Insight INVESTMENT

GLOBAL MACRO RESEARCH
YIELD-CURVE INVERSION: AN UNRELIABLE RECESSION SIGNAL IN A WORLD OF QE

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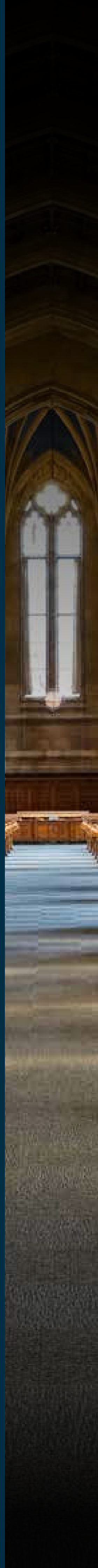
EXECUTIVE SUMMARY

1. Yield curves for major developed market government bonds have been materially inverted for over a year. Historically, yield-curve inversion has signalled a recession to come, as the market prices in future interest rate cuts from central banks – but there are few, if any, signs of a meaningful recession ahead. // 3

2. Our analysis suggests there is a factor artificially suppressing the longer end of the yield curve: the expansion of central banks' balance sheets following the global financial crisis. // 4

3. Central banks balance-sheet reductions could remove this distorting effect over time, eventually helping restore the value of yield curve inversion as a signal for recession. // 6

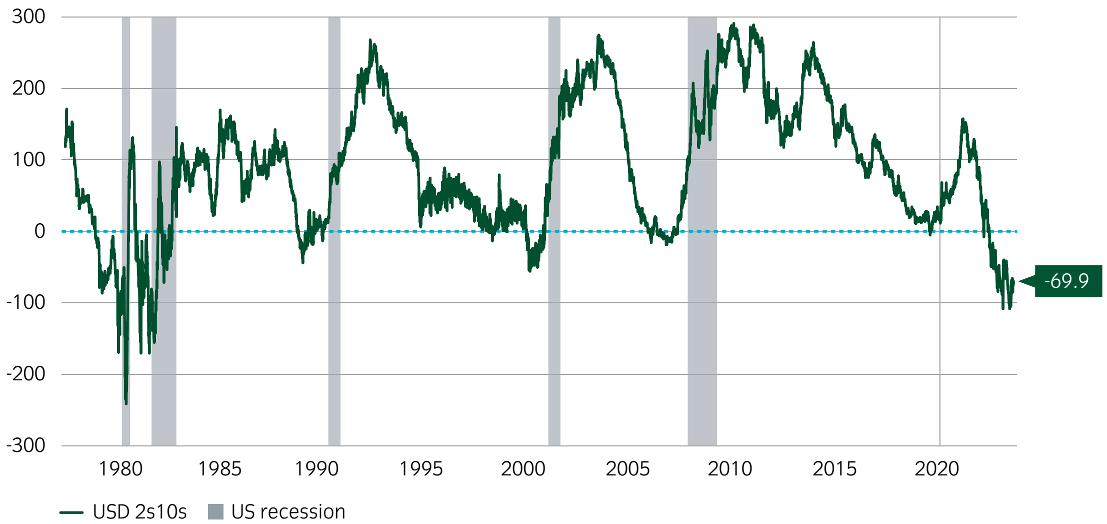


A BROKEN INDICATOR?
YIELD CURVES HAVE INVERTED – BUT THERE IS NO RECESSION YET

TYPICALLY, SHORT-TERM BOND YIELDS ARE LOWER THAN LONGER-TERM YIELDS, REFLECTING THE HIGHER RISK ASSOCIATED WITH THE LATTER. IT IS RARE FOR SHORT-TERM YIELDS TO BE HIGHER, AND WHEN THIS OCCURS, IT IS WIDELY TAKEN AS A SIGNAL THAT THE MARKET DEEMS THE OUTLOOK SHORT-TERM ECONOMIC OUTLOOK TO BE POOR[1].

