# A Primer on Interest Rate Markets and Relative Value – Part 2: Government Bonds

Government bonds play a critical role in the global financial system and are among the most liquid and deep markets in the world. As an important defensive component of portfolios, government bonds offer a lower risk source of return with high liquidity. For investors willing to look beyond the conventional approach of buying and holding bonds, there are unique relative value opportunities available in government bond markets.

In this second part of a series of primers, we outline key introductory concepts in government bond markets for relative value (RV) investing. This note builds on Part 1, which covered more general concepts of yield curve risks, relative value analysis of curves and provided examples of common trading strategies.

Our primers assume only a limited background in fixed income. We deliberately avoid detailed technical descriptions on the mechanics of instruments and risk measurements.

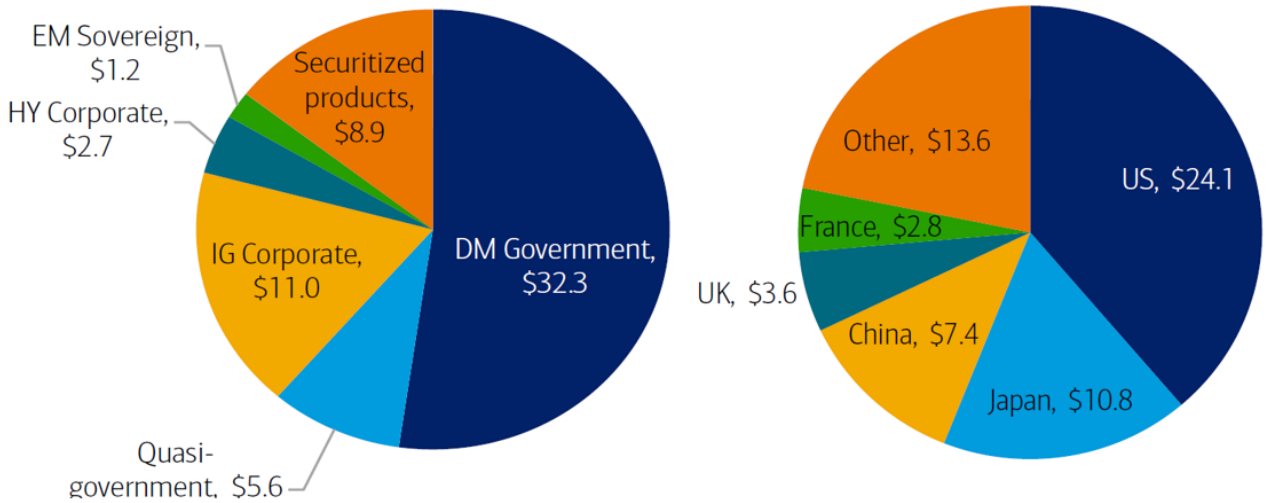
The following areas are covered in this primer:

- Basic features of government bonds
- Bond yield curves and issuance
- Repo and carry
- Bond vs swap spreads and RV
- Bond futures and RV
- Detailed RV examples

## Basic features of government bonds

Government bonds are the most common form of fixed income investments and represent a standardized loan between investors and governments. These bonds underpin some of the most liquid and deep markets in the world. In 2021, the total size of government bond markets was estimated at around US$38tn, which is about 61% of total global bonds on issue according to the Bank of America/ICE global fixed income indices (Chart 1). US Treasuries are the largest market, comprising nearly 40% of all government bonds outstanding.

Chart 1: Government bond market size within overall fixed income and country split




Source: Bank of America Global Research

All types of investors hold government bonds, including households, pension funds, hedge funds, sovereign wealth funds, corporate treasuries and central banks. The presence of central banks has been an especially transformative force in the market over the last decade, particularly since the onset of COVID. Over just the last two years, the four largest central banks expanded their balance sheets by US$12tn. The interaction between major investors, issuers and their respective preferred segments of the market give rise to relative value opportunities.

The basic common features of government bonds are as follows:

- **Issuing entity:** the government issuer that guarantees payment.
- **Face value:** the amount of the loan to the government borrower.
- **Maturity:** the date of the final repayment of the face value of the bond.
- **Coupon rate:** the interest rate on periodic interest payments paid to the investor over the life of the bond – typically a fixed rate in government bond markets.
- **Price and yield:** the price paid by the investor is inversely related to the yield – the yield to maturity is the most common measure used to compare bonds of different maturities and represents the rate which equates the discounted cash flows of the bond to the market price.

## Bond yield curves and issuance

Part 1 of our interest rate market and RV primer series details the macro drivers of yield curves and how curve trading strategies are implemented. Central bank policy interest rate expectations are the major driver of the level of yields and shape of curves. We expand on that note here with a few of the key additional factors that are important for analysing government bond curves.

