ARDEA Investment Management

A Primer on Interest Rate Markets and Relative Value – Part 1: Yield Curve Opportunities and Risks

Government bond and interest rate derivative markets are among the largest and most liquid financial markets in the world. Interest rate markets are vital to the functioning of the financial system and present a wide range of long term investment and short term trading opportunities. The unique opportunities and risks within the interest rate market are not always obvious to multi-asset investors, especially where fixed income is a smaller allocation within their portfolios.

Relative value investing in interest rate markets provides a rich source of alpha potential for investors with low correlation to macroeconomic forces and directional moves in broader bond and risk asset markets.

This first paper in a series of primers on interest rate markets and relative value outlines common types of trades implemented and risks faced by market participants. Our emphasis is on the practical concepts and common issues faced by investors, rather than a detailed technical discussion on the mechanics of instruments and risk measurements. This primer assumes only a basic understanding of bonds and financial markets.

This note is split into two parts:

1) Introduction to the concept of a yield curve and the three major sources of interest rate risk and return.
2) Practical considerations for investors implementing yield curve strategies, including market themes and trade examples from recent years.

Yield curves and the key sources of interest rate risk and return

A basic framework for understanding risk and return within a fixed income portfolio involves measuring and analysing the level of yields, the shape of the curve and credit spreads[1]. Three other sources of return within rates markets are: currency and related derivatives such as cross-currency basis, inflation and volatility. These additional sources of return are beyond the scope of this introductory primer, although we have previously published detailed introductory notes on inflation and volatility.

1) The level of yields

Movements in yield levels are normally the largest driver of performance in fixed income portfolios where government bonds are the dominant investment and credit risk allocation is low. Bond prices are inversely related to the level of yields, so for an investor with a long position in bonds (net of offsetting short positions in related interest rate derivatives), falling yields mean higher prices and returns and rising yields mean lower prices and returns.

[1] Since our focus is on interest rate markets, we confine our discussion on credit spreads to government-related credit, such as state and regional government debt.

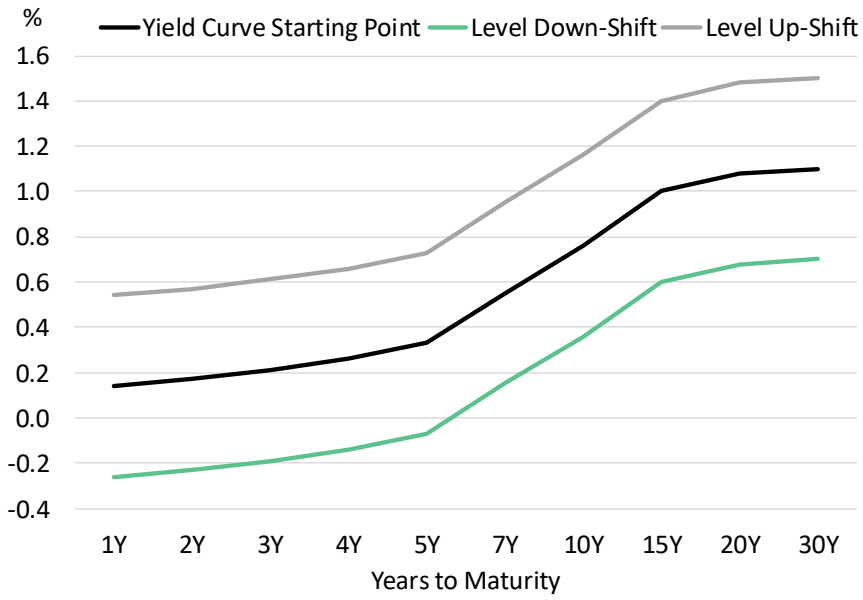
Duration is an important concept for understanding the sensitivity of a given portfolio or security to changes in the level of yields. Duration risk stems from the fact that a bond investor makes a payment today in exchange for a series of future interest payments. At the time of purchase, the bond's price reflects the present value of that future stream of interest payments, which are fixed in advance. However, the next day if the general level of market interest rates (or bond yields) rises, that fixed stream of interest payments is no longer as valuable, as it is now below current market rates. Therefore, the bond needs to be discounted to attract new buyers, and the bond price drops accordingly. The opposite happens when bond yields fall. Duration measures how much the bond price will fall or rise for a given change in yields.

The longer dated the maturity of the bond (i.e. longer duration), the more future interest payments need to be discounted and therefore the more pronounced this effect. The longer duration, the more sensitive the bond price to interest rate fluctuations. Duration measures the sensitivity of a bond's price to those fluctuations. For example, the Bloomberg Barclays US Treasury Index – a widely followed index of US bonds – has a modified duration of around 7.1. That implies approximately a 1% increase (decrease) in the level of yields causes around a 7.1% capital loss (gain).

It is common for duration analysis to assume only a parallel shift in the yield curve up or down to measure risk. This is only part of the risk an investor is exposed to in the interest rate market, but is an important first step. In many conventional fixed income funds, duration and level shifts in interest rates are a major driver of returns.

To understand and analyse the up and down movements in yields across the market, investors typically don't just follow a single bond or swap rate, but analyse a range of maturities across a yield curve. A yield curve or term structure of interest rates compares the yield to maturity of bonds (or interest rate derivative rates such as swaps) over different maturities. The yields of various bonds are plotted against time to maturity and reflect a shape, which is typically upward sloping but can take on various other forms. Chart 1 depicts a yield curve with parallel up and down movements.

