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A SIMPLIFIED GUIDE TO THE COMPLEX WORLD OF FIXED RATE BONDS AND DURATION

Chris Rands

Over the past five years, financial market participants have held more of a negative view of fixed rate bonds given that interest rates were expected to consistently move higher. While rising interest rates are obviously a risk for fixed rate investments, we believe this simplistic view overlooks the important role that fixed rate bonds play in a larger portfolio context. This paper sets out to show the performance of fixed rate bonds in different interest rate environments, the diversification benefits that are achieved through duration, the risk factors that are adopted when switching to a floating rate bond fund, and an explanation for why interest rates are set to remain lower for longer.

Duration - The value of time

Before we delve into the specifics, it is important to first show where the benefits from duration come from. Duration is a measure of the sensitivity of the price of a bond to changes in interest rates or, more simply, how much the value of a bond changes when interest rates move. This measure is reported in years: the longer the duration of the bond, the greater the impact will be when interest rates move.

A simple example of the effect of duration is shown in Table 1, using two zero coupon bonds of different lengths (i.e. bonds that pay back only principal at time of maturity). Using these bonds removes the effect of coupons, making the concept easier to understand.

Let's assume a \$100 principal payment will be received in three or six years. To calculate the price for the 3-year bond you need to discount the future cash flow by its yield back to today. At a 10% yield, for example, the \$100 cash flow that will be received in three years' time is worth \$75.13 today. If yields fell to 5%, then the \$100 would be worth \$86.38 today, representing a price increase of 15%. Using the same assumptions for the 6-year bond, today's price would be \$56.45 at a 10% yield and \$74.62 at a 5% yield — an increase of 32%.

Table 1. The effect of duration

Zero coupon bond prices	3-year ZC bond	6-year ZC Bond
Yield of 10%	\$75.13	\$56.45
Yield of 5%	\$86.38	\$74.62
Price change	15.0%	32.2%

Source: Nikko AM Australia



The quote

Fixed rate bonds have received a bad rap over the past seven years as interest rates have fallen to historically low levels.

These percentage changes show what the measure of duration is trying to capture; namely, the sensitivity of a bond price to changes in interest rates. In both examples we saw interest rates fall from 10% to 5%. However, the price of 3-year bonds changed by 15% compared to 32% for the 10-year bond. What this tells us is that the 6-year bond had a greater sensitivity to a change in interest rates.

Instead of discounting the future cash flows to find price changes, we could have instead used duration as our risk metric. For a zero coupon bond, the duration equals the time to maturity and the formula for assessing the effect of an interest rate change is:

$$\text{Expected Price Change} = \text{Duration} \times \text{Change in Yield}$$

Table 2 shows this estimate for an expected price change if there is a 5% change in yield. The expected price changes are close to the changes shown in Table 1. The difference is how much easier the calculation was to make. Looking at the returns we can again say that the 6-year bond has twice the interest rate sensitivity as the 3-year bond (or twice the duration).

Table 2. Expected price change

Duration estimate	3-year ZC bond	6-year ZC bond
Duration	3	6
Yield change	5%	5%
Expected price change	15.0%	30.0%

Source: Nikko AM Australia

When interest rates change the present value of future cash flows change, which is what duration is describing in one single term.

Please note: For simplicity, this example used zero coupon bonds. For bonds that pay coupons, the duration will not be the same as the time to maturity, but the concept will work the same way, merely spread across all the cash flows that the owner of the bond is set to receive.

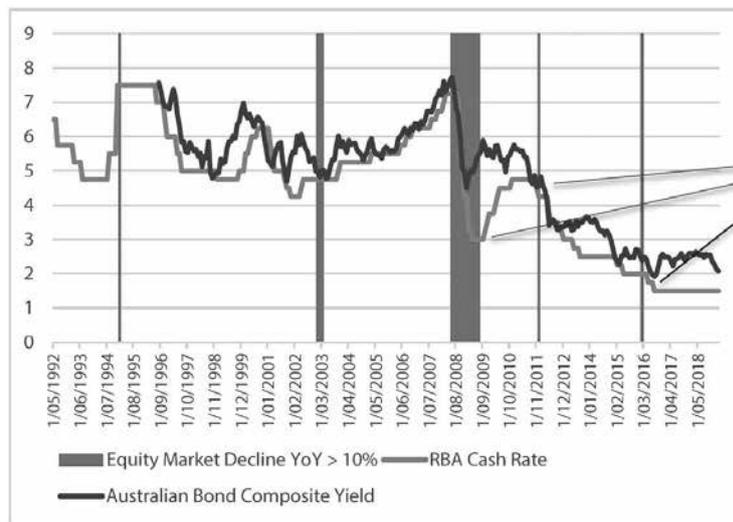
Why does duration protect against equities?

With a basic understanding of how duration can affect fixed income prices, the next question to answer is: “Why does duration offer diversification against equities?”

To answer this question, we first need to understand the key reason why diversification occurs. When equity markets are performing poorly, central banks will generally move towards more accommodative economic policies designed to stimulate growth, which can include lowering interest rates. During these times, if equity prices decline, fixed income prices can rise due to falling interest rates (think of how this worked in the example above).

Figure 1 shows how cash rates have moved compared to equity market drawdowns over the past 25 years. The shading reflects year-on-year declines in the ASX Accumulation Index of over 10%. Since the early 1990s, there have been multiple occasions when the Reserve Bank of Australia (RBA) cut interest rates around equity market declines (2008, 2012 and 2016); one period where they kept cash rates on hold (2002), and one period where they hiked rates (1994). Overall, this paints a picture of a central bank that is more likely to be offering support to the economy when the equity market is performing poorly, rather than one that tightens conditions.

