of the year, we'd like to take the opportunity to thank our new and existing investors for their continued support for what has been another successful year. Most recently we'd like to welcome the Clean Energy Finance Corporation as a segregated account mandate client. Consistent with the stated strategy of the CEFC, this mandate will invest alongside our existing funds in new build renewables projects. To all of our readership, we hope you have had a successful year, that next year brings further success, and that you enjoy the festive season.

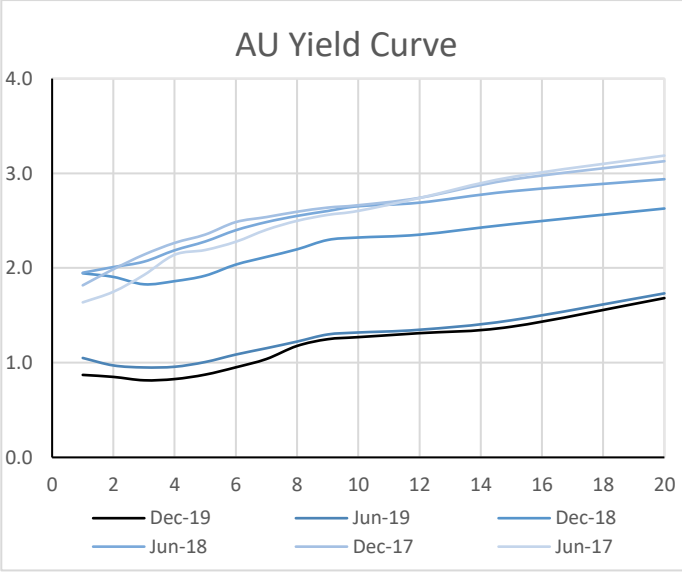
Markets update

Fixed income markets remained relatively subdued over the quarter as shown in the charts below.









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New issuance and refinancing

Date	Borrower	Instrument	Size (m)	Term (Yrs)	Curr.	Pricing/Notes
Dec 19	Canberra Data Centres	Loan	$1,500	5	AUD	Refinance
Dec 19	Trundle and Peak Hill Solar Farm	Loan	$9	5	AUD	Construction
Nov 19	Port of Portland	Loan	$78	7	AUD	Refinance
Nov 19	Tas Gas	Loan	$200	3/5	AUD	Acquisition
Nov 19	Jemalong and Kidston Solar	Loan	$175		AUD	Construction
Nov 19	Transgrid Services	Loan	$355	5	AUD	Refinance
Nov 19	Transurban	Loan	$1,650	3/5	AUD	Refinance
Nov 19	Kennedy Solar and Battery	Loan	$93		AUD	
Nov 19	NT Airports	Loan	$150		AUD	Refinance
Nov 19	Wellington Solar	Loan	$270		AUD	Construction
Nov 19	Port of Melbourne	Bond	$375	7	AUD	Refinance. 2.45%
Nov 19	Ausgrid	Bond	$240	7	AUD	Refinance. 2.25%
Oct 19	Atira Student Accommodation	Loan	$340	2/3	AUD	Acquisition
Oct 19	Yandin Wind Farm	Loan	$366		AUD	Construction
Oct 19	Lane Cove Tunnel	Loan	$326	5	AUD	Refinance
Oct 19	United Energy	Bond	$205	7	AUD	Refinance. 2.20%

Equity and other news

- Tilt Renewables has sold the 270 MW Snowtown 2 Wind Farm in South Australia to Palisade and First State Super for $1.07 billion. Snowtown 2 was commissioned in 2014 and has a long-term power purchase contract with Origin Energy until 2030 with a five year extension options.
- AMP Capital has acquired 50% of the 420 MW Macarthur Wind Farm from Malakoff Corporation. The wind farm's output is contracted to AGL who pay an availability payment. The project has a similar risk profile to an AGL bond. Morrison's owns the other 50% of Macarthur Wind Farm.
- ICG has acquired the Tas Gas Networks as part of the acquisition of Enwave from Brookfield for $420 million. Tas Gas Networks comprises an 837km network of gas pipelines across Tasmania and is the second largest gas retailer in Tasmania.
- In the student accommodation sector, Scape has purchased the Atira portfolio for $680 million and the Urbanest portfolio for $2.0 billion. The Atira portfolio is around 3,500 beds and is a former Goldman Sachs and

Blue Sky joint venture investment. The Urbanest portfolio contains 6,805 beds across student dorms in the major capital cities.