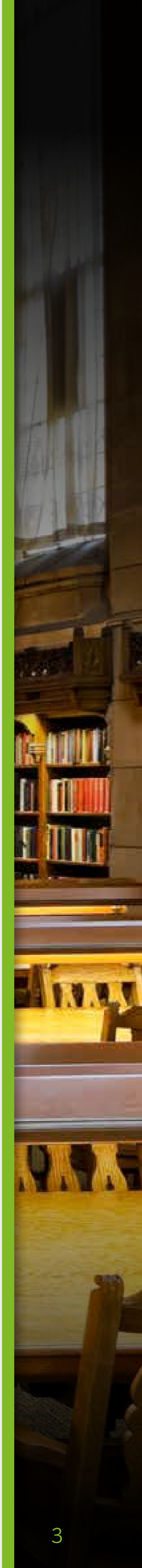
Historically, yield-curve inversion has been shortly followed by a recession, as illustrated in Figure 1 which shows when the 2-year US Treasury yield has exceeded the 10-year Treasury yield. However, this relationship now appears to be broken. The 2-year/10-year US yield curve has remained inverted for over a year, and we are yet to enter a recession.

Figure 1: The 2-year/10-year US yield curve has inverted, but there is no recession – yet[2]



The apparently broken relationship between an inverted yield curve and economic performance could be due to forward guidance from central banks; negative interest rates in some jurisdictions, if the usual linearity of lower rates leading to steeper curves is reversed when rates go negative; excess global savings; lower interest-rate volatility; or lower inflation expectations. The impact of these factors merits further research.

We believe a key factor is the shift in central banks' policies since the global financial crisis – in particular, quantitative easing and the expansion of central banks' balance sheets due to extensive asset purchases. By suppressing the yield curve at the long end, our contention is that the previously useful economic signal of yield-curve inversion no longer works. **This conclusion suggests that as central banks' balance sheets reduce in size, the yield curve could once more become a useful and effective indicator of recession.**



[1] For example, see: Why Does the Yield-Curve Slope Predict Recessions?, 2018, Federal Reserve Bank of Chicago.
[2] Source: Insight analysis and Bloomberg, as at 31 August 2023.

THERE IS A DEMONSTRABLE RELATIONSHIP BETWEEN RECENT YIELD-CURVE INVERSION AND THE SIZE OF CENTRAL BANK BALANCE SHEETS

TO UNDERSTAND THE RELATIONSHIP BETWEEN THE YIELD-CURVE INVERSION OF RECENT YEARS AND CENTRAL BANK BALANCE SHEETS, WE MUST FIRST WORK OUT HOW YIELD CURVES WOULD LOOK WITHOUT AN AGGRESSIVE EXPANSION OF CENTRAL BANK BALANCE SHEETS, AND USE THE RESULTS TO ASSESS WHETHER THE LATTER HAD ANY IMPACT ON THE YIELD CURVE.

To do this we followed three steps.

1. For US Treasury, German bund and UK gilt yields, we used regression analysis to model the relationship between cash rates (3-month LIBOR), 2-year and 10-year yields before the global financial crisis occurred.
2. We then applied the same regressions from the global financial crisis to the present day. When we compare the results of our model to where markets have actually traded, we are left with an unexplained residual. We believe that this residual can largely be explained by central bank bond purchases.
3. To test this hypothesis, we examined the relationship between the size of the residual relative to the size of central bank balance sheets.