Figure 1. Equity market declines and cash rate



Source: Bloomberg, Nikko Asset Management

As the stock market faltered, the RBA lowered interest rates

Authors from the International Monetary Fund (IMF), *Cashing In: How to make Negative Interest Rates Work* (2019), echo this sentiment: “Severe recessions have historically required 3 – 6 percentage points cut in policy rates”, similar to what can be seen in 2008 when Australia avoided a recession but saw cash rates fall over 4%. In addition to the IMF’s statement, research from Cieslak and Vissing-Jorgensen (*The Economics of the Fed Put*, 2018) highlights that Federal Reserve participations are “more likely to mention the stock market after market declines... and the frequency of negative stock market mentions in [Federal Open Market Committee] FOMC documents predicts target rate cuts”, moving the market to expect easing during periods of market volatility.

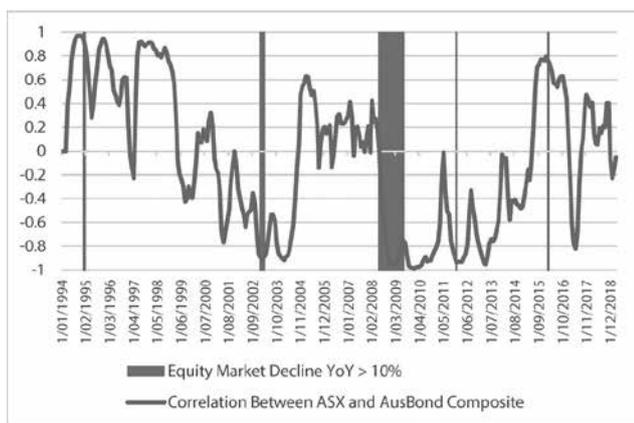
This provides the answer to why duration offers diversification against equities; as central banks often react to lower stock market prices by reducing cash rates, driving yields lower to support the economy.

Diversification against equities – An historical perspective

The diversification between fixed rate bonds and the Australian Stock Exchange Accumulation Index can be seen in Figure 2, with equity market declines of greater than 10% shaded in green. Through the cycle, the correlation often bounces between negative and positive figures. However, it is during times of stress that you can see fixed income and equity returns become highly negatively correlated. As equity markets declined towards the end of 2018, the correlation between these two asset classes fell into negative territory, showing that fixed rate assets can still achieve their role of diversification despite there being low levels of interest rates.

Looking at actual returns, it is relatively rare for both fixed income and equities to experience negative year-on-year returns at the same time. Figure 3 shows year-on-year returns for the ASX Accumula-

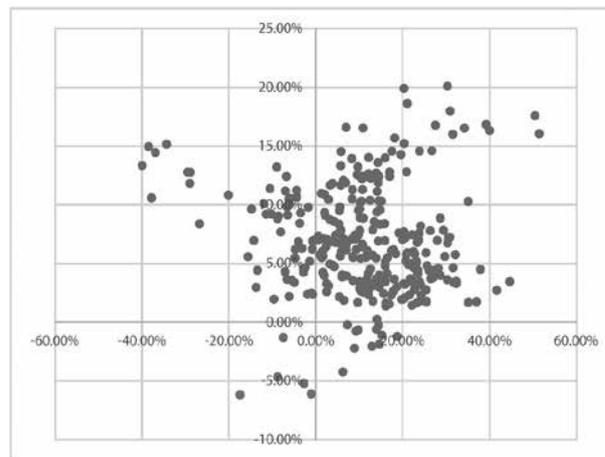
Figure 2. Equity and bond one-year rolling correlation



Source: Bloomberg, Nikko Asset Management

tion Index on the horizontal axis and the Australian Bond Composite on the vertical axis. The top left corner shows periods when equity performance is negative, but fixed income is positive. The bottom left quadrant reflects periods that investors do not want to see: periods when both equity and fixed income markets register negative returns.

Figure 3. Equity and bond returns



Source: Bloomberg, Nikko Asset Management

Since the early '90s, only five months have fallen into this bottom left quadrant and all were during the 1994/1995 period. The bulk of the fixed income returns have been positive during equity market stress. While it is appropriate to understand the risk of what would occur to a portfolio during a 1994 style sell off, we should not completely dismiss fixed income as an asset class on the basis that this could re-occur. As Figure 3 shows, over the past 20 years a ‘1994 scenario’ has been the exception rather than the rule, and it’s the possibility of different scenarios that we should focus on, rather than just the worst-case.

A simple model for bond returns – What can we expect?

Building on the understanding of how and why duration works, we can now explore a framework to determine how much diversification could be achieved during equity market stress. A simple model to understand fixed income returns can be expressed as:

$$\text{Expected One Year Return} = \text{Yield} - (\text{Duration} \times \text{Yield Change})$$

The first component of **yield** reflects the return investors receive for holding the asset, while the **duration x yield** change reflects the expected capital gains or losses. When using fixed income as a diversification against equities we should seek to understand the following:

1. How far can interest rates fall?
2. How much duration do I hold?
3. Duration: When will it go wrong?

The first two of these points will determine how much return we can expect from the asset class, while the third helps determine the odds of being wrong and suffering a negative return.