Chart 1: Yield curve with stylised +/- 40bp parallel shifts

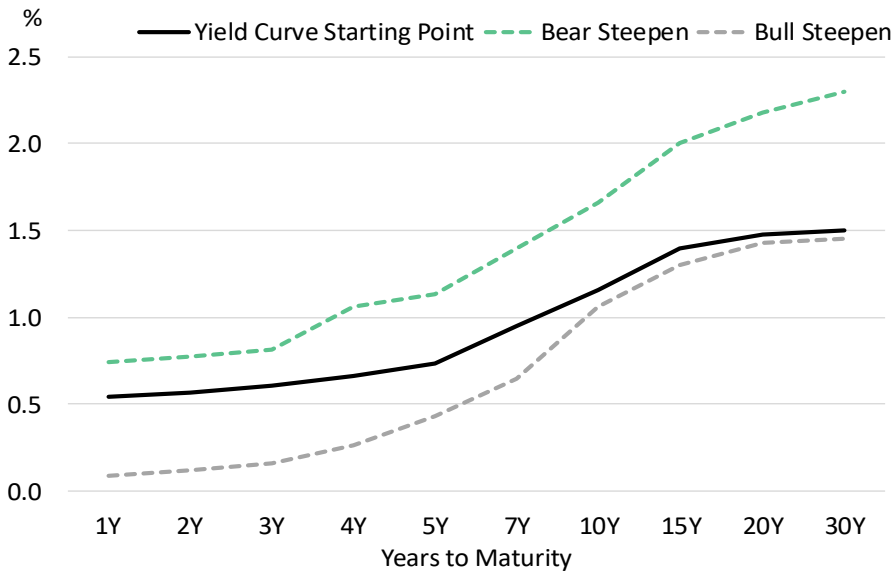


2) The shape of the yield curve

In practice, yield curves often do not make consistent, purely parallel shifts up or down. The shape of the curve tends to steepen or flatten, which describes changes in the size of the relative movements in longer versus shorter maturity bond yields or derivative rates.

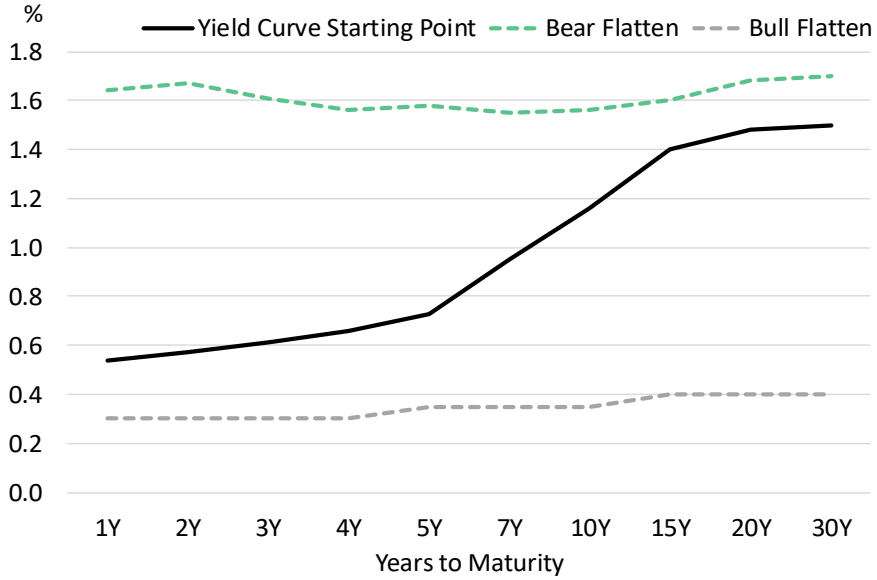
A simple example of two curve steepening scenarios is shown in Chart 2. Market participants typically call these movements "bear" and "bull" steepening. A "bear steepening" scenario is where the curve steepens while the overall level of yields is rising (a "bear" scenario for bond prices) – longer term yields rise by more than shorter term yields. A "bull steepening" scenario is where the curve steepens while the overall level of yields is falling (a "bull" scenario for bond prices) – shorter term yields fall by more than longer term yields.

Chart 2: Yield curve with two steepening scenarios



In contrast to steepening, curves can also "bull" and "bear" flatten, whereby the slope of the curve becomes smaller in both falling and rising yield environments (Chart 3).

Chart 3: Yield curve with two flattening scenarios

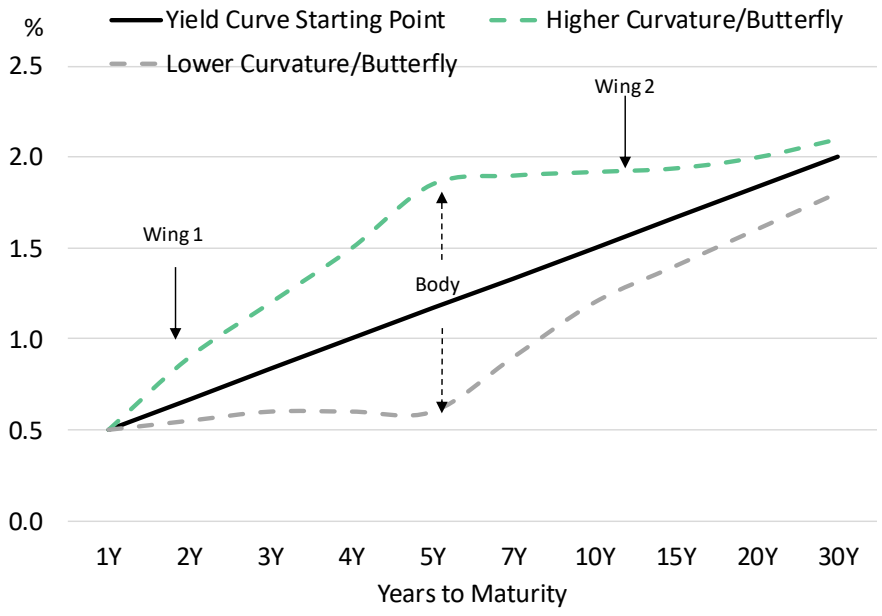


A yield curve spread is calculated as the difference between long term yields and short yields. To implement a bond curve steepening trade, an investor buys shorter term bonds and sells longer term bonds. To implement a flattening trade, an investor sells shorter term bonds and buys longer term bonds.