A government yield curve is constructed based on the bonds on issue. The spectrum of maturities and liquidity of tenors varies among global government bond issuers based on the borrowing needs of governments and investor demand for both issuers and currencies. Most governments have multiple aims

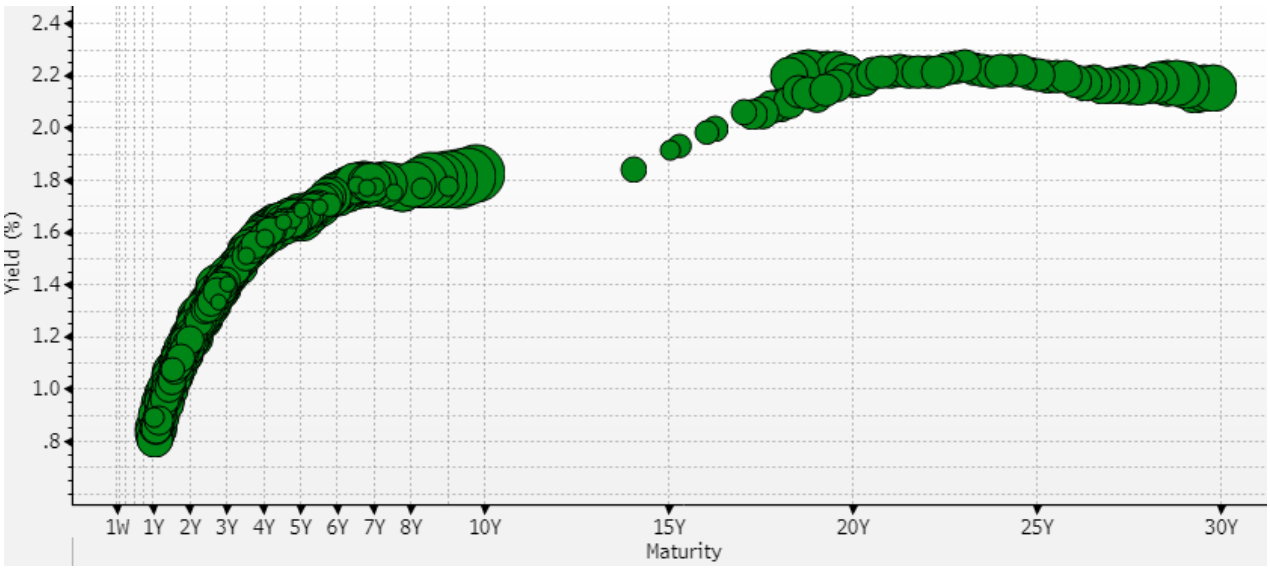
in issuing debt. While minimising borrowing costs is important, it is not the only consideration, which is why short-term bonds are not a more dominant source of funding (given yield curves are normally upwardly sloping). Issuers also need to manage many other important risks including:

- Meeting investor demand for maturities and being “regular and predictable” (where possible) to ensure ongoing support.
- Smoothing refinancing risk over many years.
- Value-based considerations from issuers on the distribution of maturities.

Beyond these considerations, mechanisms for supply also vary within and between global markets. Bond tenders are the most common form of issuance, where investors competitively bid for new supply at specific, often regular intervals. Outside the US Treasury market, it is more common to see the regular tender schedules interspersed with occasional syndicated issuance facilitated by banks for bonds in less liquid parts of yield curves and to build larger initial investor support for new lines. This method of supply has been used more frequently post-COVID to fund larger issuance programs in European, UK and Australian markets.

The volume on issue for a given bond line needs to be considered when assessing relative value, as issuances size varies considerably by tenor. Chart 2 illustrates the US Treasury yield curve adjusted for the size of bonds on issue. There is a wide spectrum of volume outstanding within the curve. Large individual bond lines, such as the Nov-31, currently have $145bn outstanding, while just further out the curve a Feb-36 bond has just $26bn on issue.

Chart 2: US Treasury yield curve – dots are proportional to the volume outstanding




*Source: Bloomberg*

Volume is not the only determinant of liquidity. In a large market such as the US Treasury market, the more recently issued bonds are referred to as “on-the-run” whereas previously issued bonds are referred to as “off-the-run”. The on-the-run bonds tend to be more liquid and may trade at a premium to off-the-run bonds. In the Treasury market, some longer-term investors may undertake trades purely to maintain positions in on-the-run bonds (selling older bonds for newer bonds). In contrast, in smaller markets like Australia, the issuers tend to build up a much smaller number of benchmark bond lines that are more

frequently issued than non-benchmark lines. While these differences in liquidity are sources of relative value, care needs to be taken in positioning for any short-term change in this dynamic.

At the time of issue, the coupon of a new bond is typically set close to the prevailing yields of bonds at that part of the curve, so the price of the new bond is offered at or below par. Since market yields vary a lot over time, the result is that yield curves at a given point in time trade with different coupons. It's important to account for this difference when viewing curves on a yield to maturity basis, since large differences in coupon sizes can lead to an exaggerated picture of RV mispricing. Consider two bonds of the same issuer with the same maturity dates, but one has a 5% coupon and the other has a 1% coupon. The duration of the 5% coupon bond is much lower and so in an upward-sloping curve, this bond should trade at a lower yield, all else equal. Plotting the curve on a yield-to-maturity basis will not capture this duration effect. But making some adjustments for the coupon effect can reveal a different picture. Charts 3 and 4 show a simple example, comparing a small segment of the current ACGB curve with both maturity and duration axis (see Part 1 for a discussion on duration risk). In this simplified example, the ACGB 0.5% coupon Sep-26 maturity appears slightly cheap (higher yield) compared with nearby 4.25% coupon Apr-26 and 4.75% coupon Apr-27 bonds. However, when compared on a duration axis, the Sep-26 bond appears more normal on the curve since it's duration – or interest rate risk – is closer to the Apr-27.