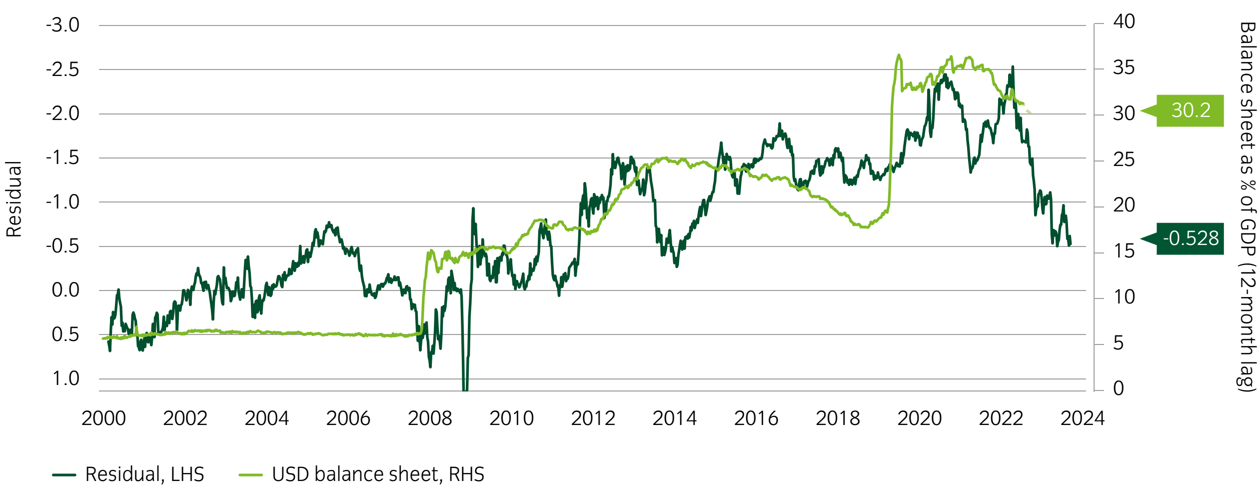
Our analysis found that the residual and the size of the relevant national central bank's balance sheet, measured as a percentage of national GDP, were related to a statistically significant degree.[3]

ANALYSIS APPLIED TO THE US YIELD CURVE

In the US, it is clear that a significant change occurred in the years following the global financial crisis, with the yield curve trading well away from modelled fair value (see Figure 2). The size of this unexplained residual continued to grow as the Fed expanded its balance sheet in the years that followed.

Interestingly, as the Fed hiked rates between late 2015 and 2019, the fair value of the curve flattened to reflect this, reducing the residual over that period. This then changed dramatically once again as the pandemic hit and the Fed aggressively expanded its balance sheet further.

Figure 2: Comparison of US yield curve residual and Fed balance sheet[4]