- QIC and Schiphol have acquired a 70% stake in Hobart Airport. This represented an exit by Macquarie's Global Infrastructure Fund and a partial selldown by Tasplan Super (from 49.9% to 30%). Subsequently Tasplan has merged with MTAA Super. Pricing of the sale has not been disclosed.
- Caisse de depot et placement de Quebec (CDPQ) has acquired an approximately 25% stake in the Sydney Metro Northwest PPP for a disclosed sale price of A$167 million. This represented an exit from the transaction by Partners Group and Palisade.
- AMP's Community Infrastructure fund purchased a 40% stake in the Auckland Prison PPP. This adds to the Community Infrastructure Fund's existing prisons investment – the Kalgoorlie Eastern Goldfields Regional Prison.
- Federation asset management recently a 18.4% stake in listed Windfarm developer and operator Windlab (ASX:WND). The acquisition is a substantive stake in Windlab, it will be interesting to watch what Federation chooses to do with this position going forward.
- Energy Australia has decided to delay execution of its PPA with Genex to take power from the Kidston pump hydro project. Energy Australia publicly stated that they wanted more work to be undertaken before committing to the offtake. It's not clear from media reports as to where the issues are, but this has been quite a blow for Genex.

Hydrogen Economy/Green Hydrogen

Hydrogen has been attracting a lot of attention from policy makers recently. This has included the adoption of a National Hydrogen Strategy by COAG in November. This article attempts to provide a quick primer on hydrogen and what investors in the energy infrastructure space need to know.

What is it?

Hydrogen is the most abundant gas in the universe (in fact shortly after the big bang hydrogen and helium were practically the only two elements). Hydrogen makes up 75% of the universe (by weight) or 90% by number of atoms. However, it was only recognised as a unique element by Henry Cavendish in 1766.

Hydrogen can be burnt or mixed with oxygen to create heat or electricity (using a fuel cell) with water (H2O) as the only emission (and, in particular, no CO2 or other greenhouse gas emissions).

Hydrogen can be produced using electrolysis (that is using electricity – which could be renewable electricity) or through steam reformation of natural gas. When produced with renewable electricity, (so called green hydrogen) this represents a CO2 emissions free form of energy production.

Why the interest in hydrogen?

For countries with limited domestic renewable resources, who have typically relied on imported coal, oil and natural gas for energy, hydrogen is an obvious replacement fuel. Examples are countries like Japan or South Korea – whose relatively small land masses and high population levels mean that it would be difficult to decarbonise their energy mix using locally based renewable energy. For these countries, de-carbonisation will effectively rely on a fuel mix shift: to green hydrogen, on CO2 recapture for existing fuels (which is struggling from a cost/technical viability perspective), or the direct importation of renewable electricity via sub-sea cables.

One attraction of hydrogen is the potential to tap into existing transportation and distribution infrastructure for liquified natural gas (LNG). Hydrogen is quite similar to LNG and can be liquified (albeit at a significant energy cost). The capacity to leverage existing supply chains and infrastructure is very attractive from a transition cost perspective.

A further attraction is that hydrogen based electricity supplies are potentially dispatchable. That is, you can think of hydrogen as stored variable renewable energy (VRE) and, thus, can be used to provide dispatchability to an energy grid.

Once liquified, hydrogen has a very high energy density. 1kg of liquefied hydrogen contains 120 MJ of energy. By contrast, petrol has an energy density of 44 MJ per kilogram. Lithium ion batteries have an energy density of around 1 MJ per kilogram. Energy density is a big issue for electric vehicles. While battery powered passenger vehicles are achieving reasonable driving ranges for domestic use – the low energy density of batteries mean these technologies don't scale up well for heavy transport such as long-distance trucking. Given its very high energy density, hydrogen is a more creditable fuel for trucks than current battery technologies.

For Australia – fossil fuel exports are a very substantial share of national income. Given our comparative advantages in hydrogen (low land costs, great solar and wind resources, existing relationships as an energy supplier to Asia) we should be aiming to be a major player in this space. The potential for Australia to shift from being a fossil fuel exporter to a green energy exporter, would both leverage Australia's strengths as well as protect against a potential downturn in fossil fuel export revenues as the rest of the world decarbonises.