Chart 3: ACGB Yield vs maturity curve

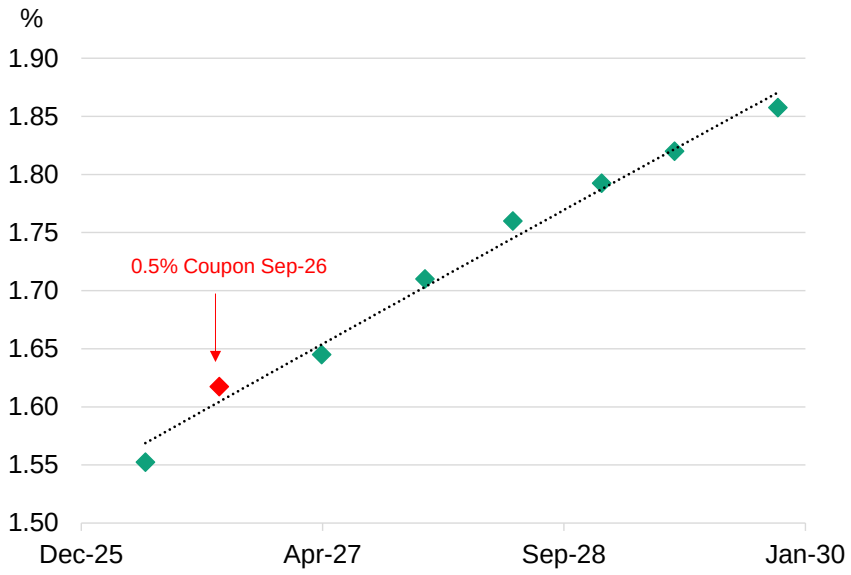
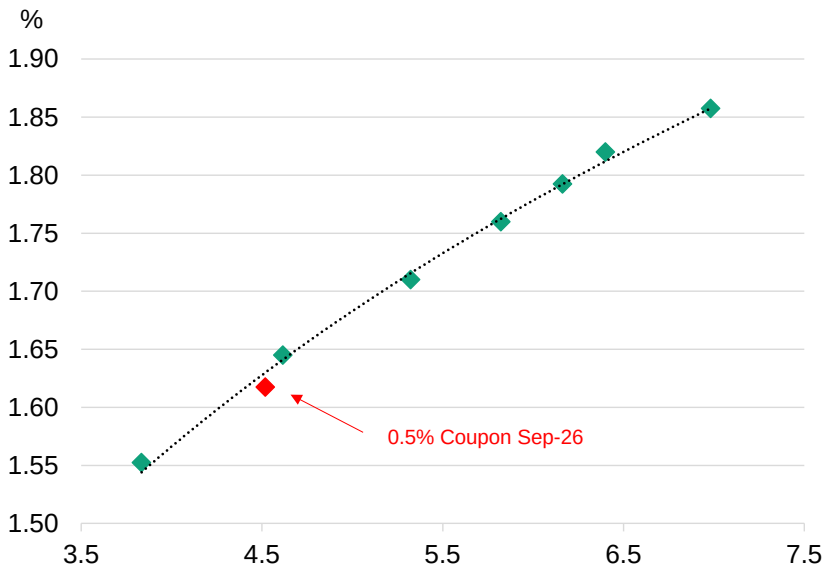


Chart 4: ACGB yield vs modified duration curve




*Source: Ardea, Bloomberg*

## Bond repo and carry

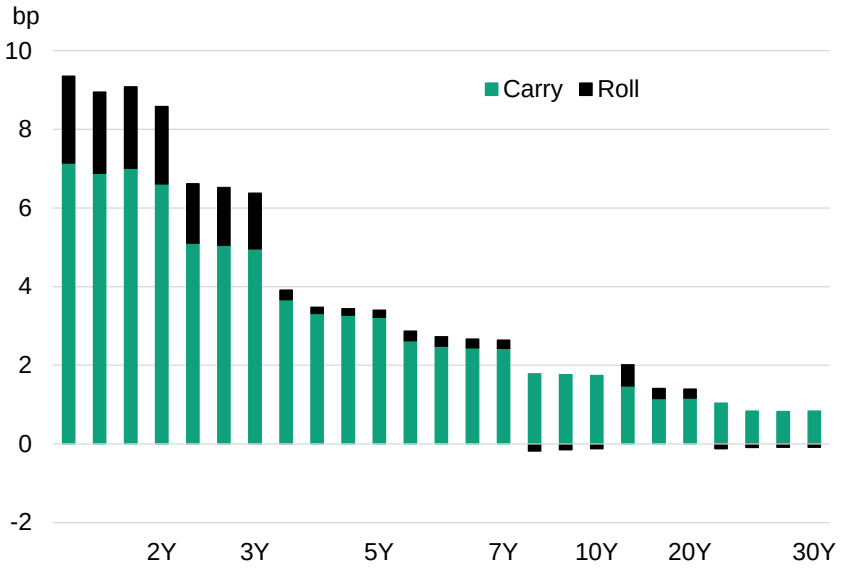
Bond repurchase rates (repo rates) are important for analysing RV and are related to the key concept of carry. A repurchase agreement is a transaction in which a one counterparty agrees to sell a security to another counterparty for cash, but with a commitment to reverse the transaction at a future date. The counterparty receiving cash is entering a repo and the other counterparty providing cash is entering a reverse repo. In a repo trade, bonds are a pledged as collateral, much like a secured loan (there is typically a "haircut" on the value of bond collateral). These trades are mostly overnight but can be traded over months or even longer and the secure nature of these trades keeps the repo rates very low. Repos have a wide range of uses, such as optimizing cash management, funding short positions and leveraging a bond position to increase returns.

