DEBUNKING THE YIELD CURVE AS A 'SUPER-FORECASTER'* OF RECESSIONS

Please note that this document may contain technical language. For this reason, it is not recommended to readers without professional investment experience.

RICHARD BARWELL
HEAD OF MACRO
RESEARCH

▼

Richard is the Head of Macro Research at BNP Paribas Asset Management. His team is responsible for producing market relevant research, including: analysis of high frequency news, market developments, upcoming policy decisions and political events; and producing macroeconomic scenarios, thematic research and trade ideas. Prior to joining us, Richard worked at the Royal Bank of Scotland and at the Bank of England for almost a decade. He holds a PhD in Labour Economics from the London School of Economics and Political Science. Richard has written several books on economic policy and published a number of articles on this subject.

* Source: 'Superforecasting: The Art and Science of Prediction', Philip Tetlock and Dan Gardner

The credentials of the yield curve as a 'super-forecaster' of recessions should be treated with scepticism. At best, the yield curve is a mirror that reflects what we already know, or think we know, about the economy. The slope of the yield curve and whatever message it sends about recessions risks should therefore reflect nothing more than the market's considered assessment of public information on economic fundamentals or the conduct of economic policy for example; and potentially much less. This mirror image is likely distorted, offering an inaccurate view of the true state of the macro outlook because the slope of the yield curve is also driven by other factors, unrelated to the risk of recession. There is no plausible, stable mapping between a percentage point increase in the perceived (or actual) probability of a recession and the slope of the yield curve; be it the corresponding shift in either expectations of short rates or the term premium.

The only reason to ignore fundamentals and focus instead on their reflection is if you believe that bond investors are better at economics than economists – that the slope can partially reveal the superior forecasts of those investors. In any case, it seems unlikely that a market where prices are increasingly driven by global investors and global factors can speak authoritatively on local developments. Moreover, the very shift in the shape of the yield curve that supposedly sends a signal of looming recession reduces its likelihood by stimulating demand. The real risk of recession may arise in 'tantrums': when the yield curve decouples from fundamentals and there is an unwarranted increase in medium to long-term yields that will depress activity. We accept there are reasons to be concerned about the outlook for demand at the global level, but we maintain that investors are better off forecasting recessions by thinking about fundamentals and discussing with economists than excessively analysing the distorted reflection of fundamentals in the yield curve mirror.

BNP PARIBAS
ASSET MANAGEMENT

The asset manager for a changing world

INTRODUCTION

The yield curve has flattened dramatically over the past couple of years. Since the election of President Trump, we have seen that the spread between short-term and long-term US yields has compressed from over 2 percentage points to under 1 percentage point in late 2018, and then to around 30 basis points at the start of this year.

This latest bout of flattening has triggered renewed interest in an old question in economics and finance – *is the slope of the yield a good leading indicator of recessions?* – leading investors to question whether a recession in the coming quarters is likely.

In theory, a whole host of financial variables could contain useful information about the likelihood of a recession. Two decades ago, Estrella and Mishkin (1996) argued that within that potential set of leading indicators, the yield curve slope – specifically, the spread between the interest rate on the ten-year Treasury bond and the three-month Treasury bill – was the best in class, significantly out-performing other variables at forecasting recessions two to six quarters in the future. This result and subsequent corroborative research has become firmly lodged in the market psyche. For example, Bauer and Mertens (2018a) claim that:

> *'the term spread is one of the most reliable predictors of future economic activity among a wide range of economic and financial indicators and, as such, is closely watched by professional forecasters and policymakers alike'*

Indeed, many investors are currently questioning whether the current flat curve signals an increased risk of recession in the near future. These concerns also appear to be shared by some policymakers as well. For example, Bullard (2018) argues that:

> *'Historically, an inversion of the yield curve has been a bearish signal for the U.S. economy and has helped predict recessions'*