Key issues

The biggest challenge for green hydrogen is the low efficiency and relatively high capital costs at each step of the hydrogen supply chain (that is, electrolysis, storage, utilisation). These low efficiencies make green hydrogen expensive.

For example, in its National Hydrogen Roadmap Report the CSIRO estimated that current technology for electrolysis of hydrogen provided for around 54% efficiency (that is, conversion of electricity into stored energy in hydrogen) and had a levelised cost of $4.78-7.43 $/KG. In energy terms, this is circa $40-60/GJ. That is, around 5 to 8 times the cost of natural gas.

In addition to the high cost/low efficiency of electrolysis, there are further costs if the hydrogen needs to be compressed/liquified (adding a further 10% for compression, and 50% for liquification).

At the usage end, fuel cells are typically 40-60% efficient which is relatively similar to gas fired CCGT electricity generators (and significantly better than a typical car engine – which is around 22%).

However, the net effect of these losses is that the round-trip efficiency of turning electricity into hydrogen and then back into electricity is likely to be pretty low – that is in the 35-50% range.

A key driver for green hydrogen is electricity costs. To the extent that projects can be constructed at large scale, operating at high capacity factors and utilise extremely cheap electricity, it will be possible to substantially reduce the cost of green hydrogen. For example, the CSIRO report predicts a "best case" future price of green hydrogen of $2.29-2.79/KG – which is around a a third of current cost estimates. Important to this cost reduction is the assumption of a third reduction in electricity input costs. To the extent Australia can leverage its natural endowments of abundant solar and wind resources, we are well placed to be globally competitive in the production of green hydrogen.

However, it is important to understand that green hydrogen faces strong competition from cheaper substitutes. In the short term, and in particular in the absence of a price on carbon, green hydrogen is likely to be substantially more expensive than natural gas (5 to 8 times more expensive). This means for users just looking for energy (rather than the unique chemical properties of hydrogen) they are likely to choose natural gas given current costs. Similarly, for users who need hydrogen in particular (for example, it is used in oil refining), hydrogen that is manufactured from natural gas using a steam reformation process (which has high CO2 emissions) is around half the price of green hydrogen.

In the longer term, increases in scale and falling electricity costs have the potential to make hydrogen much more cost competitive. However, it is important to remember that in this world of cheap electricity, green hydrogen will need to compete against the direct use of electricity. For this reason, I see a stronger case for green hydrogen in niche

activities that leverage its very high energy density (for example, trucking) rather than as a broad stationary energy substitute.

CPI + x% Return Targets – Is it the right objective?

Most balanced/growth superannuation funds express their return objectives to members as CPI + 3-4% after tax and fees. That is, funds are aiming to deliver long-term returns 3-4% above inflation. Looking back over the last 10 years, the average fund in the Superratings SR50 Growth universe has returned 8.3% a year compared to inflation of 2.1% a year. That is, a real return of 6.2% per annum. Compared to a 3-4% return target that sounds like a brilliant result …. but is it?

Accumulation returns (% p.a. to end of September 2019)

	1 mth	1 yr	3 yrs	5 yrs	7 yrs	10 yrs
SR50 Growth (77-90) Index	1.4%	7.0%	9.1%	9.5%	10.3%	8.3%
SR50 Balanced (60-76) Index	1.2%	6.9%	8.5%	7.8%	9.1%	7.7%
SR50 Capital Stable (20-40) Index	0.4%	5.8%	4.9%	4.9%	5.4%	5.6%

Source: SuperRatings

Whether this is a fantastic result depends very much on what your objective is. If your objective with superannuation is to save during your working life and then spend the proceeds in a single year – then a simplistic CPI return objective is appropriate and the results over the last decade have been fantastic.

However, if the objective is to save sufficient capital to then spend it over a 25+ year retirement, then the objective needs to capture both cost of living (i.e. CPI) as well as capacity to generate investment returns in retirement.

A simplistic approach to measuring this would be to assume that at retirement, a retiree buys a 25-year fixed term annuity with annual indexation equal to CPI. For simplicity, I have ignored taxes and fees and assumed a return equal to the 10 year bond rate. In respect of inflation, for the period starting 2009 I have used actual inflation outcomes over the last decade (2.1%). For future inflation, I have used the breakeven inflation rate implied by the 10-year Commonwealth CPI bond (note if you used the RBA target range for inflation of 2-3% the results would be much worse).