Repos have another important use in RV analysis as an input into forward yield and carry analysis. Unlike swaps, bonds are not traded out of forward starting dates and so repo rates can be used to estimate the forward value of a bond. The forward bond values can be then used to estimate carry, which is the income on a bond investment, net of financing costs, over a normally short period of time. The practical usefulness of carry numbers for trading decisions is to understand the theoretical breakeven return for a position under a restrictive set of assumptions. Since repo rates are normally low and yield curves upward sloping, carry trades are often assuming a positive expected return for holding bonds that are financed with repo.

For example, at the time of writing (February 2022), carry for an on-the-run 2y US Treasury is estimated to be around 7bp per month, given a yield of 1.22% and a repo rate of 0.08%. Carry estimates are often combined with a related concept called "roll-down", which assumes the yield curve remains static and the passage of time sees the bond roll down an upwardly sloping yield curve and therefore appreciate slightly in value. We can then say that "carry and roll" for the bond is estimated at 9bp over a month (Chart 5). Since this is a positive number, it effectively pays to be long and is costly to be short the market, in a

scenario where nothing changes (the market is unlikely to be completely static in practice). When determining multi-leg RV positions, these numbers become useful inputs, since total return is more confined and positive carry reduces the expected cost of holding a position while waiting for RV to be realised. There are major pitfalls to carry-oriented strategies. Simply being long a 2y US Treasury bond in the current positive carry environment can still result in substantial capital losses since yields could rise further and wipe out carry gains. Indeed, at the time of writing, the 2y yield had risen 59bp over the prior month. A good practice is to adjust carry estimates for realised and expected volatility.

Chart 5: US Treasuries 1 month carry and roll




Source: Ardea, Bloomberg

## Bond vs swap spreads and RV

As briefly discussed in our previous RV primer, comparing bond and swap curves has two benefits for investors:

1) **Swap spread trading opportunities**. Investors can speculate on the direction of swap spreads by going long a bond and paying fixed on a swap or vise-versa (bond futures can also facilitate this risk profile without having to fund a physical bond position). Under the right set of circumstances, swap spreads are a source of alpha that is uncorrelated with conventional duration and credit positions and can further enhance a fixed income portfolio return.

2) **RV analysis of bonds.** A swap curve captures similar macro interest rate developments to bonds and swap curves tend to be smoother because forward-starting trades are possible, so differences across the curve can indicate comparative rich or cheapness of bonds.

Some of the key drivers of swap vs bond spreads are as follows:

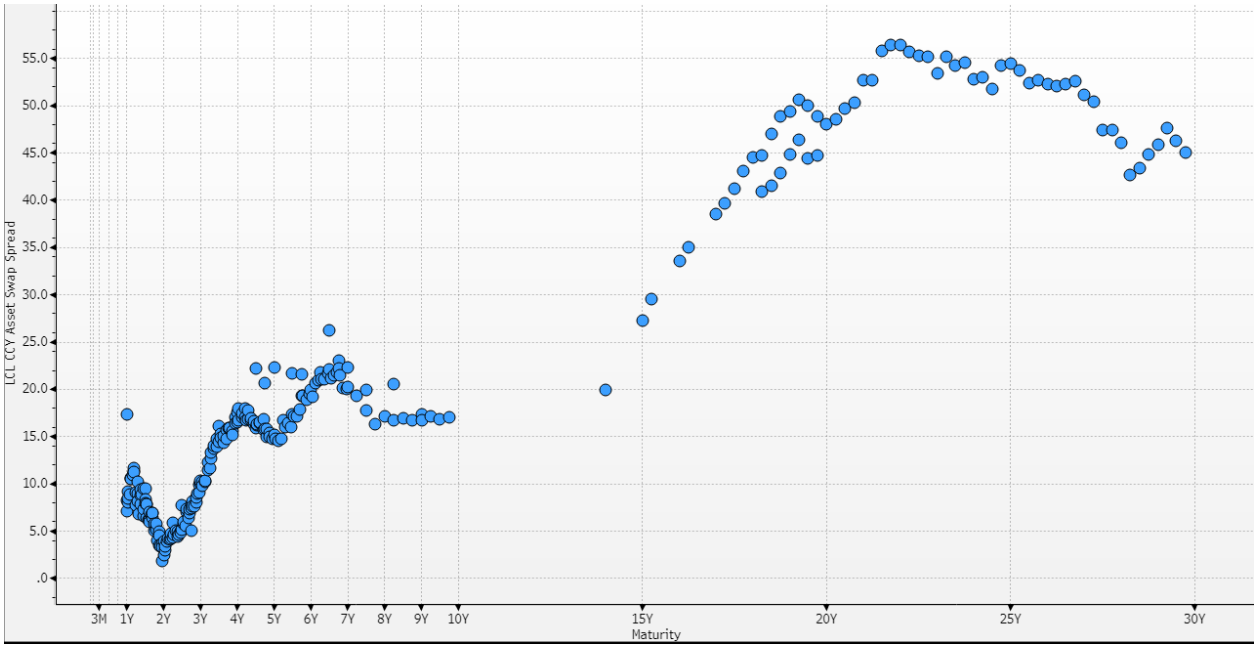
- Actual and anticipated supply of new bonds.
- Changes in demand flows in bond markets.
- Hedging and speculative flows in the swap market.
- Central bank policy, especially QE.