Chart 1: The US yield curve slope
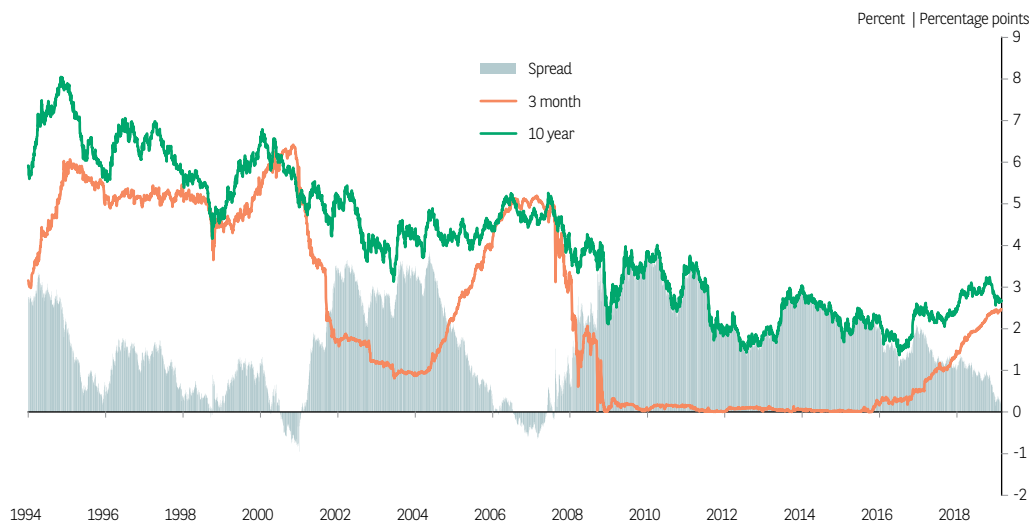
Source: Haver and Bloomberg, BNP Paribas Asset Management, 26 February 2019.

In this article we argue that confidence in the forecasting prowess of the yield curve is misplaced. Given the particular interest in the shape of the US yield curve, the primary focus of this article is on the US economy and whether the risk of recession has materially increased. However, most of the arguments presented can be applied more broadly. This article is structured as follows.

Section 1 discusses the plausible mechanisms which could explain a predictive power in the yield curve slope and the accuracy of the slope's forecasting ability. In doing so, this section raises serious questions about the market's favoured 'early warning' indicator of recession.

Section 2 underlines why government bond yields cannot be expected to behave like a theoretical exotic binary option which could beused as a recession indicator: it is unrealistic to expect any stable mapping between a percentage point increase in the risk of recession and a movement in the slope.

Section 3 argues that the only individuals who would trust the distorted reflection of fundamentals of the yield curve to forecast recessions are those without access to economic data; or those who believe the market is a better forecaster than the individuals and institutions who place their forecasts in the public domain.Otherwise, surely it is better to focus on the fundamentals themselves.

Section 4 introduces an inherent weakness in any recession forecast based on the yield curve.The shift in yields that supposedly signals an increased risk of output contraction should in fact stimulate demand, thus reducing the risk of recession.

Section 5 discusses the illogicality in expecting a yield curve increasingly driven by global forces to forecast local recessions.

Section 6 offers an alternative rationalisation of the recent behaviour of the yield curve and **Section 7** reflects on the curious response of policymakers to the recent disconnect between investor expectations of the future path of rates, and the guidance that they provide on the current path of rates. Finally, **Section 8** concludes.

- SECTION 1 -
AN EMPIRICAL REGULARITY IN SEARCH OF AN EXPLANATION

The slope of the yield curve may have a good track record of forecasting recessions, but before putting too much faith in this indicator we should consider why the slope might have predictive power. We have so far referred to the slope of the yield curve as though it was a clear and measurable concept, although it is not.

There is no single definitive measure of the *slope* of the yield curve as there is no credible linear relationship between yield and maturity that spans all relevant maturities. Instead, a *slope* can be defined at a point on an estimated curve, or a *spread* can be defined between the yields at a pair of points. There is no guarantee that these slopes or spreads will even have the same sign, let alone be of comparable size for a given curve at a given moment in time.

In any case, econometric analysis ought to proceed from a clearly defined hypothesis that is based on a firm prediction of theory. Firstly, one should specify how the yield curve slope foretells the onset of recession; then suggest the appropriate metric of the slope; and finally, test the predictive power. Otherwise, there is a risk of specification searching (Leamer (1978)) – one should avoid uncovering an empirical regularity (in this case, between the yield curve slope and recessions) then scouring all possible representations of that relationship (in this case, all possible representations of the slope) to obtain the 'model' with the best fit, and only then rationalising that particular relationship by appealing to whatever theoretical argument suits.

Generally, literature tends to spend relatively little time on providing solid foundations for the yield curve's superstar status (for an honourable exception see Benzoni, Chyruk and Kelley (2018)) and instead moves straight on to illustrating its forecasting prowess. The literature essentially relies on one of two mechanisms: expectations effects at the front end of the curve, or term premia effects at longer maturities.

Actual and expected policy rates at the front end of the curve

Basic economic theory suggests, and monetary policy *relies* upon, the fact that an increase in official interest rates will tend to depress demand with a time lag, slowing the pace of economic growth. It is also reasonable to assume that the yield curve will flatten and ultimately invert when short-term interest rates rise, because long rates will tend not to move proportionately to short rates (see later). This establishes a basic link between the curve slope and the path of output.