Date	CPI	10 Year Bond Rate	Implied Real Return	Price of 25 Year Annuity - Current Dollars	Price of 25 Year Annuity - 2009 Dollars	Annual Inflation
September 2009	2.10%	5.43%	3.33%	16.79	16.79	
September 2019	1.23%	0.96%	-0.27%	25.90	31.88	6.6%

On these assumptions, a 25-year annuity in 2009, paying $1 per year indexed at 2.1%, would have cost $16.79. Or alternatively, a $500,000 lump sum could have purchased an annuity indexed to inflation of just under $30,000 per annum.

Fast forward to today, and much lower interest rates mean that a $500,000 lump sum would only purchase an annuity of $19,000 indexed to inflation. Or expressing this another way, to buy an annuity of $1 in 2009 purchasing power

terms, for the next 25 years would cost $31.88 not $16.79. That is, the cost of a retirement income stream has almost doubled. Or put another way, from the perspective of a retiree - this is an inflation rate of 6.6% over the last 10 years.

In this context, the median growth option return of 8.3% has only delivered a return of 1.7% compared to this definition of inflation (and for those who opted for less investment risk and went with a capital stable or balanced option rather than a growth option the results are even worse).

This highlights that current asset values have been pumped up by falling yields, and the past decade of strong headline returns hasn't delivered much in terms of a higher standard of living in retirement for prospective retirees. Many of you in our readership group will be acutely aware of this issue, however, we do wonder whether the lack of conversation more broadly on this issue is creating a problem for the industry in the future – one which is intractable for older members in the accumulation phase from where we stand today. As it stands the focus in the broader media continues to be on relative annual performance (continually) rather than on what the real focus of our retirement income system should be – income in retirement.

A soft patch for trade volumes

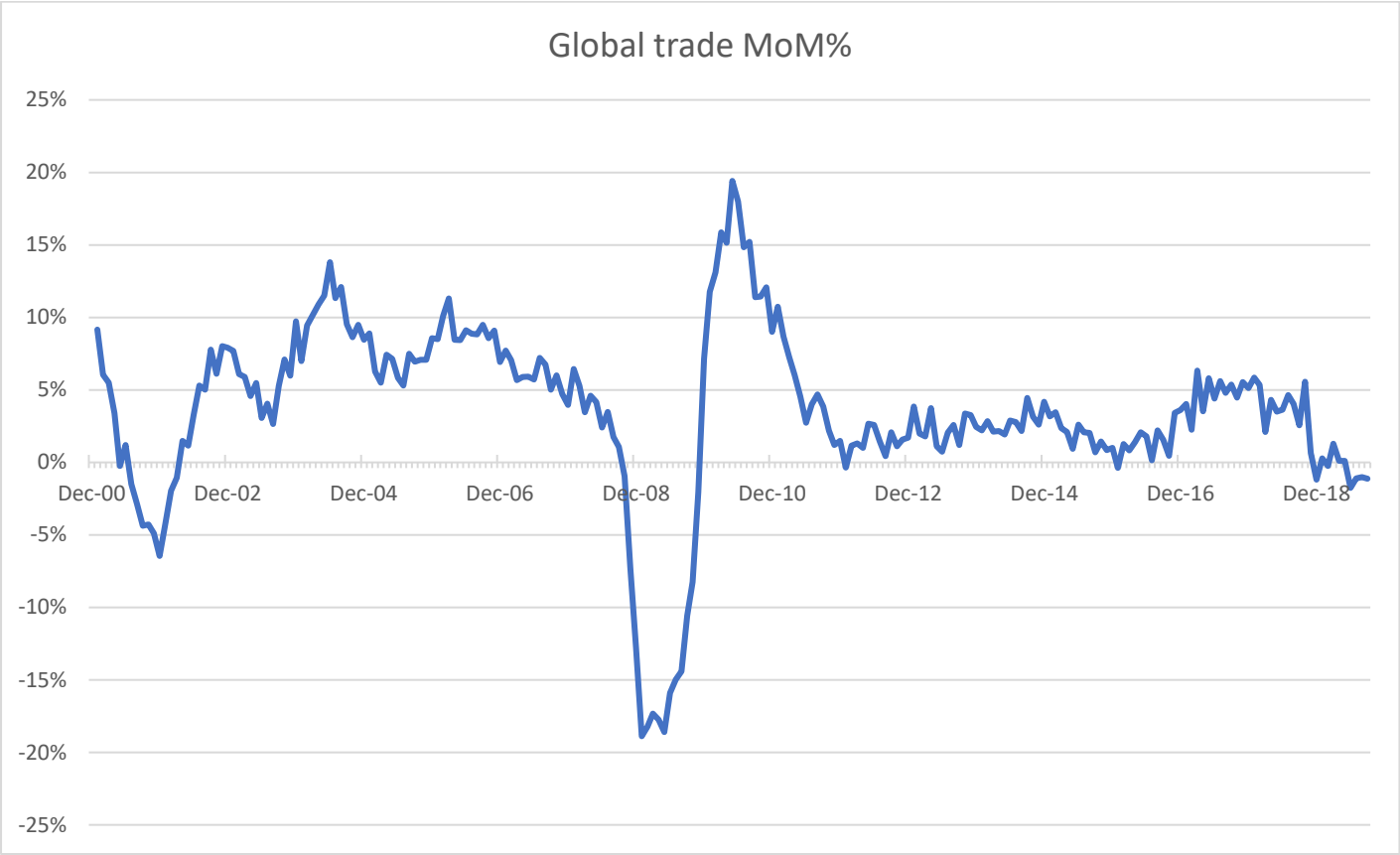
Economic theory posits that free trade increases the number of goods a consumer can purchase and decreases the cost of these goods through the promotion of competition. Nation states should focus on utilising their resources more efficiently by specialising in the production of goods and services where they have a comparative advantage. The net result is that the world economy is collectively better-off (in theory).