- Bank regulations.
- Sovereign risk perceptions.
- SSA and corporate issuance flows.
- Movement in spreads of floating rate benchmarks and associated perceptions of bank credit risk historically drove swap spreads, but has lessened as a driver in recent years amid benchmark reforms, central clearing of swaps and other regulations.

In practice, there is more than one measure of swap spreads to either trade or assess bond RV because swaps are highly flexible over-the-counter contracts. Investors can seek to simply maturity-match a swap to a particular bond or they can enter an asset swap transaction, which effectively transforms the cash flows of a fixed rate bond to a floating rate note (where the floating rate is a swap/money market benchmark rate).

To measure RV, it is common to assess bonds using an asset swap curve, such as Chart 6 for US Treasuries. The overall shape is a function of the level of swap vs bond spread differences across the curve, as well as more specific bond supply and demand characteristics.

Chart 6: US Treasury asset swap curve (OIS)




In practice, understanding the reason why a bond appears expensive or cheap compared with swaps usually requires some further analysis. Qualitative research might reveal flows in swaps that exaggerate a particular asset swap anomaly or there could be an expectation of bond issuance or large flows into certain bonds. Further quantitative screening is also beneficial. Much like the earlier example of yield to maturity, asset swap curves can also reflect other biases such as coupon differences. Additional measures can be applied to really zero in on where an RV opportunity exists, such as “z-spread” curves, which help account for coupon differences.

## Yield curve models

Quantitative yield curve models are another method for identifying relative value opportunities in

government bonds, by comparing the yield of a bond with a fair value yield derived from a model. These models tend to be more adaptable to government bonds than corporate issuers since the liquidity and high frequency of issues along a curve allows for accurate calibration. A detailed review of these models goes beyond the scope of this note.

## Bond futures and RV

Physical government bonds are typically transacted over-the-counter in spot terms, where a price/yield is agreed upon and settlement usually occurs in two days. Bond futures allow investors to trade a bond at a forward date with standardised terms and to transact efficiently through an exchange. An attractive feature of futures contracts is that they allow investors to gain exposure to the value of a bond with limited upfront cash (margin). Bond futures contracts have a wide range of uses, such as speculating on yield movements or hedging existing portfolio or issuance risk.

We limit our discussion of futures to the key features. Detailed contract and market custom information is published by major exchanges. Most markets have a short-term contract such as 2y or 3y, an intermediate maturity such as a 10y and a long-term contract, such as 20y and/or 30y. The 10y contracts tend to have large trading volumes, since this maturity more closely reflects the overall duration of government bonds on issue and has been a more relevant tenor for investors to trade in a world of low cash rates over the last decade.

Many bond investors may undertake futures (and swaps) trades to modify the interest rate risk profile of their bond portfolios. For example, a portfolio manager might be expecting yields to rise for macroeconomic reasons and so could position the portfolio to hold 5 years of duration relative to an index of 7.5 years by selling bond futures against physical bond holdings which have duration levels close to the index. If yields rise in this example, the portfolio may still experience a capital loss, but by less than the index. The conventional strategy also has the capacity to increase its duration exposure relative to the index through derivatives to position for lower yields by taking a long position in bond futures.

For relative value trading strategies, bond futures play two key roles.

1) **Capturing RV opportunities**. Consider a bond that is identified as trading cheap. An investor could either buy the bond outright and assume its full interest rate risk profile, or the investor could buy the bond and offset the interest rate risk by selling futures. In this latter approach, the net position is targeting only the difference in pricing between the bond and the futures contract, which is normally a more constrained relationship and is not exposed to changes in the overall level of bond yields. The investor has bond vs futures basis risk (and perhaps curve risk), rather than duration risk. The basis between bonds and futures has lower risk than duration exposure.

2) **A cause of RV differences between bonds**. Futures create a point of high liquidity along yield curves and can give rise to relative value opportunities. A common way this occurs is where the points of the curve underlying futures contracts are affected by large shifts in market flows targeted at futures. For example, there may be increased interest to sell futures by speculators expecting a large increase in central bank policy rates or end to QE. Those speculators have easier access to short positions in futures than physical bonds, leading to a concentration in selling flows in the part of the curve underlying a 10y futures contract. The surrounding physical bonds maintain some relationship with the

futures contract and therefore become cheaper relative to other maturities.

The relationship between futures and physical bonds is significantly impacted by the settlement rules of the exchange and the interaction of these rules with broader market dynamics. Bond futures contracts are generally deliverable, which means at expiry the seller is obliged to deliver a physical bond to the buyer. Australian government bonds are an exception to this general rule and are cash settled. The precise mechanisms and full list of rules are detailed and differ based on market customs, so we outline here in only broad terms. There are generally a range of bonds – called “basket” bonds – eligible for delivery under a contract (or to form the basis of cash settlement in the case of the Australian market).