For both flattening and steepening examples, we have shown "bull" and "bear" scenarios as these are most common. Another possibility is that a curve either flattens or steepens based on different directions of respective short and long term yields - a steeper curve where long term yields rise and short term yields fall or a flatter curve, whereby short term yields rise and long term yields fall. However, yields tend to be directionally correlated across the maturity spectrum and such multi-directional moves are less common than the respective "bear" or "bull" scenarios. Indeed, it is this high boundedness between instruments on the same yield curves that make curve and relative value trading opportunities attractive from a risk/reward perspective. This higher correlation between points on a curve from a level perspective also contributes to the overall lower riskiness of government bonds (and related interest rate derivatives) relative to most other asset classes, if overall portfolio risk is managed appropriately.

Another type of yield curve shift commonly targeted for trading opportunities is referred to as curvature. By curvature, we refer to the extent to which a curve has a convex or concave shape (or how much of a "hump" exists in the curve). Chart 4 shows a couple of stylised examples where the middle part of the yield curve moves higher and lower relative to both longer and shorter maturities. Like a standard curve steepening or flattening position, changes in curvature don't depend exclusively on the broader level of yields moving up or down.

Chart 4: Yield curve with two curvature shift scenarios



The market jargon for trades to take advantage of changes in curvature are called butterfly trades (or simply fly trades) and the terms curvature and butterfly are often used interchangeably. There are three legs to a butterfly curve trade, comprising the body of the butterfly and two wings. Where a body position is long bonds, the wing positions are both short bonds and where a body position is short bonds, the wing positions are long bonds. Butterfly spreads can move significantly, but are mostly less volatile than comparable standard curve steepening or flattening positions. We have deliberately shown a highly exaggerated 2y (wing 1)/ 5y (body)/ 10y (wing 2) curvature/butterfly position in Chart 4 to illustrate the

concepts. The logic behind a curvature shift is helpful for interest rate RV because it can be applied to a wide range of scenarios, including to isolate a specific bond or derivative from its nearest maturity counterparts (often called a "micro-fly" position).

To calculate the spread of this three-leg butterfly position, we measure the "spread of curve spreads" between the front wing (W1) and body (B) and longer wing (W2) and body. Mathematically, the butterfly spread = (B-W1)-(W2-B). This equation simplifies to butterfly spread = 2*B-W1-W2.

A basic framework for a typical investor when constructing a yield curve strategy is outlined below and involves three broad steps (note this reflects the more common approach taken by macro-oriented investors and not a pure RV style of investing).

(1) ***Take a view on the direction of the overall yield curve***. Forming this view generally requires a strong understanding of both global market/macroeconomic developments and of specific market dynamics underlying curves. The need for a view on the market is true for positioning for level shifts as well. But interest rate traders will often have more conviction on whether a yield curve will steepen or flatten than whether yields will go up or down and this may inform their choice of a curve trade over an outright directional trade.

(2) ***Choose which combination of maturities to implement the trade.*** A 5y vs 30y curve trade is generally driven by a different set of market forces and is more volatile (riskier) than a narrower maturity curve expression such as 5y vs 7y. Butterfly trades tend to be implemented because they are lower risk than curve trades, but this is not always the case (careful judgement and market understanding is required to keep such positions low risk).

(3) ***Weight the long and short positions to be duration neutral.*** Because a curve trade is designed to avoiding taking duration risk, investors will seek to weight the long and short legs of the trades to be as close to duration neutral as possible. Without getting into too much technical detail, achieving this weighting requires estimating the ratio of sensitivities between each leg to level shifts.

For example, an investor could estimate the $-value of a 1bp parallel shift across the whole curve for each of the shorter and longer maturity positions and then use this information to weight the size of the long and short positions. For example, a bond curve flattening trade will require a smaller sized long position in the longer maturity bond than the equivalent short position in a shorter maturity bond. This is because of the higher duration risk in longer term bonds (as outlined above). In practice, this understanding of position sizing is crucial. For example, if an investor implements a flattening trade (where sizing on the two legs is appropriate) and the curve parallel shifts higher in yield (but retains its curve shape), the gains from the shorter maturity position will offset losses from the longer maturity bond.

3) Credit risk and spreads

Credit spreads are a dominant form of global fixed income return and risk. Since this primer is confined to interest rate markets and relative value, we will not be covering credit in-depth. From an interest rate market perspective, the credit spectrum is narrow and generally confined to government and related entities. Bonds issued by national governments, such as the US Treasury, are considered to be the lowest risk from a credit perspective. These are also commonly referred to as "risk-free", although the real meaning of risk-free is debated more widely now among investors than prior to the 2008 crisis.

Within interest rate markets, credit risk is very low and confined to that of high-grade issuers outside national sovereigns. Some examples include:

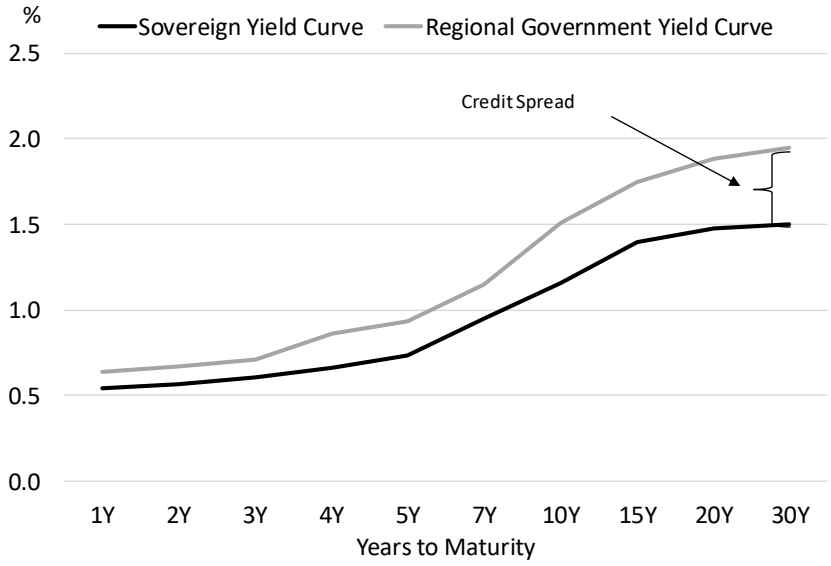
- State or provincial borrowers;
- Government agencies with the explicit support of a government;
- Supranational issuance entities backed by more than one country.

The specific underlying support and guarantee structure between various government-like entities can be very different across the world and this difference can have trading implications. For example, a bond issued by a state, province or government agency in one country might feature an explicit federal government guarantee, while in another country a similar issuer might not have an explicit guarantee, but may have a significant and predictable federal-state fiscal relationship or an implicit (market-assumed) guarantee. This latter issuer might trade at a wider spread than the former issuer to account for the different absolute level of credit risk and perhaps because of what the explicit guarantee does for some investor mandates.

However, the level of default risk is generally considered to be very low or negligible among the high-grade bond issuers considered part of the interest rate market (as opposed to the credit market). There is still a credit spread between these high-grade issuers and the base federal government curves and often the swap curve as well. The spread is typically much tighter and less volatile than for corporate bonds. Drivers of movements in this spread tend to reflect:

- large shifts in general investor risk appetite;
- the issuance outlook;
- credit rating changes;
- allocations and mandate changes among major investors.

Chart 5: High grade state/provincial and government curves



Practical considerations for investors implementing yield curve strategies

We outline three areas of practical consideration faced by investors in interest rate markets and provide market examples from recent years.

1) Macro interest rate market trades

In the first section of this primer we discussed how investors can target higher or lower yields or implement combinations of long and short trades in bonds to position for a change in the yield curve shape. Like any trading decision, positioning for yield and curve changes requires an understanding of what is currently priced and a view on future market conditions.

Predicting movements in the level of yields is complicated in practice because of the dynamic nature of markets and the many forces that impact yield levels. We list a few common examples:

- central bank policy rate expectations;
- central bank quantitative easing expectations;
- changes in the economic outlook;
- hedging flows, such as increased demand for downside hedges for risk assets;
- flows from ETFs and passive investors;
- geopolitical events driving flows into or out of safe assets;
- large changes in the outlook for bond supply;
- large changes in demand, such as from global pension funds or sovereign wealth funds.

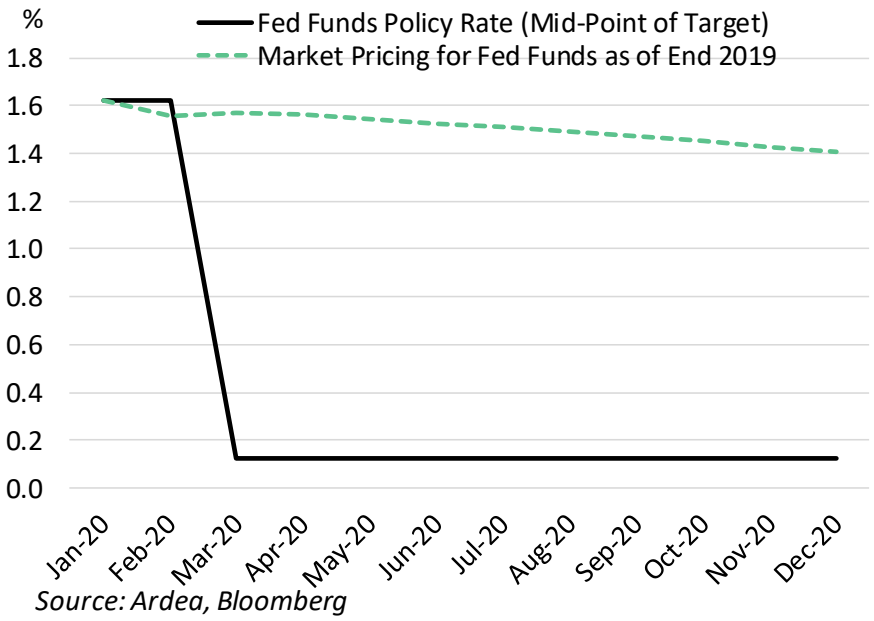
There is no single accepted framework to implement duration-based investment strategies. Portfolio managers typically need to take account of a wide range of market forces. A very basic approach might involve first examining a yield curve to understand the path for a central bank cash rate policy being priced by the market and then entering a long or short duration position based on a subjective view of how a portfolio manager thinks policy will play out in the future. Since cash rates are driven by central bank intervention, they provide an anchor on yield curves and an opportunity for investors to condition future market expectations on a view for monetary policy and the economy. Gauging what expectations are already priced into market instruments involves analysing a forward curve for interest rates in bonds but also in swaps and futures.

Note that a forward curve is related but different to the yield-to-maturity curve discussed earlier. A yield-to-maturity curve provides an indication of the average return on bonds across a maturity spectrum when the yield curve is static, assuming a spot starting date. A forward rate shows the market expectation of where interest rates will be at a future (or forward starting date) and is derived from the yield curve and derivative contracts. For example, a two year spot starting swap rate is at 0.20%, but because the market expects rates to rise, the two year forward starting, two year swap rate is 1.20%.