Despite the world economy being better off, in aggregate, there are of course winners and losers within each country and, thus, domestic political issues arise. Over the last 30 odd years of trade liberalisation, jobs have migrated to places where productivity is highest for the type of work being performed. In developed economies that has led to the hollowing out of traditional blue-collar jobs.

The United States, once the champion of free trade, has done an economic U-turn under Donald Trump whose policies revolve around American protectionism. Beyond simple rhetoric, the premise for the change in policy is driven by a range of perceived structural imbalances. To date, the US has applied tariffs to US$550 billion of Chinese goods and China has applied tariffs to US$185 billion of American goods. Both sides have also threatened qualitative measures.

From about September this year, both sides have been discussing either rolling back or delaying the implementation of further tariffs. During November, the US and China have allegedly agreed "in principle" to a timetable of rolling back tariffs, and as of Friday 13 December a 'phase 1' deal has been agreed, albeit with limited details.

Trade data statistics from the CPB World Trade Monitor show that world trade volumes have been falling from about September 2018. Over 2017 global trade volumes were growing at approximately 5%. This has since contracted to no growth since the start of the trade wars with the last data point of September 2019 showing a year on year decline of -1.12%. This is quite unusual (see chart below). Outside of recessions (see 2001 and 2008-9) it is rare for trade volumes to decline.



Similar contractions in trade have occurred at all major Australian container ports. At Port Botany, Australia's largest container port, the year on year growth rate for full containers is minus 4.4%. At the Port of Melbourne and Port of Brisbane, the same statistic is minus 3.3% and minus 3.7% respectively. Even though Australia has yet to be directly impacted by the US/China trade wars – the impact of declining trade volumes is already being felt.

On the outlook for international trade, the bullish view would be that it is in China and the US's joint interests to reach a rapprochement and that would see a resumption of "normal service" in trade terms. That is, a resumption of long-term growth.

The bearish view is that there is an enduring escalation of geopolitical tensions (including those focused on trade), encouraging both sides to shorten supply chains and locate more production internally (or at least within their direct sphere of influence). This could act as a headwind on trade volumes – which historically have grown much faster than GDP on the back of increased globalisation.

Unfortunately, given that any near-term deal between the US and China is unlikely to address the fundamental structural issues of the parties, the most likely scenario is probably the later.