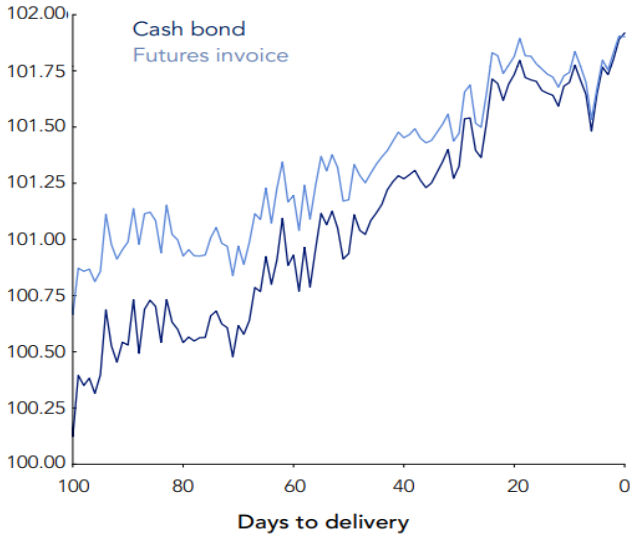
The reason the market operates based on a basket is that restricting to one deliverable bond would create a bottleneck in that particular line. New bonds are always being issued and fixed maturities roll down (or up) curves, which means the basket is also changing over time. The exchange sets guidelines for which bonds can be used, such as maturity ranges. The consistency of this market custom means that when new bonds are issued, investors can reliably forecast their inclusion in a basket. The basket maturity range is often wide compared with the actual maturities. For example, a 10y US Treasury contract has deliverable maturities of 6.5-10y.

A basket of deliverable bonds has a range of securities with different maturity dates, yields and coupons. However, a futures contract is for a standardised bond transaction - a 6% 10y bond in the case of the US 10y contract. These differences need to be reflected in futures, so there are adjustments made to the bonds eligible for delivery – called a “conversion factor” – applied to each bond to convert its price to a 6% yield. Without the right adjustments, the seller (receiving cash and delivering bonds at expiry) would be incentivised to deliver the lowest $-priced bond at expiry, which may only be the lowest price based on coupons. This situation would cause the contract to track coupons more closely than maturity.

Note that while a conversion factor aims to make bonds equally attractive to deliver, it’s not a perfect system and in practice, a particular bond will emerge as the cheapest-to-deliver (CTD) bond. Logically, the CTD bond would always be chosen by the short side of the futures contract. An investor short a bond futures contract determines which bond has the lowest net cost of delivery by comparing the cost of funding the bond used for delivery, after accounting for the conversion factor. The concept of implied repo is also used to determine the CTD bond. This involves calculating what the return is for delivering the bond for a short futures position. (See the CME for the specifics of the delivery process and underlying mathematics of CTD and conversion factors in US Treasuries).

The CTD bond allows investors to understand the fair value of a futures contract. The yield of the futures contract will tend to track the yield of the CTD bond. Investors can then more accurately compare physical securities with futures and undertake specific types of RV trades, called futures basis. These basis trades work by targeting small mis-pricings between cash bonds and futures (a type of near-arbitrage). To increase the return on these positions, many hedge funds undertake the trades with large amounts of leverage. Chart 7, from the US Treasury Office of Financial Research, shows the reliable convergence between cash bond and futures prices, over a contract life.

Chart 7: Cash Treasury and futures




Note: Average over all five-year contracts since 2016.

Sources: Bloomberg Finance L.P., Center for Research in Security Prices/ University of Chicago Booth School of Business, Office of Financial Research

Over the long term, cash-futures basis trades have positive expected return, but significant risks can occasionally emerge, since the trades rely on the normally abundant liquidity in cash, futures and repo markets. When liquidity conditions rapidly deteriorated in March 2020 at the onset of COVID, many highly levered hedge funds were forced to unwind basis trades, leading to significant losses and disruptions to market function.

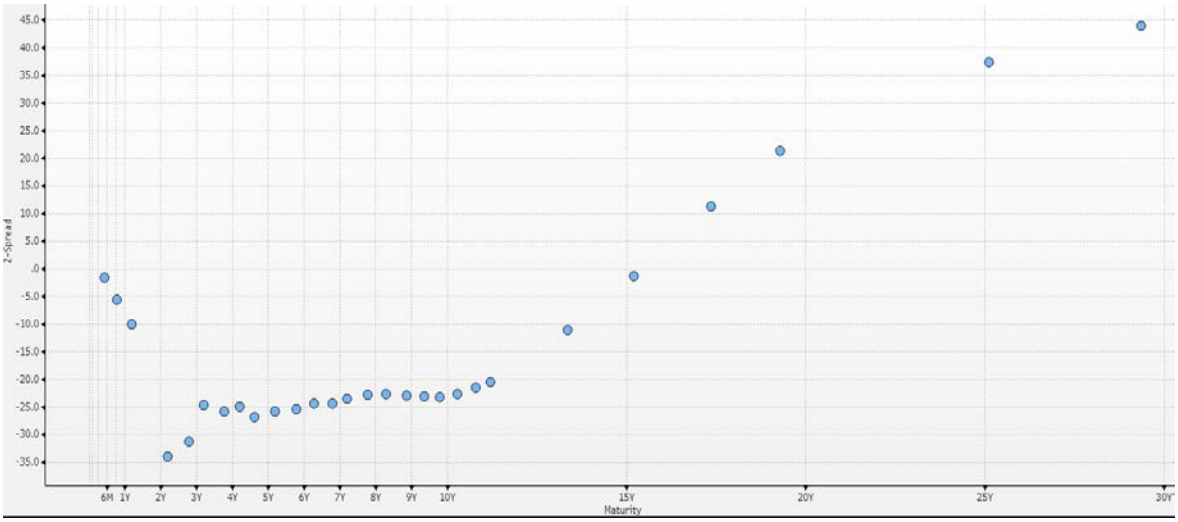
## Detailed bond RV examples

We outline two detailed examples of recent bond RV, using the concepts outlined in this primer.