Chart 6 shows an example of the market pricing for the US Fed Funds rate at the end of 2019 for the year 2020 compared to what actually transpired. The market was expecting the Fed to cut rates in 2020, but nothing like what the Fed actually delivered in the wake of the escalating COVID pandemic. Rates were expected to take the escalator, but instead they took the elevator. With the benefit of hindsight, the decision to position for lower rates was the right call. But looking at what was priced at the end of 2019, many investors might have correctly anticipated rate cuts were coming but that enough Fed action (or risk

of cuts) was already priced and so a very small duration underweight or neutral position was warranted. Of course, this example is extreme, but does illustrate the general challenge in both forecasting interest rates and relating that outlook to an investment decision.

Chart 6: The Fed Funds rate in 2020 vs market expectations at the end of 2019

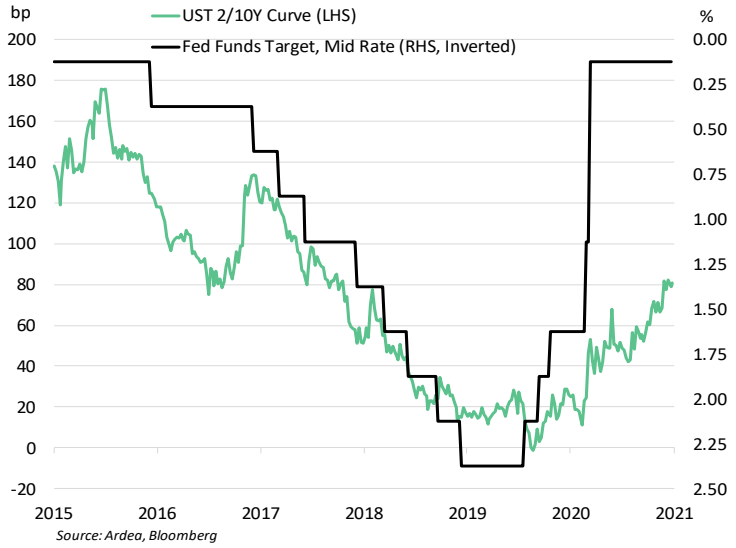


Source: Ardea, Bloomberg

Central bank policy changes traditionally impact shorter-dated bonds by more than longer-dated bonds. The distribution of risks to the longer term interest rate outlook, the value of duration as a hedge and other supply/demand factors have a bigger impact on long term bonds. This gap in the macro drivers at different parts of the curve gives rise to many popular yield curve trading strategies. A few years ahead of our previous example, the Fed lifted the funds rate from 0-0.25% to a high of 2.25-2.50% (policy target range). Over this period, longer term yields reached higher absolute levels. However, the change in shorter maturity US Treasury yields, such as the 2Y, was greater relative to their starting point, than longer maturity yields like 10y. Expectations of an eventual turn in the cycle, thoughts about the new "neutral" level of rates and lower global ex-US interest rate levels all kept a lid on long term US yields. The net result was a consistent flattening of the 2y vs 10y curve from 2015 to 2019 (Chart 7). At this time, many investors took the view that a flattening trade provides a higher risk-adjusted return than trying to predict the overall direction of yields or intermittently timing long and short trades in 10y bonds.

Eventually the curve inverted, which many investors and economists took as a negative indicator for the US economy, given the history of the yield curve inversions as a predictor of recessions (there is a vast number of empirical studies on the usefulness of the yield curve in economic forecasting, such as this note from the Boston Fed).

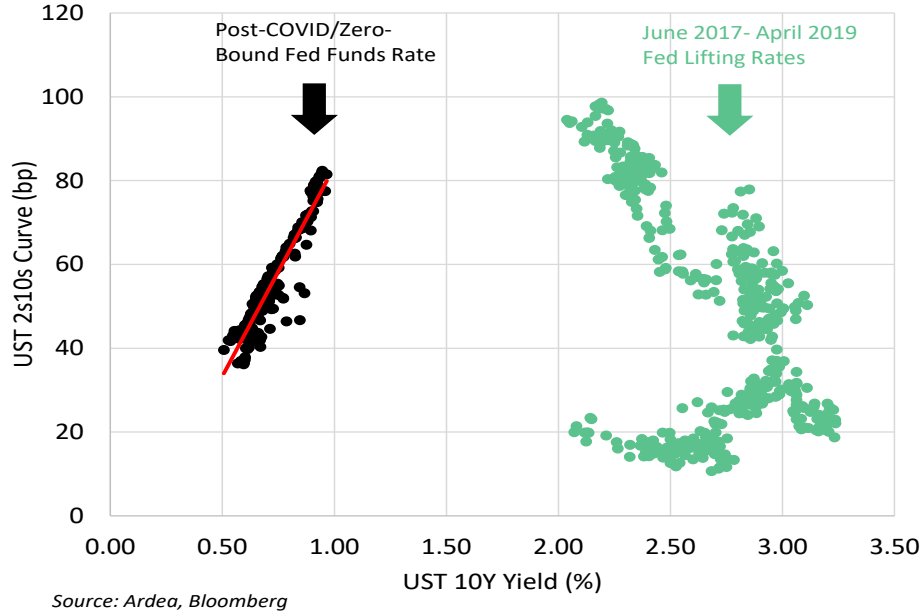
Chart 7: The US Treasury 2y vs 10y curve through the last Fed policy tightening cycle



Source: Ardea, Bloomberg

A risk with any macro-oriented trading strategy – outright or curve – is a major macro market regime change. If we take the US curve flattening trend of 2015-2018 and extrapolate it forward to a post-COVID pandemic 2020, the macro trade-offs have dramatically changed. In 2020, the Fed took the Funds rate to zero, promised to keep it there until the recovery is assured and did not commit to negative rates. The Fed simultaneously purchased longer term bonds, but there remained a very large "free float" of bonds on issue. These two decisions alone have profound impacts on the correlation of bond yields within the curve and on the risk of curve trading strategies. By locking down the short-dated yields with zero rate pledges, a 2y vs 10y curve trade ends up dominated by the volatility of the 10y yield. As Chart 8 illustrates, in 2020 a 2y vs 10y curve trade behaves more like a 10y only trade (duration risk), which has significant broader impacts on portfolio construction beyond an individual macro curve position. In this case, an investor would have to consider their risk sizing in the trade or whether a different combination of maturities would better suit their needs.