1. How far can interest rates fall?

The first point to understand is how far bond yields can fall in a time of stress. For this component it is best to look at the official

cash rate, as fixed income yields are typically anchored by these levels. Currently, the Australian cash rate is 1.50% — only marginally higher than zero, which is often thought of as the lower bound for monetary policy. In essence, this means that during an economic or financial shock, Australian cash rates could fall approximately 1.50% before meeting a level with which the RBA will struggle to take them through. This relationship suggests bond yields would move by a similar amount.

Figure 4. Australian cash rate and AusBond composite yields

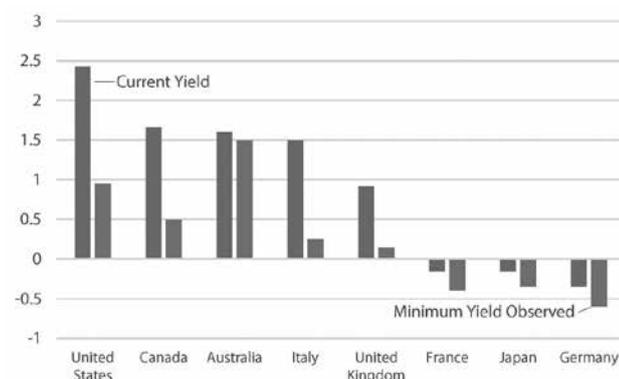


Source: Bloomberg

While there has been a widely held idea over the past five years that Australian yields can go no lower from here, and the RBA is reluctant to move rates, we would caution this idea based on the actions of central banks in other developed economies. A simple review of other developed countries, particularly Europe and Japan, shows that yields can go far lower than markets previously believed was possible, with many markets recording negative yields. Looking at the lows in yields of other major developed economies, Australia has been the only country that hasn't seen their five-year bond yield fall below 1% since the GFC.

While it may seem like Australian cash rates are already low enough, a cursory glance across the world tells us there is room for them to move lower. Given the inability of central banks to push in-

Figure 5. Five-year government bond yield



Source: Bloomberg

terest rates meaningfully below 0, it is very unlikely that the cash rate will be able to fall the 300 – 600 basis points required during a recession. However, this would not stop the RBA from using its powers — the relationship between cash rates and bond yields implied that fixed income yields could fall approximately 150 points from here in a time of stress.

2. How much duration do I hold?

The second point to understand is how much duration to hold, as the expected return will be a function of both how much yields change and the level of duration. Given most fixed income exposures are measured against a composite bond index, the best place to check is how much duration is in the index.

Over the past 10 years the Australian Composite Bond Index has increased from a duration of three to four years to around five-and-a-half years. This is because there has been increased issuance from the Federal and Semi Governments issuers, who are able to borrow at far longer maturities than corporates. For an investor using the Bloomberg Australian Bond Composite, the effects of changes in interest rates will be around 50% larger now when compared to 10 years ago. While active fund managers can position themselves overweight or underweight duration, this level of benchmark duration is a good place to start when forming expectations of how the asset class will perform, because it's what fixed rate managers typically manage against.

Figure 6. Australian composite bond index Duration



Source: Bloomberg

3. Duration - When will it go wrong?

The final point to consider before trying to forecast expected returns is what could go wrong with the view, i.e. that interest rates rise aggressively. When looking at fixed income returns, we believe investors should be most concerned with the idea of continually rising rates as this would eat away at returns over a number of years, compared to a one-off rise that would see an investor lose money initially, then start to receive higher returns over the coming years.

With this in mind, to help put in perspective on how far rates can rise, we can again review the link between the cash rate and bond yields. Figure 7 shows that typically bond yields sell off 6 – 12 months ahead of the first cash rate rise (1998, 2003 and 2009) and peak at about 50 basis points above where the cash rate finishes.

This information helps provide a framework to inform our decisions around the prospective risks of interest rates rising. Given we can see that interest rates should begin rising 6 – 12 months before a hike, and should stop ~50 points above our final cash rate forecast, we can begin trying to forecast when cash rates will move and where they will end up. Both of these points can contribute to timing a market position as well as providing potential road markers for when to re-enter the asset class.

There are two points worth making about these ideas:

- **Firstly** if cash rates don't move, then fixed income yields will typically trade in a range and keep returns close to the yields on the bonds.
- **Secondly**, if you believe that the interest rate structure now is lower than during the GFC, which we cover later in the paper, then any sell-off will be shallower than the market believes and potentially end up with rates still low by historical standards as the cash rate stalls out below 4%.

Taking all this information into consideration, our expectation is that yields could go 1.50% higher before starting to level off. Furthermore, the lack of inflation in the Australian economy means there is no pressing concern to forecast this occurring over the next 6 – 12 months. While moves of this magnitude would be enough to see fixed income returns go negative, it would not result in persistently negative fixed income returns because as soon as yields stabilise, the income from the asset class would become the dominant driver of returns.

Forecasting an expected return

Now that we have an understanding of how far yields could move and how much duration is held in a benchmark position, we can forecast scenarios of different fixed income returns.

Expected One Year Return = Yield - (Duration x Yield Change)

Here we focus on three different interest rate scenarios:

- Wholesale equities decline – RBA cuts to 0% and yields fall 1.50%
- Benign growth environment – RBA keeps cash rates on hold and yields are unchanged
- Strong growth environment – RBA hikes cash rate to 2.50% and yields rise 1.50%

This would give the following bond forecasts under each environment.