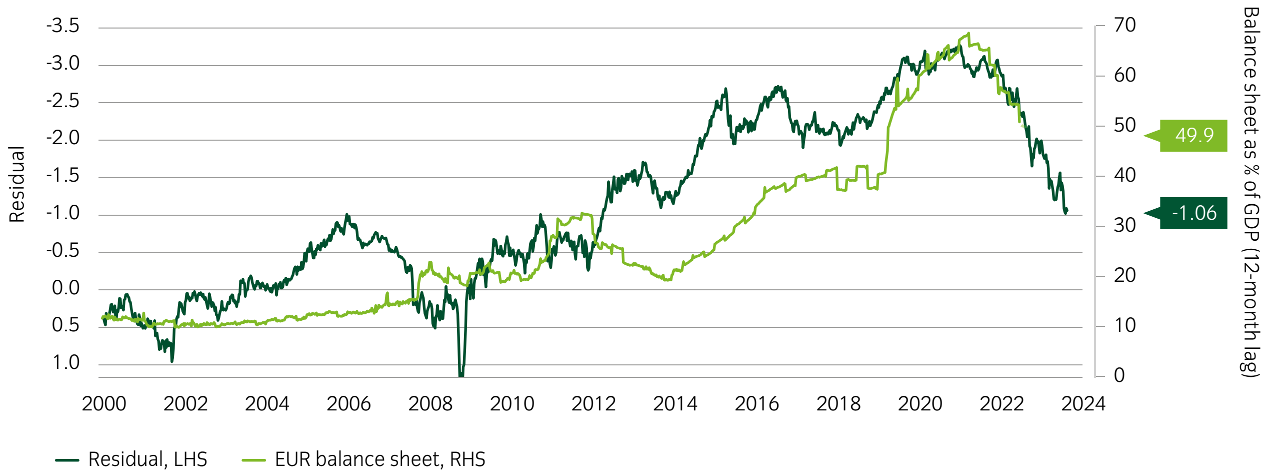


[3] Model results have certain inherent limitations, and do not represent actual trading/returns. Investors' actual results may be materially different than the model results presented.
[4] Source: Bloomberg and Insight analysis, as at 31 August 2023.

ANALYSIS APPLIED TO THE GERMAN YIELD CURVE

For the German bund yield curve, the curve flattened significantly into 2019, despite there being no interest rate hikes from the European Central Bank (ECB). The large difference between our modelled fair value and the actual slope of the yield curve appears to be highly correlated to the size of the ECB's balance sheet (see Figure 3).

Figure 3: Comparison of Germany yield curve residual and ECB balance sheet[5]

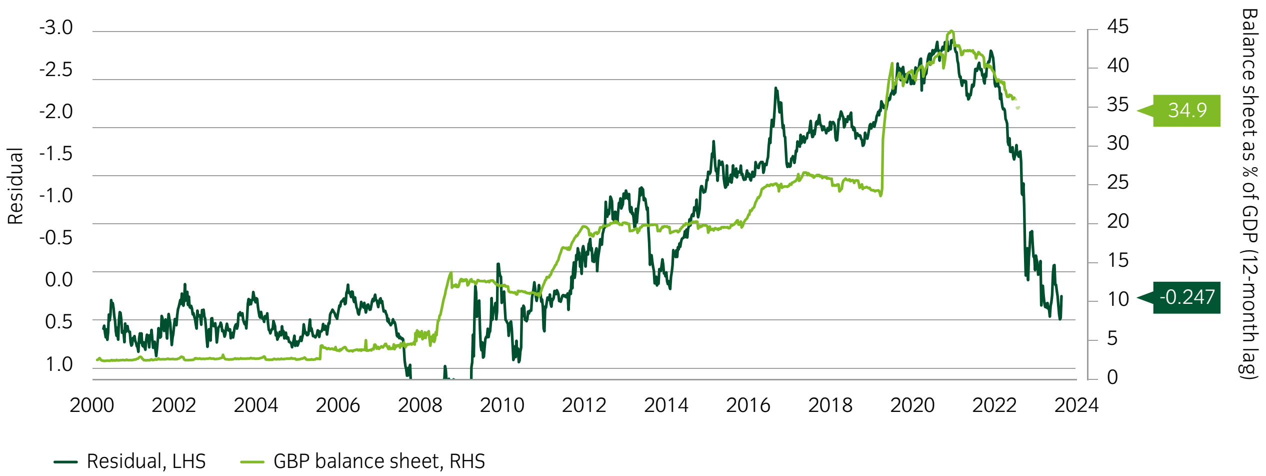


ANALYSIS APPLIED TO THE UK YIELD CURVE

In the UK, there was also a clear structural break after the global financial crisis, as can be seen by the dramatic move in the residual in Figure 4.

Despite a minimal rate-hiking cycle in 2018, the yield curve flattened to a much greater degree than our model suggests it should have, and the unexplained residential grew steadily over that period as the Bank of England expanded its balance sheet. It's notable that the relationship between the UK residual and the Bank of England (BoE) balance sheet is tighter than for the US.

Figure 4: Comparison of UK yield curve residual and BoE balance sheet[6]



[5, 6] Source: Bloomberg and Insight analysis, as at 31 August 2023.