Chart 8: The US Treasury 2y vs 10y curve before and after the zero bound Fed Funds rate



Source: Ardea, Bloomberg

2) Micro interest rate market trades

We have described how understanding the relationship between different parts of the yield curve and macro drivers is critical for forming duration views, constructing bond portfolios and identifying trades like 2y vs 10y curve positions, which are often described as “macro relative value”. Beneath the macro surface of the market there is a micro opportunity set. Taking advantage of these micro opportunities involves a more nuanced analysis of the curve to identify value in specific securities, rather than just adjusting different sectors of the curve by macro fundamental drivers to identify value.

Some market participants use micro analysis for a stand-alone strategy or to optimise a macro investing framework. For example, an investor might decide first to increase duration or to buy bonds based on a macro view. Their second step might be to take a micro view of the curve to choose which bond within a sector of the curve to buy. Another common approach is to set up relative value trades to take advantage of specific distortions by buying “cheap” and selling “rich” securities.

There are a very wide range of micro curve distortions and relative value strategies in the rates market, as well as the quantitative and qualitative methods of screening for trades. In this primer, we list only a few of the market drivers, analytical methods and examples of trades. In later notes, we will provide more detail and specific examples around micro curve and relative value trading strategies.

Key drivers of micro yield curve and market distortions:

- new bond issuance;
- regulation driving investors into certain securities;
- mandate restrictions preventing investor access to certain securities;
- currency-hedged vs unhedged value considerations;
- money market funding distortions;
- bond futures basket or cheapest-to-deliver implications;
- liability hedging flows;
- structured derivative product hedging flows;
- central bank bond portfolio decisions.

Some of the methods investors use to identify micro yield curve and market distortions:

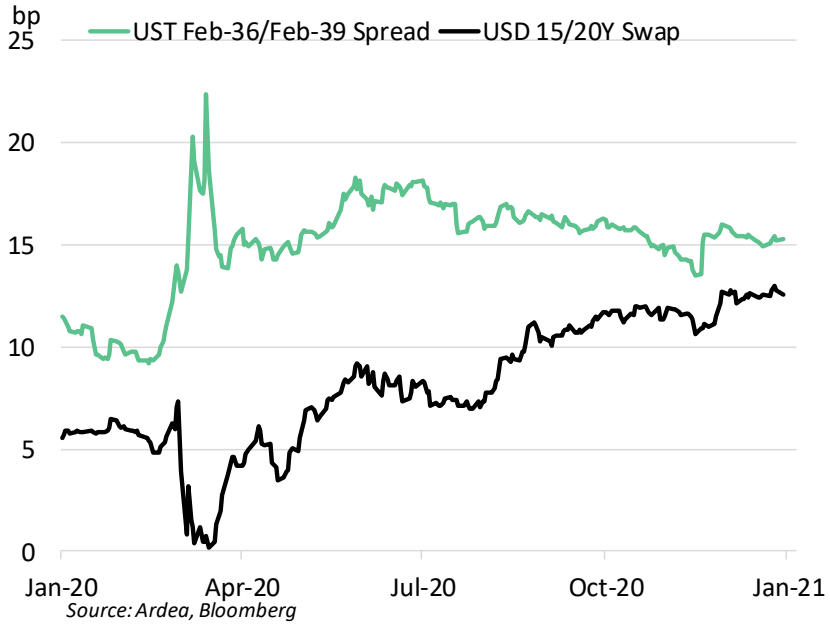
- micro yield curve and butterfly spread range analysis;
- fitted yield curve fair value models;
- bond vs swap curve comparisons;
- regression analysis;
- duration adjusted curve analysis;
- carry analysis.

Many micro curve distortions require multiple analytical perspectives to identify the right combinations of rich or cheap securities to trade. The size of these valuation gaps are often small and so portfolios targeting RV trades generally take large numbers of positions. Like our macro rates section, for ease of simple illustration we show a few of the more extreme market examples of the last few years.

The relationship between physical bonds and the futures market and the physical bonds that underly futures contracts provides a common source of micro curve distortions in the bond market. Coupled with sharp changes in market liquidity conditions, the relationship between bonds that are otherwise very similarly priced can change quickly.

For example, in early 2020 the gap between two maturities on the US Treasury curve – the Feb-36 and Feb-39 – widened very sharply as the onset of COVID led to a temporary evaporation in liquidity. The slightly longer maturity Feb-39 bond cheapened relative to the Feb-36 by more than would normally be the case for a slightly longer bond in a generally upward sloping yield curve. As Chart 9 shows, the gap between the two yields jumped sharply in March. Investors preferred the Feb-36 (keeping its yield relatively lower) because this bond was the "cheapest-to-deliver" in the prevailing long bond (20y) futures contract, meaning this is the optimal bond to deliver to settle a futures position. The Feb-39 didn't benefit from this feature and so traded cheaper and the gap between the bonds was exaggerated by a temporary vacuum in market liquidity as the worst of the COVID crisis (for financial markets) unfolded. We also show in Chart 9 a comparable maturity swap curve remained much flatter.