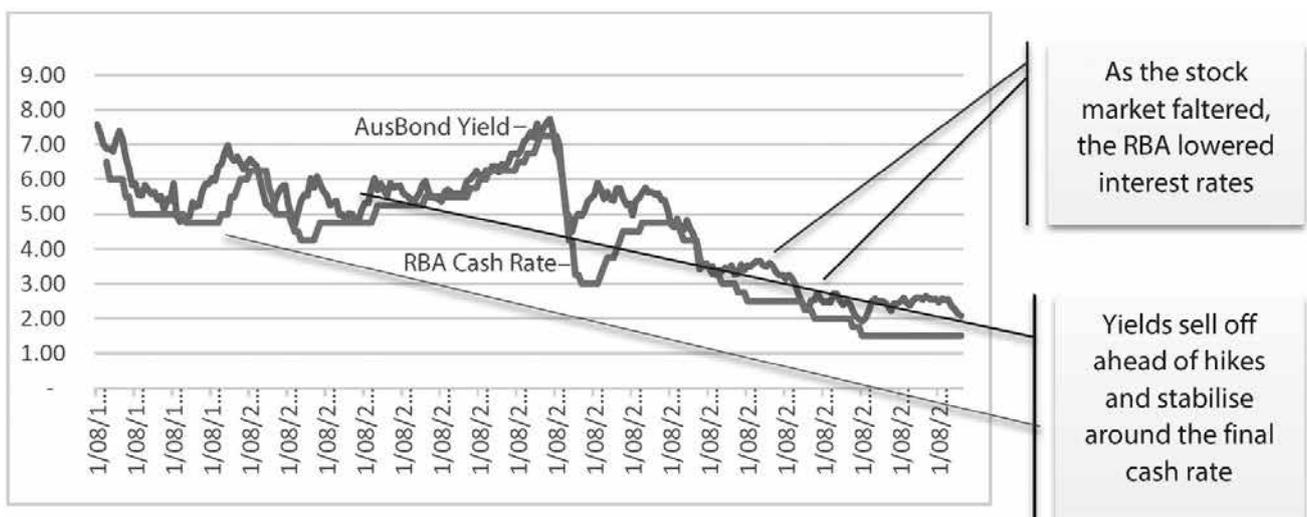
Table 3. Three different interest rate scenarios

Scenario	Yield	Capital gain/Loss (Duration x Yield change)	Expected Return
Equity decline	2.1%	7.95%	10.0%
Benign growth	2.1%	0.00%	2.1%
Strong growth	2.1%	-7.95%	-5.9%

Source: Nikko Asset Management

While this is in no way intended to be an exhaustive exercise of forecasting possible outcomes, it provides a framework for understanding fixed income returns and what effects that different interest rate environments will bring. Thinking about fixed income from this perspective provides the ability to understand how using duration can fit in a broader portfolio context and whether giving up the diversification benefit is worth it in respect to the level of outperformance that equities could offset in a strong growth environment.

Figure 7. Bloomberg Ausbond Composite 0+ Yield to Maturity



Source: Bloomberg

Putting this together – Fixed income as a diversifier

If the role of fixed income in a larger portfolio context is diversification against equities, then we believe owning duration should be the default position because this is where the diversification comes from. What percentage of fixed income and the length of duration will depend on your objectives, how much diversification you wish to achieve and whether you believe that you can time the cycle. While it may be tempting to forecast higher yields and exit the asset class completely, we do not believe this is an optimal strategy as you are giving up diversification benefits in order to engage in market timing, a notoriously hard way to improve returns.

Overall we still see benefits in a larger portfolio context of owning duration and believe that the fears of interest rates rising quickly and persistently is a lower probability event than the market believes.

Floating rate funds – Out of the frying pan and into the fire

Over the past 12 – 24 months we have observed many market participants advocating the use of floating rate funds instead of fixed rate in order to reduce the amount of interest rate risk. While floating rate funds do reduce interest rate risk, it should be noted that this is not a free ride for investors as it introduces a different source of risk. For most floating rate funds this is credit risk.

Floating rate funds typically lend to corporate issuers in order to increase the yield of the portfolio above the cash rate. In doing this, the funds create a sensitivity to credit spreads (i.e. the amount of compensation you receive over the risk-free rate for lending to a borrower who could default), which, like interest rates, can be measured in duration. This is referred to as credit duration.

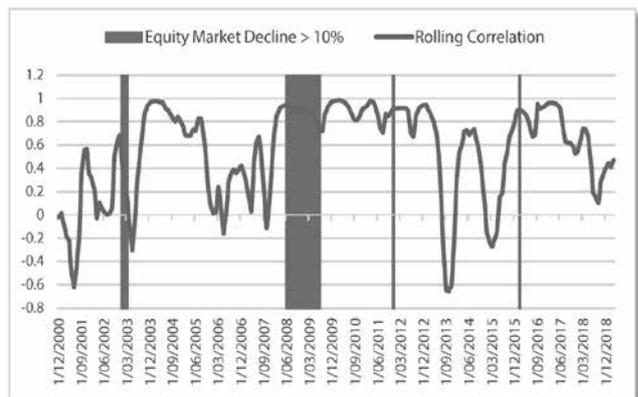
The risk that this introduces is not that interest rates rise, but

rather that credit spreads widen as issuers with default risk have to pay more to borrow money. Unlike fixed rate funds, these products typically offer little diversification to equities, as credit spreads react to the economic environment in a similar way to equities, widening when the risk of business failures increase. Figure 9 shows how credit spreads widen when equities fell in 2008, 2011 and 2016, weighing on performance at the same time as equities underperformed.