AS CENTRAL BANK BALANCE SHEETS SHRINK THE YIELD CURVE COULD REGAIN ITS USEFULNESS AS A RECESSION SIGNAL

Our analysis summarised in the previous section indicates that:

- there was a meaningful divergence between the slope of the yield curve in reality, and that expected through regression analysis; and
- this divergence is highly correlated with the size of relevant central banks' balance sheets.

Based on these conclusions, we created a formula to guide our expectations for future development of the 2-year/10-year yield curves, based on our expectations for central bank balance sheets in the future.

CENTRAL BANKS' BALANCE SHEETS ARE SET TO KEEP SHRINKING

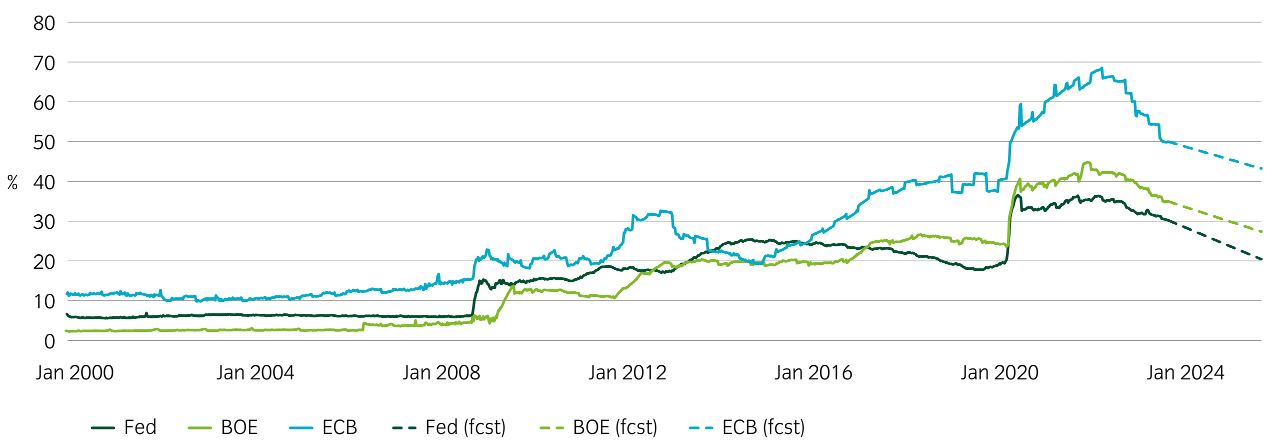
We expect central banks to maintain the pace of run-off even if policy rates begin to be lowered. There are clear signs that balance sheet size has impacted liquidity and increased the scarcity of government bonds (especially in the eurozone). By running down their balance sheets, central banks provide more room to ease policy via quantitative easing in the future if needed.

This assumption is likely not to hold if a deep recession develops and interest rates are cut rapidly. In this scenario, their balance sheets would likely stabilise or grow again.

- **US/Federal Reserve:** We expect the current roll-off pace of $90bn per month for at least the next two years, potentially ceasing if levels similar to 2012 or 2019 are reached. We expect a policy rate of 5.125% in late 2024, reflecting one rate cut at the start of a policy-easing cycle.
- **Europe/European Central Bank:** We expect the current roll-off pace of €25bn per month indefinitely. We have tentatively forecast a stop to reinvestments of principal payments from the pandemic emergency purchase programme (PEPP) from March 2024, equivalent to c.€6bn per month, and accounted for roll-offs of targeted longer-term refinancing operations (TLTROs) over the next two years. We expect a policy rate of 4% in late 2024.
- **UK/Bank of England:** We expect a roll-off pace of £100bn per year over the 12 months to September 2024 and September 2025 respectively. We expect a policy rate of 5% in late 2024.

We illustrate our forecasts for these central banks' balance sheets, as a proportion of GDP, in Figure 5.