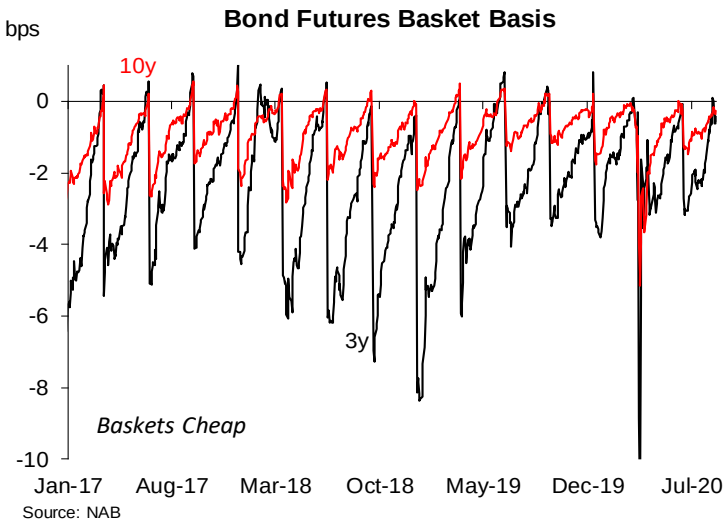
Chart 9: US Treasury Feb-36/Feb-39 bond yield spread vs 15/20y swap spread



Source: Ardea, Bloomberg

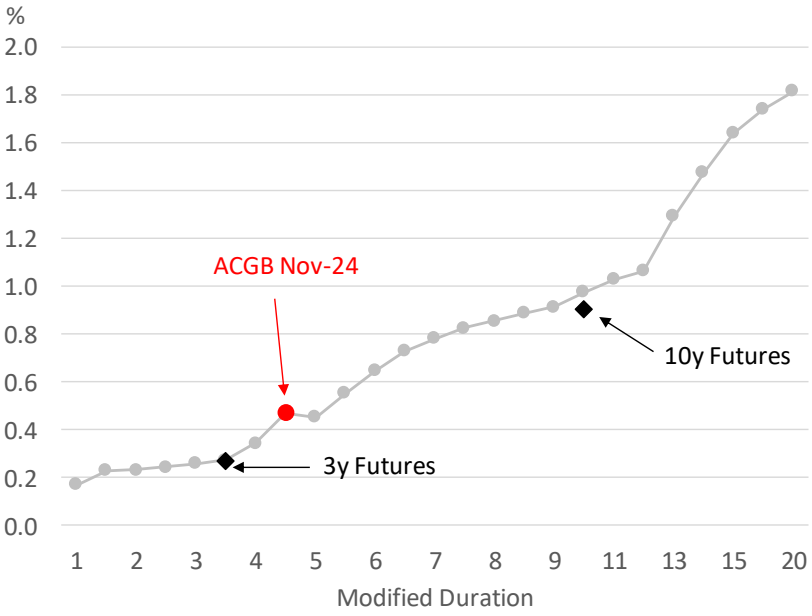
As with our earlier post-COVID macro example, being able to time when to enter and exit this sort of trade (in either direction) would have proven very challenging in practice. It is more common for the relationships between bonds that can and can't be used to settle futures contracts to be much more tightly bounded, allowing for less risky micro curve trading. This is also the case in other bond markets where the futures contracts are only cash settled based on a defined basket, such as Australia. Chart 10 shows the gap between the yield on a 10y Australian government bond futures contract and the average of the underlying basket bond yields (lower means cheaper physical bonds relative to futures). The futures contract will always settle based on the physical bond yields at expiry, but supply and demand dynamics for physical bonds vs futures causes the spread to vary within contract periods. Investors can trade this gap (we are showing a pure arbitrage method of trading this spread, but it is also possible to trade the gap between futures and individual bonds).

Chart 10: Australia 10y physical "basket bonds" vs 10y futures spread



A final example of a micro curve relative value trade also comes from Australia in 2020. The government issued a new 4 year bond (Nov-24 maturity) in April 2020 at a time of still limited physical bond demand. At the time, the Reserve Bank of Australia (RBA) had a 3y yield curve target of 0.25% in place, which anchored the 3 year part of the curve, but had less impact on the 4 year part of the curve. The new bond priced at a spread of 19bp over the 3y yield (based on a 3y futures contract), which represented a cheap valuation for just a one year extension on the curve – a type of new issue yield premium or price discount. It was attractive to short the 3y part of the curve and buy this new Nov-24 bond to lock in a 19bp spread, which tightened 10bp over the following quarter, benefiting those investors that bought at first issue. Chart 11 shows this bond on a duration-adjusted yield curve to reflect the small incremental increase in risk.

Chart 11: Australia duration-adjusted government bond curve at time of Nov-24 issue



A final worthwhile practical consideration with micro relative value trades is “carry”. The carry on a bond or interest rate derivative is defined as its income (from coupons, swap cash flow etc) net of financing cost. The carry concept allows investors to quantify the return on holding a bond or trading strategy if the market only moves by the amount priced into the forward curve. In other words, a carry calculation allows an investor to:

- figure out a total return potential of a trade by adding the carry to the expected price/yield movement;
- estimate a total breakeven level for the profit and loss of the trade at the time of entry.

The carry concept is relevant for all fixed income portfolios and types of trading strategies but is especially critical when assessing micro curve and RV strategies, as these positions (at the individual level) tend to track more confined trading ranges. Making sure the trade doesn’t cost money to hold while waiting for a mispricing to revert is therefore important. A further step for some RV trades is to adjust the carry by the expected volatility of the position. The actual calculation of carry varies by type of interest rate market instrument (we will cover this topic in more depth in a later update).

3) Government bond vs swap curve trades

An in-depth discussion on derivatives is beyond the scope of this note, but it is worth covering some brief, but important practical points on swaps and the differences between swaps and government bonds. There are many types of interest rate swaps. For simplicity, here we will refer to the vanilla fixed vs floating swap curve. This standard interest rate swap allows counterparties to exchange fixed for floating cash flows and the payments are netted over the life of the swap contract. The rate agreed upon for a given term is referred to as a swap rate and these are traded in the market like bonds.