The effect of this can also be seen in the correlation between the floating rate credit index and the ASX Accumulation Index. The correlation between floating rate credit is rarely below -0.4 and moves to a correlation of almost 1 in a time of stress.

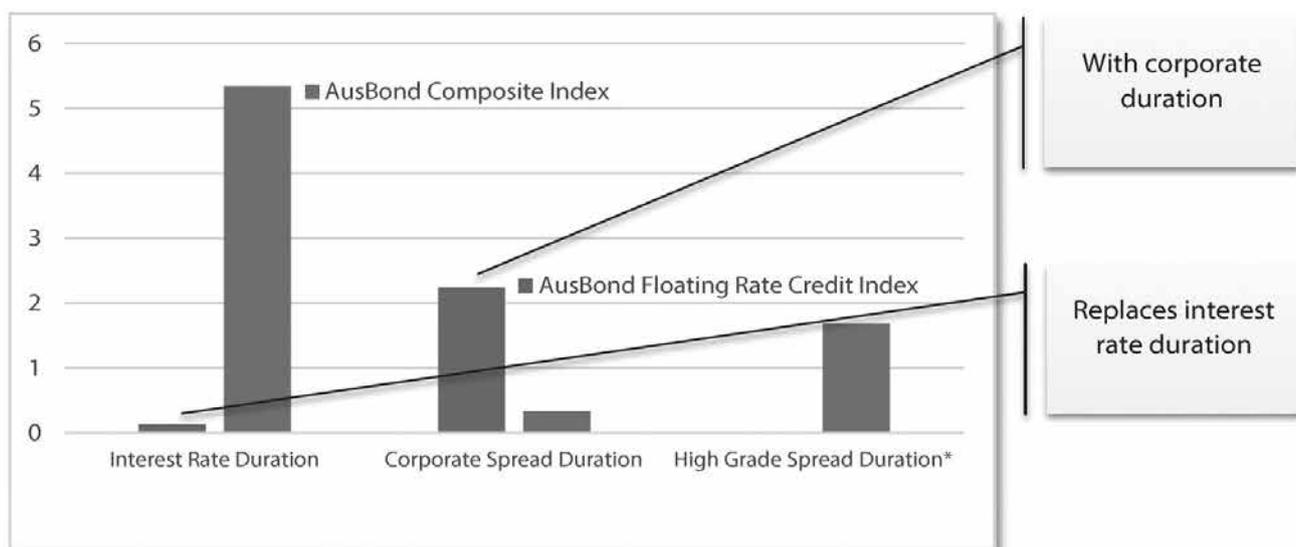
While the floating rate index has not observed a negative year-on-

Figure 9. Rolling 12m correlation – Floating rate credit and equities



Source: Bloomberg

Figure 8. Risk sensitivities – Fixed income



Source: Bloomberg, Nikko Asset Management
*Refers to Semi-Government and Supranational issuers.

year return in any period since the year 2000, the index experienced its lowest return of 1.9% in 2008. For investors who used these style of funds, it was unlikely they suffered losses, but saw poor performance in the asset class at the very time it was needed the most.

Finally, from a compositional perspective it should be noted that the largest exposures in floating rate funds quite often can be the same issuers as those that are held in equity portfolios. For example, the top five issuers in the AusBond Floating Rate Credit Index are all of the major Australian banks, which is similar to the top five companies in the Australian Equity Index. This should raise questions about whether it can outperform during an equity market route, as investors run the risk of having similar issuer exposures, just in a different part of the capital structure.

Table 4. ASX 200 – Top 12

	Weight	Cumulative
Commonwealth Bank	7.4	7.4
BHP Group Limited	6.2	13.5
Westpac Banking Corp	5.2	18.8
CSL Limited	4.9	23.7
ANZ Banking Group Limited	4.5	28.2
National Australia Bank	3.9	32.1
Macquarie Group Limited	2.5	34.6
Woolworths Group Limited	2.1	36.7
Westfarmers Limited	2.1	38.9
Telstra Corporation	2.1	41.0
RIO Tinto Limited	2.0	43.0
Woodside Petroleum	1.91	44.88
Total	44.88	44.88

Source: ASX200List.com

Table 5. Floating rate credit index – Top 12

	Weight	Cumulative
Westpac Banking Corp	14.8	14.8
National Australia Bank	14.4	29.2
ANZ Banking Group Limited	14.4	43.6
Commonwealth Bank	12.0	55.6
Royal Bank of Canada	2.4	58
Suncorp-Metway Ltd	2.3	60.3
Bank of Queensland	2.2	62.5
Mitsubishi UFJ Australia	1.8	64.3
Bank of China	1.6	65.9
UBS AG Australia	1.6	67.5
Toronto Dominion	1.6	69.1
Bank of Nova Scotia	1.6	70.7
Total	70.7	70.7

Source: Bloomberg

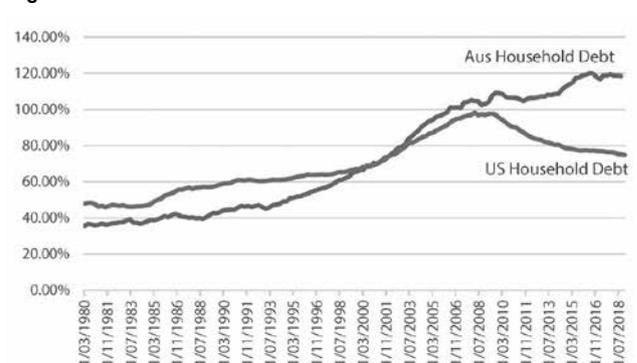
Deciding whether to switch between fixed and floating rate funds is more complex than simply stating that these funds are less risky because they have no interest rate duration. Switching into floating rate funds can mean a greater exposure to corporate bonds (with an emphasis on financials), introducing a different form of risk that has a higher correlation to equities.