Growth vs Defensive Assets and APRA Heatmaps

For the policy wonks out there, one of the longest running debates in disclosure policy in Australia is what constitutes a growth or a defensive asset. The debate on how to classify asset classes between growth and defensive (and its sub-debate on whether infrastructure is growth or defensive or some mixture of the two) has been going since the early 2000s. With its latest guidance as part of the introduction of APRA's "Heat Maps", this debate might be about to be resolved. This article tries to quickly address what are growth/defensive assets, why this matters, and the potential implications of the APRA heat maps framework.

What is a Growth or Defensive Asset

ASIC's money smart glossary defines growth and defensive assets as follows.

growth asset

Assets such as shares and property that not only produce an income but have the potential to grow in value over time.

defensive asset

Cash or fixed interest investments that are generally low risk and less volatile than growth investments.

While most people agree that listed shares are growth (and so is private equity and venture capital) and that cash and fixed income are defensive, the disagreements tend to focus on the mid-risk assets. That is, asset classes such as infrastructure equity, property and hedge funds – should they be classified as growth or defensive or some split?

A key measure, reported by most superannuation funds, is the growth/defensive split or growth assets percentage. That is, for each investment option what is the split in the strategic asset allocation, between growth and defensive assets.

At the moment, individual superannuation funds have different approaches to classifying growth versus defensive assets, and report their allocations based on these varying approaches. This makes it difficult for consumers as growth asset allocations are not comparable between funds. The bulk of the divergences arise due to the treatment of unlisted infrastructure and property investments. Given that property and infrastructure can account for up to 20% of a balanced option's asset allocation – how these asset classes are classified can make a big difference to the overall growth assets percentage.

Under the proposed APRA heatmaps there are pre-specified categorisations of asset classes into growth and defensive. In particular:

- Unlisted infrastructure equity and property is 75% growth and 25% defensive
- Listed infrastructure is 100% growth
- Commodities and "other" is 50% growth and 50% defensive.

While different people would have different perspectives on whether these allocations are correct, at least they provide a consistent framework, which will allow growth assets percentages to be comparable across funds.

Why Does it Matter?

Growth assets percentage is seen as a proxy for the risk of an investment option. That is, a higher growth assets allocation is assumed to be correlated with higher volatility of returns as well as a greater frequency or severity of negative returns.

In addition, a fund's growth asset percentage is used to group similar options into performance surveys. For example, the SuperRatings SR50 Balanced Growth surveys are of options that self-report a 60%-75% and 77%-90% growth assets percentage, respectively. In this context, growth assets percentage is a key driver of which peer universe a fund is benchmarked against. Given the importance of league table performance in attracting and retaining members, this creates substantial pressure on the reported growth assets percentage. In particular, there is a strong incentive to classify infrastructure assets as defensive – allowing a fund to push for higher returns while staying in the same league table category.

This raises the question, is a growth asset percentage the best proxy of risk? If you were trying to assess the risk profile of a fund, is this the one number you would choose to use?

The key advantages are:

- Objective – or at least now, how assets are classified between growth and defensive is more objective (leaving the mysterious other category to one side);

- Not reliant on historic performance data - can be applied to newly created investment options or updated if an investment option changes its investment strategy; and
- Simple/transparent - unlike anything that is reliant on complicated capital market returns, standard deviation and correlation matrix inputs.

A key disadvantage is that it takes no consideration of the details of the underlying assets. For example:

- Cash on deposit with the RBA would be treated the same as Venezuelan bonds – 100% defensive!;
- an investment in venture capital is treated as the same risk as an unlevered investment in an office building with a long-term government tenant; and
- an investment in Transurban is as risky as an investment in Telsa (or WeWorks).

Growth assets percentage provides some insight into risk and is quite good for comparing options within a fund (for example, comparing the Balanced and Growth member investment choices of the one fund), but it provides no information on the risk profile within the growth or defensive bucket. For this reason, it is quite a poor measure of risk.