**1) Australian Government Bonds – 2033 maturity**

The Australian government bond curve is shown in Chart 8 on a Z-spread basis (as of February 2022). As outlined earlier, this spread is the asset swap adjusted for coupon differences and is one of a range of ways to view RV opportunities on bond curves.

Chart 8: ACGB Z-Spread Curve




*Source: Bloomberg*

A few general themes stand out:

- The <1y bonds are short enough in maturity be money market instruments and so tend to trade closer to comparable government T-notes (Australian equivalent of the US T-bill).
- The two 2024 maturities are rich on the curve, reflecting a dominance of the RBA in this part of the curve, as this sector was directly targeted by the RBA's yield curve control policy.
- The curve between 3y and 10y is generally flat, as the RBA has been targeting bonds out to 10y in their post-COVID purchase program (which ended in February 2022).
- The 10y sector is also rich vs longer maturities because bonds in this part of the curve form the futures basket or soon to be futures basket bonds.
- Longer term >10y bonds are not as actively traded in Australia and don't benefit from the same futures basket or QE related demand (there is a 20y futures contract, but liquidity is very low).

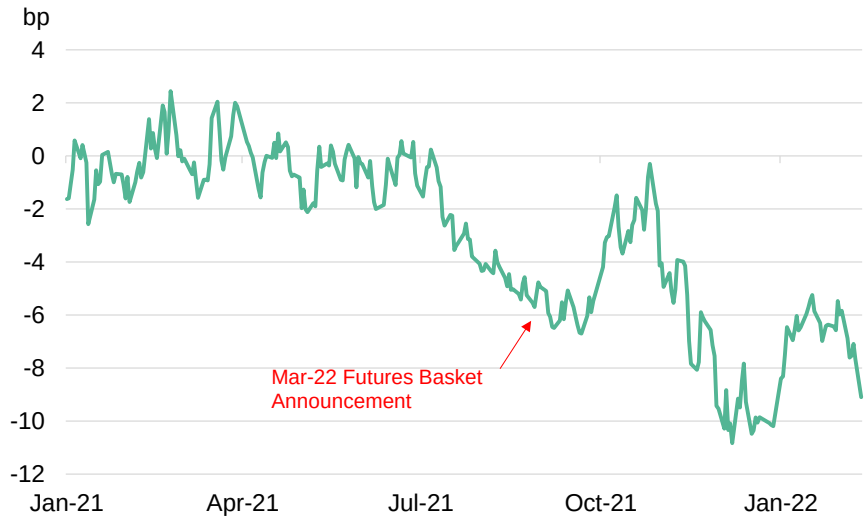
A broad observation is relative cheapness in longer term bonds and so that might be targeted as a general strategy. However, one has to adjust for the relative liquidity, supply and demand expectations in this part of the curve, which could trade very differently to shorter term bonds. The general shape of the curve and high-level RV themes shown in Chart 8 have been this way for some time.

As outlined in the futures section, the Australian bond futures contracts are cash settled based on the average yield of bonds comprising the basket. A popular strategy is to buy the bonds comprising the basket and short the futures contract – similar to the US Treasury basis trade discussed above. Many traders implement this strategy using repo for leverage. The cost of repo and relative supply/demand premiums in bonds drive this strategy. Bonds comprising the futures basket tend to be rich on the curve (although the attractiveness of basket arbitrage trades were diminished by RBA QE in recent years).

Investors could choose to zero in on a particular bond line to analyse its RV potential. An example in 2021 is the Apr-33 maturity. This bond (as of February 2022) is part of the March-22 10y futures basket and bonds tend to richen ahead of entry into the basket. Chart 9 shows the outperformance of the Apr-33

compared with the nearby Jun-31 and Jun-35 maturities ahead of its entry into the Mar-22 contract basket. The ASX announced the inclusion of this bond in the March-22 contract in September 2021 and as the Chart shows, the Apr-33 outperformed nearby maturities heading into this announcement, as market participants anticipate basket changes in advance (lower spread is Apr-33 outperforming). This shift in RV could be captured by going long this bond vs short in nearby maturities (depending on the cost of shorting the bond), but most investors would tend to be short the 10y futures contract against a long position in this bond.

Chart 9: ACGB Apr-33 ASW performance relative to Jun-31 and Jun-35 (Butterfly spread)