Floating rate – Is there also an unseen interest rate exposure?

The final point to explore is whether there is a second order effect of interest rates that can filter into floating rate funds. While this is not a direct link between the price of a floating rate bond and the outright level of interest rates (as they have limited interest rate duration), it comes to whether the current low interest rates are supporting the economy.

A simple way to express this idea is via the Australian household, which has increased its debt levels substantially over the past 10 years. Australian households now have one of the highest household debt levels in the world, well above the 100% household debt to GDP ratio that was observed in the United States just prior to the Global Financial Crisis.

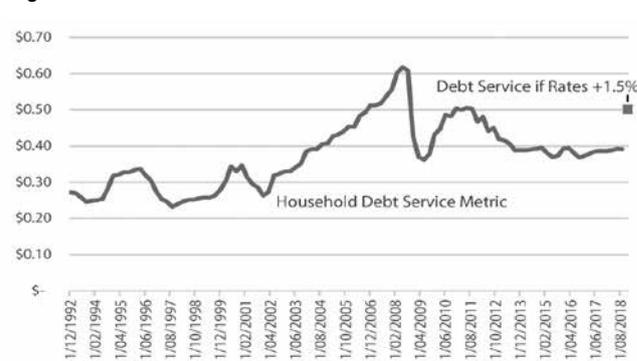
Figure 10. Household debt to GDP



Source: Bank of International Settlements, Bloomberg

The reason that this debt remains serviceable is that interest rates are low. Figure 11 shows this fact by estimating the amount of interest households pay (total household debt times interest rate) and then dividing that into household disposable income. This shows that at current interest rates, households are using only average amounts of their disposable income to service their loans. However, if we shock the interest rate higher by +1.50% (i.e. a cash rate of 3%) this metric quickly extends to historically stretched levels which have implied household stress (2007 and 2011), showing that the Australian household will likely be vulnerable to rising rates.

Figure 11. Household debt service metric



Source: Bank of International Settlements, Reserve Bank of Australia, Nikko Asset Management

What linkage does this have to floating rate credit? Well, as shown previously in Table 5, the main issuers of floating rate bonds are the Australian Banks with Westpac, NAB, ANZ, CBA, Suncorp and Bank of Queensland all being in the top 12 issuers and making up some 60% of the index. These are also the largest lenders to the Australian household, being reliant on them to service their bills in order to remain profitable.

This raises the question of what happens to Australian banks credit spreads if interest rates were to rise too fast and hit the household's ability to repay. While higher interest rates will not directly affect the floating rate bond price, there could be a second order effect coming through credit spreads if higher rates slow the economy. Interest rates are currently low for a reason, as they have been supporting economic growth and made funding cheaper for corporate borrowers.

While rising rates would not be beneficial for fixed rate bond returns as it occurs, it is not necessarily the fact that floating rate funds will be completely insulated from higher interest rates as many people currently believe. Macroeconomic conditions are intricately linked to the price of money and expecting fixed rate bonds to wear all of the losses without any effect on floating rate funds may be a questionable assumption.

Interest rates – Are we in a new regime?

It is as important to ask if we are in a new interest rate regime, which would potentially mean that the continued calls for higher interest rates are overlooking the economic reality we now find ourselves in. We believe that there is a high (and growing) probability that we are in a lower for longer interest rate environment, which will see interest rates remain at levels which are considered “too low” for some time.

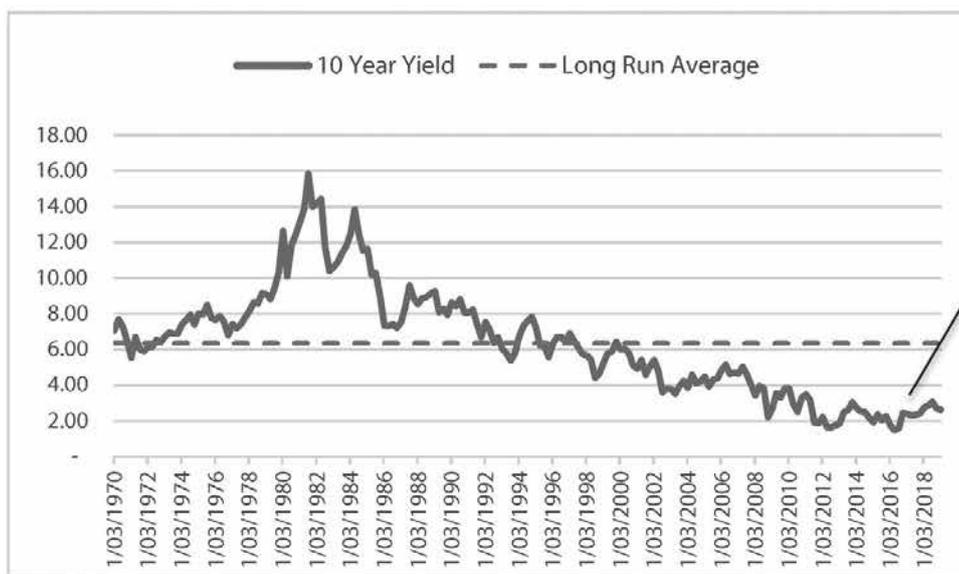
When looking at interest rates it is important to understand the drivers of current levels, rather than be fixated on the fact that they are low. One of the key arguments we continually hear about low bond yields is that they have fallen considerably over the past 40 years and therefore should start to rise. Figure 12 is often used to make this point.