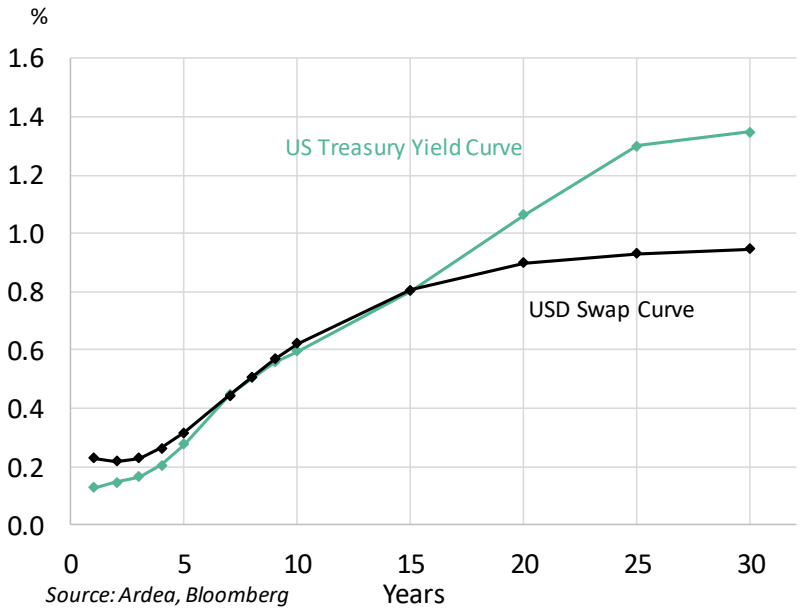
Swaps provide investors with the benefits of gaining exposure to movements in market yields without the upfront commitment of capital required by purchasing a bond and are highly flexible contracts. These attributes of swaps allow market participants to hedge interest rate risk and speculate on the direction of interest rates. Many of the level and curve shifts in swaps follow the broad macro interest rate market drivers discussed earlier. There are, however, some important differences.

Interest rate market participants actively trade these differences or spreads between government bond yield and interest rate swap curves, generically referred to as “swap spreads”. We briefly outline the importance of swap spreads and provide examples of how the different curves and spreads impact portfolios and provide extra trading opportunities.

First, a few of the reasons why a gap between bond yields and swaps exists:

- hedging and speculative flows in the swap market;
- differences in money market funding spreads, such as bond repo vs LIBOR;
- flows into bonds by real money investors;
- central bank policy, especially QE;
- bank regulations;
- sovereign credit risk;
- Perceptions of bank credit risk (this used to be a major driver, but has diminished greatly over the last five years amid central clearing and regulation);
- changes in bond supply.

Chart 12: US Treasury Yield Curve vs USD Swap Curve in August 2020



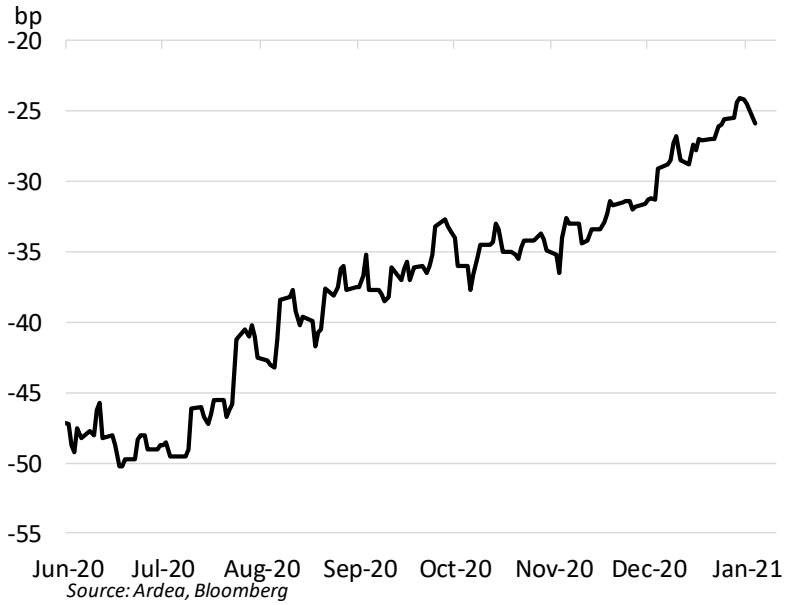
Source: Ardea, Bloomberg

Turning to a practical example, a wider gap is evident in Chart 12 between long maturity bonds and swap rates than in shorter maturities. One key reason for this wider long term swap spread is the outlook for large volumes of sovereign bond issuance, as the US government ramps up spending to fight a slowing economy. Investors may demand a higher yield compared to a comparable swap rate to compensate for extra supply (further discussion of relative value through this period is discussed here). There are two main advantages to understanding this spread:

- 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 cheap bonds.
- Swap spread trading opportunities. For example, if an investor thought the 30y bond is likely to outperform a 30y swap curve (such as shown in Chart 12), buying bonds and paying swaps would be an attractive trade.

Extending this second point with an example, the supply discount evident in long term US Treasuries in 2020 had to be balanced against the other forces impacting bonds. In particular, the possibility that growth would lift and lower issuance estimates, the growing Fed bond portfolio and the comparative attractiveness of US Treasuries to offshore investors that are more active in bonds than swaps. As Chart 13 shows, as it transpired, the swap-bond spread lifted (bonds outperforming swaps) over the latter part of 2020. For investors able to time such a move, there was significant pickup available by trading a spread instead of a higher risk outright yield or duration position.

Chart 13: US 30 Year Swap-Bond Spread in H2 2020



Source: Ardea, Bloomberg