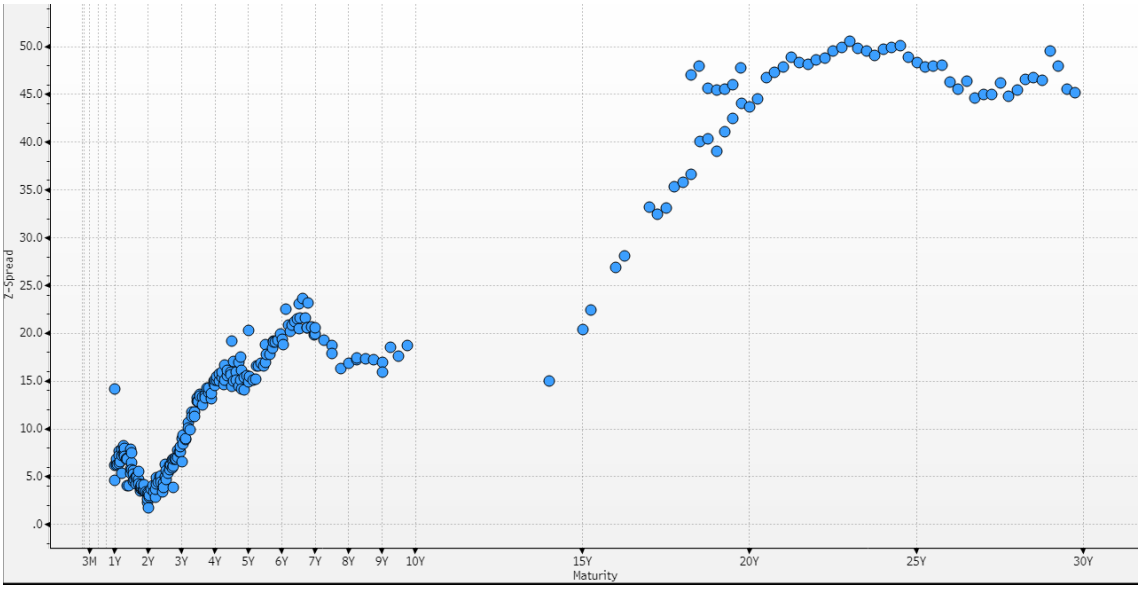



Source: NAB, Bloomberg, Ardea

**2) US Treasuries – 20y RV**

A similar chart to the Australian example is shown here for US Treasuries.

Chart 10: US Treasury Z-Spread curve




*Source: Bloomberg*

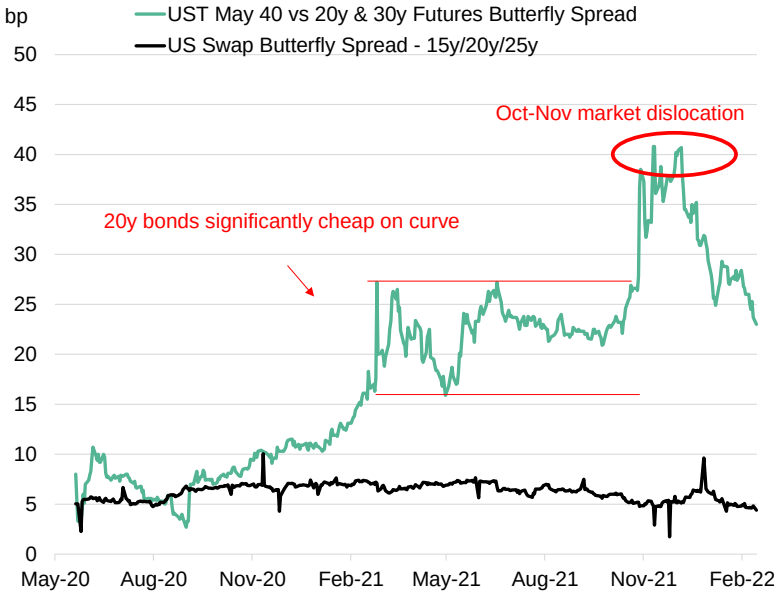
A stand-out theme looking at this curve is the cheapness of the 20y sector compared with 10y and 30y. The chart also captures the CTD bonds for the two nearest futures contracts to the 20y physical bonds - the “Long Bond” and 30y contracts (which have 15y and 25y CTD maturities, respectively). The drivers of relative cheapness of the 20y sector (2040 and 2041 maturities) reflects both supply and demand related forces.

On the supply side, the 20y part of the curve adjusted to a change in both the volume and distribution of issuance. With a massive increase in funding needs after COVID in 2020, the US Treasury recommenced issuance of 20y bonds for the first time since 1986. Many market participants initially estimated the bond would debut at a smaller size than the $20bn the Treasury first targeted. Issuance sizes in 20y bonds reached a high $27bn in November 2021. This supply pressure started to ease when the Treasury’s updated borrowing program saw a $4bn reduction to 20y auction sizes in late 2021, which at the time was the largest reduction of all maturities.

On the demand side, the 20y didn’t receive as much support as 10y and 30y bonds from some large investors. The 10y sector tends to be favoured more than 20y by passive and macro investors. Meanwhile, the 30y sector benefited relative to all shorter maturities from increased pension fund demand. Many private pension funds had reached a fully funded status for the first time since pre-2008 (according to the Milliman 100 Pension Funded ratio). In turn, the higher funded status leads these investors to take a more defensive approach and protect portfolios against rising rates through purchases of long-term bonds. This demand benefits the 30y sector (the actual process of creating long duration exposures occurs through Treasury dealers repackaging bonds into separately traded principal and coupons – called STRIPS).

Investors have a range of options in capturing the 20y RV, such as purchasing vs swap or nearby futures. An alternative is a “butterfly” trade structure, which is long in the 20y bond relative to short in nearer and further maturities to construct a non-directional trade that also captures RV (see Part 1 of our primer series for detail on how butterfly trades are constructed). Chart 11 shows the performance of a long May 2040 bond vs short positions in 15y (CTD for the Long Bond futures contract) and 25y (CTD for 30y futures contract). A wider spread is underperformance and tighter spreads is outperformance of the May 2040 bond. The size of this relative price movement on the curve is significant and can be seen through a comparison with a similar maturity swap butterfly, which has remained static through this period. This chart also highlights the risks with RV trades. The rates market dislocation of October to November 2021 temporarily drove this spread even wider (or the 20y bond even cheaper). As with our discussion in the first primer, this type of trade tracks a much tighter trading range than outright yield movements.

Chart 11: UST May- 2040 vs futures spread




Source: Ardea, Bloomberg