Strictly speaking, since 1970 this observation is true. However, extending our history further in time challenges this narrative. Using data going back to the early 1900s shows that US bond yields between 1920 through to 1960 actually traded between 2% – 4%. Financial markets have been relatively fixated on the recent history since 1970 to determine that rates should rise, without explaining why that period in time is the best comparison to use.

Another way of extending this example is to look at the narrative of the global economy in 2008, which has often been described as the worst recession since the great depression. If the economic conditions were bad enough to garner a comparison to this period, then surely we should want to understand how interest rates behaved following the Depression? The US great depression started in 1933 and, as can be seen in Figure 13, interest rates remained at levels below 3% for 23 years following that event, eventually rising in the '60s. While we are not advocating a 1:1 comparison for yields across this time, we want to point out that arbitrarily picking a period without a justification for why that period was chosen can lead to poor results. There could be a strong argument that yields need to remain low for a long time after a global shock and hence looking at the history from 1970 – 2008 may not be the best comparison period.

For a more nuanced view we believe that debt levels should also

Figure 12. US Government 10-year yield



Yields are low versus history, so they should rise

Source: Bloomberg

be included in any analysis of interest rates, as this is what they are being charged on. As mentioned earlier, Australian households have levered up considerably over the past 30 years, which has seen household debt increase from around 35% of GDP in 1980 to approximately 120% today. Given the interest rate is the cost of servicing this debt, it stands to reason that a much lower interest rate would be required today, when compared to the 1980s. Plotting Australian household debt against 10-year bond yields brings this relationship to life, which is shown in Figure 14. The more money Australian households have borrowed, the lower interest rates needed to be. This relationship shows that until these debt levels can be managed down, it will be unlikely that interest rates can rise meaningfully.

And it is not just Australian households that have too much debt. Different sectors across the globe have increased their leverage considerably over the past 30 years. For example, Figure 15 shows the United States Government debt to GDP against their 10-year yields since 1946. Again we see that the higher the debt levels, the lower the interest rate. Interestingly, after the end of World War 2 the United States government had similar debt levels as today, and unsurprisingly a similar interest rate was set to ensure the country could meet their repayments.

These relationships raise the question of whether the low interest rate environment is just a reflection of the high debt loads around the world. In order to keep the

high debt loads serviceable, interest rates must be lower than they were in previous cycles. If interest rates were to rise too quickly, those who borrowed too much would begin to reduce spending in order to pay higher interest costs, putting pressure on economic growth — something that no central bank has wanted in an already low growth environment.

While interest rates look optically ‘low’, they could remain so for some time as most countries have not deleveraged their overall debt levels since the GFC began. If this is true, those claiming that interest rates must rise from here may be making the same comments for years to come, while missing out on the benefits of owning fixed income. When assessing the future returns of fixed income we think that investors need to weigh up all the evidence of why we are currently in the environment we are in, as the past 10 years has proven that just because something is low does not mean that it can’t go lower.

Conclusion

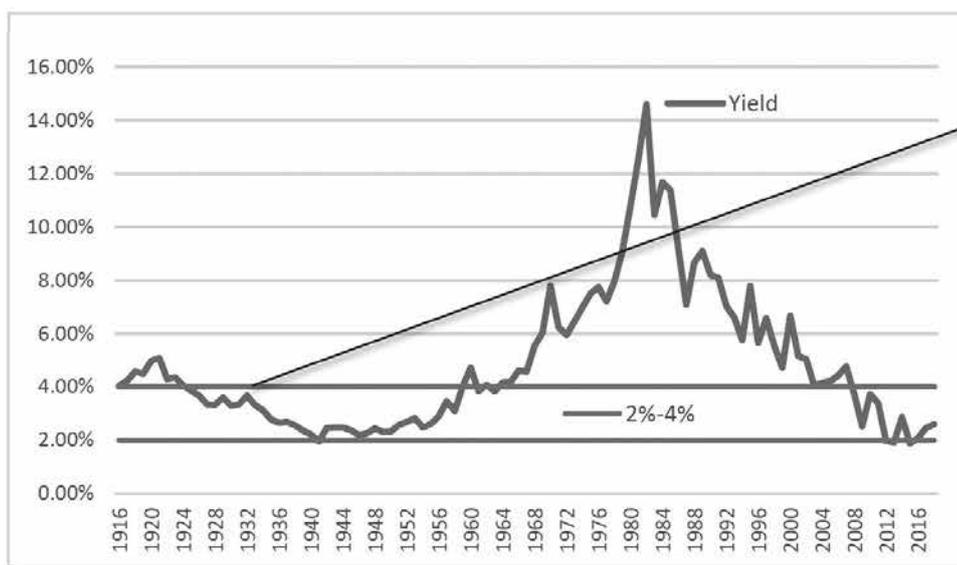
Fixed rate bonds have received a bad rap over the past seven years as interest rates have fallen to historically low levels. However, just because interest rates are low is not a reason to neglect the asset class, as returns should be viewed in the context of the whole portfolio and the diversification benefits that the asset class can achieve. Understanding duration and the role it can play in a portfolio is an important concept to understand. **FS**



The quote

Just because interest rates are low is not a reason to neglect the asset class.