What about alternatives:

1. Standard risk measure. This is the probability of a negative return based on the fund's (or its consultant's) return, standard deviation and correlation assumptions. The problem with the standard risk measure is that it is not standard. Different funds use different assumptions and, hence, they are not comparable across funds.
2. Probability of a negative return – government mandated assumptions/methodology. You could correct the problems with the standard risk measure by having a mandated consistent set of assumptions. This would make it comparable. However, it would mean regulators would need to set standard assumptions – which would inevitably be wrong at some point in time. While standardised capital markets risk and return assumptions for listed asset classes aren't too difficult, creating standardised assumptions for unlisted asset classes such as infrastructure or hedge funds would be difficult/controversial.
3. Standard deviation of returns based on historic data. This is objective but can't be applied to funds without a return history. Furthermore, where some funds have large allocations to unlisted assets which aren't marked to market daily, it raises potential questions that the lower volatility of those strategies reflects smoothing of returns rather than a genuine difference in risk profile.
4. Standard deviation - government mandated assumptions/methodology. Really the same as the chance of a negative return (point 2 above) with most of the same issues.

Conclusion

Growth assets percentage with government mandated classifications is probably the best of a bad bunch. Its consistent and simple. It's just not very accurate. Maybe it gets you within +/- 10% on the risk profile of a typical superannuation fund, but not within +/- 1%.

Examples of issues that would be missed:

- Are property investments geared or ungeared?
- Are defensive assets all cash/government bonds or does it have substantial credit exposure (ie junk bonds, emerging markets, private credit)?
- What is the currency hedging strategy?
- Strategic discipline – will the trustee/manager hold its nerve through an investment downturn?
- How effective is diversification within the fund (both between assets classes and within assets classes)?
- What is the liquidity risk of the fund's investments?

Longer-Term Implications

While the short-term focus on these issues will be linked to the shaming of "poor" funds in APRA's heat maps, and it will undoubtedly lead to some consternation amongst funds that rank poorly on a net investment performance basis (as well as on the fees and other measures), the more interesting policy question is what are the long-term impact of these changes. That is, how will this framework change behaviour?

- Reinforces a relative rather than absolute risk focus. Funds will be focused on the incremental risk they are taking relative to their SAA benchmark, rather than the absolute risks. I am sure regulators will argue this is the case already, and I have some sympathy for that view, but during the next downturn, when the typical balanced fund is down 10+%, I don't think consumers will thank regulators for reinforcing existing market behaviour.
  It is also worth noting that Australia, compared to other countries, has a much higher than average allocation to growth assets. This 50%+ allocation to listed equity risk is effectively unmanaged.
  This relative vs absolute risk focus is reinforced by the relatively short period (3 and 5 years) of the return comparisons. For example, there hasn't been material downturn in unlisted asset markets since the GFC – in a 5 year rear view mirror, it makes these assets look like risk free sources of additional return. The reality is likely to be more complicated.
- Hollowing out defensive assets. Given all cash and fixed income assets count as 100% defensive, it incentivises funds to reduce cash and government bond holdings and increase allocations to credit. This both reduces the potential defensive buffer as well as potentially introducing new liquidity risks.
- Reinforce the rush to unlisted assets. If listed infrastructure is 100% growth and unlisted is 75% growth/25% defensive it reinforces the incentive to hold assets in unlisted form. The act of de-listing does not reduce the risk profile of an asset, all it does is make getting an objective and timely measure of value more difficult.
- Potential gaming of SAAs. Strangely the benchmark return calculation for the APRA heatmap is based on the fund's strategic asset allocation not its actual asset allocation. Actual asset allocations would seem more robust and have less potential for gaming.

As a final point:

- Implicit in the creation of the heatmaps is a belief by APRA that past poor performance relative to benchmark is a good predictor of future underperformance. If they didn't think past performance persisted – why would they be so keen to calculate and report it!
- If APRA believe this, they should do a back test to support their policy. It would be Interesting to go back 6 years and look at performance for the next 3 years and then compare to performance for the 3 years after that. How good a predictor was it? How many false negatives were there?
- It would be interesting to look at this on a pre and post fee basis. My guess is that the main predictive component comes from fees. That is, high fee underperformers show persistence in underperformance, because of the high fees. If this is the case, perhaps APRA should invest more effort on the fee disclosure portion of the heatmap.
- While not directly analogous, there have been numerous academic studies showing that there is no evidence of persistence of fund manager returns (for example, studies of the US mutual funds) after controlling for common factor exposures and manager fees. APRA's objectives would seem to directly contradict this evidence – if outperformance is not persistent, by extension neither is underperformance. If it was – we would simply need to find out what the underperforming funds are doing and do the opposite!