Figure 5: Insight forecasts a reduction in the size of central banks' balance sheets as a proportion of GDP (%)[7]



[7] Source: Source: Bloomberg and Insight analysis, as at 31 August 2023. Note there was some variation in the scale of central bank balance sheets before the GFC, around 2.5% for the BoE, 6% for the Fed and 12% for the ECB. Changes in the functioning of money market operations since then may need a permanently higher level, similar to the mid-2010s. Nominal GDP growth assumptions use Insight forecasts for 2024 and the Bloomberg consensus for 2025. Our assumptions around base rates come from the latest rates forecasting round in June, substituting policy rates for LIBOR.

SHRINKING CENTRAL BANK BALANCE SHEETS COULD LEAD YIELD CURVES TO NORMALISE

We modelled the relationship between the 2-year/10-year yield curves for the US, Germany and the UK; the policy rate; and the size of the relevant central banks' balance sheets. We sought to consider structural differences between the markets, while assuming a degree of commonality between them.

The analysis suggests the following (see Figures 6, 7 and 8):

- **Shrinking central bank balance sheets could lead, all else being equal, to a reduction in the inversion of yield curves.**
- **If our projections for earlier interest rate cuts and a reduced balance sheet for the US Federal Reserve relative to Europe and the UK are correct, the US yield curve should become less inverted than in Germany (we expect the ECB balance sheet to remain large) and the UK (we expect interest rates to remain high).**

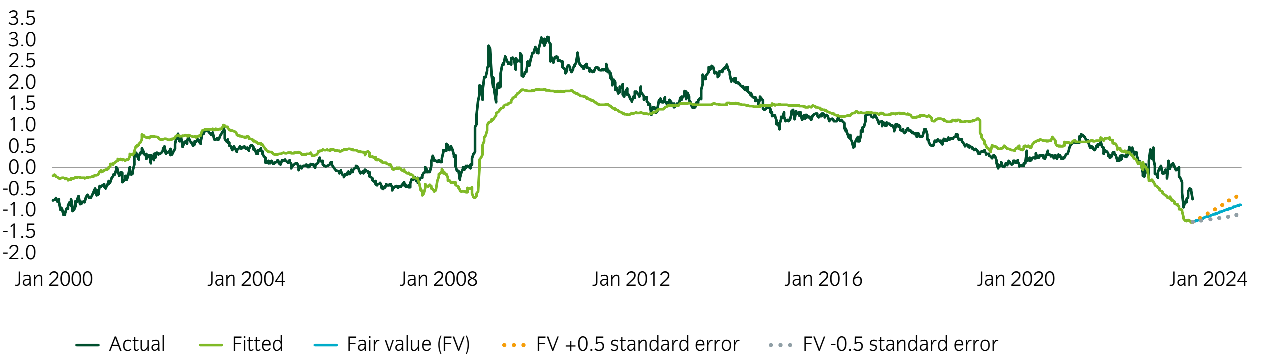
We note that while the extent of yield-curve inversion driven by central bank balance sheets reduces in all cases, the regressions suggest that the European and UK yield curves are currently less inverted than they 'should' be, as illustrated by the gap between the actual and fitted data in Figures 7 and 8.

We believe this analysis presents another angle on the relationship of a central bank's balance sheet and the yield curve, and will seek to incorporate the relevant models into our strategic bond forecasts.

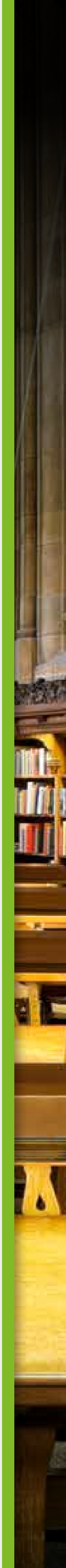
Figure 6: US 2-year/10-year yield curve actual vs expected[8]

Figure 7: Germany 2-year/10-year yield curve actual vs expected[9]

Figure 8: UK 2-year/10-year yield curve actual vs expected[10]



[8, 9, 10] Source: Bloomberg and Insight analysis, as at 31 August 2023.



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