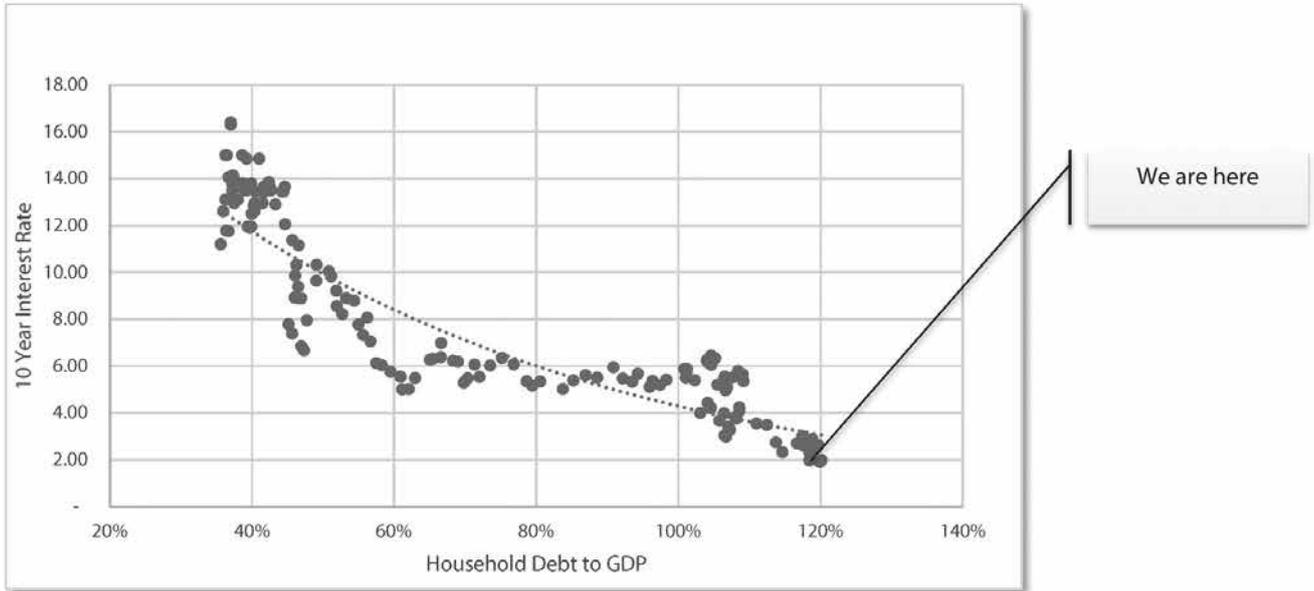
Figure 13. US Government 10-year yield



The Great Depression

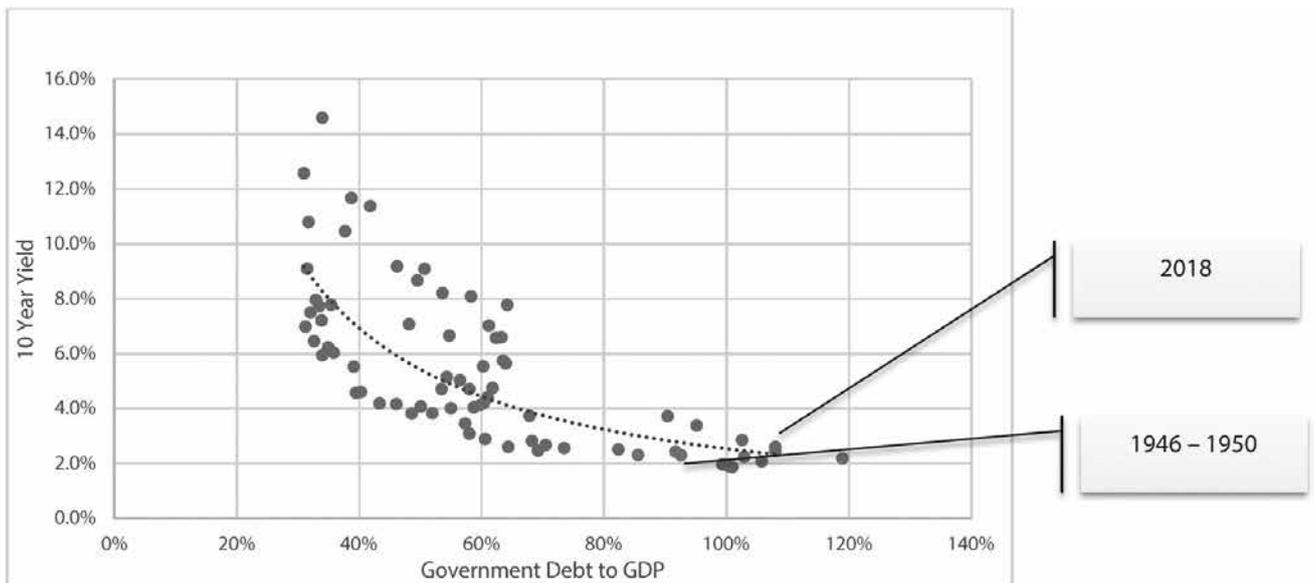
Source: Bloomberg, MeasuringWorth A History of Interest Rates

Figure 14. Australian household debt to GDP and 10-year yields since 1987



Source: Bank of International Settlements, Bloomberg

Figure 15. US Government debt to GDP and 10-year yields since 1946



Source: Bloomberg, MeasuringWorth, US Bureau of Economic Analysis