A more sophisticated variant of this argument compares the short-term real rate (adjusted for inflation expectations) to an unobservable equilibrium reference rate. It is only when the relevant short rate is above "neutral" that the economy should slow. Unfortunately, that "neutral rate" is incredibly hard to estimate in real-time.

Although superficially persuasive, this argument linking the policy rate to the part of output is misleading. Central bankers set the policy rate (and influence the short real rate) to steer the economy. As a rule, policymakers will try to keep demand growing at the 'trend' rate, pinned down by the supply capacity of the economy. Therefore, the policy rate is often high when central bankers are expecting growth to be too strong and the economy is at risk of over-heating. The objective is to slow the economy down from a sprint to a leisurely stroll, without sending the economy into reverse.

It follows that a 'high' policy rate is only a concern in a specific set of circumstances:
- when the central bank slows the economy down by mistake because policymakers misjudge the underlying momentum of spending (or perhaps the sensitivity of spending to interest rates) – in that they believe growth is, or will be, much higher than will actually be the case;
- when the central bank consciously chooses to slow the pace of growth below its trend rate in order to achieve its inflation mandate, either to offset the inflationary implications of so-called cost shock (such as an increase in commodity prices), to choke off domestically generated inflationary pressure that might otherwise emerge (because the economy is operating above its normal capacity level) or to (re)anchor expectations on the target of policy.

The yield curve should reflect expectations of the future path of the short rate – because spot rates can be decomposed into a sequence of forward rates – and therefore, should indirectly reflect expectations about changes in the economy. A flat forward curve is consistent with investors believing that the short-term rate is unlikely to rise materially higher that its current level. An inverted forward curve – which is what we currently observe in the market – is consistent with expectations that the short-term rate is likely to fall. An inverted curve is therefore consistent with increased concerns amongst investors about the state of the economy because those investors are 'pricing in' hikes. However, an inverted forward curve could simply reflect an expectation that today's policy setting will slow the economy back to trend at which point the policy rate can be lowered.

Nonetheless, combining these two arguments, if the mechanism, which underpins the slope's reputation as a super-forecaster of recessions in the 'near' future, operates with current and future policy levels, the slope at the front end of the curve should hold the predictive power. For example, we could compare the spread between the current rate and the expected short rate in two years' time. The rele-

vance of the long end of the curve is less clear. After all, expectations of the level of the policy rate over the next couple of years will have very little bearing on the expectation of the average policy rate over the next decade, which is embedded in the ten year yield, for example.

Chart 2: US Forward rates
One month forward OIS rates

Percent

| | 26-Feb-19 | 03-Jan-19 | 09-Nov-18 | 01-June-18 | 01-June-17 | 07-Nov-16 |
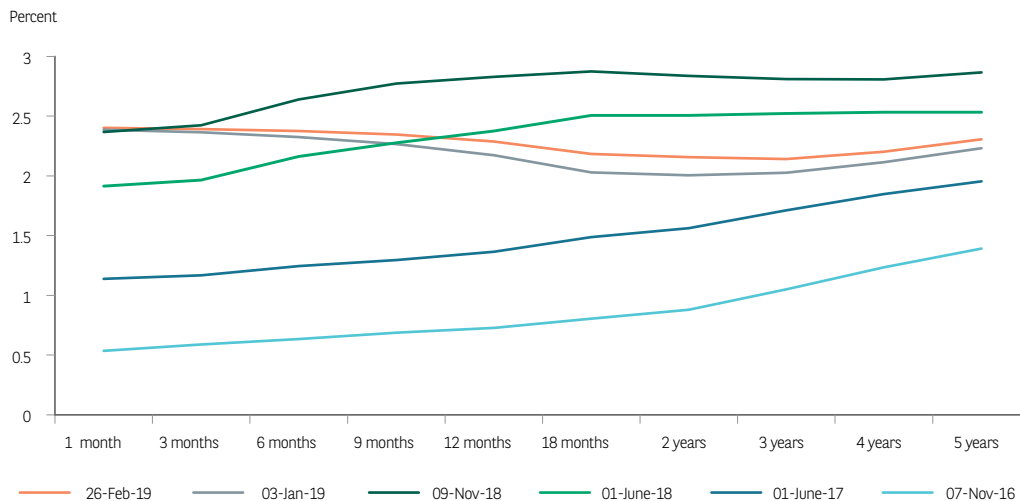
Source: Bloomberg, BNP Paribas Asset Management, 26 February 2019.

Term premia effects at longer maturities

Long rates are not determined solely by the expected path of short rates. They also embed a term premium that can potentially encompass a number of forces and chief among them ought to be compensation for interest rate risk. It is reasonable to assume that the yield curve will tend to flatten and ultimately invert when that term premium implicit in long-term bond yields shrinks - that is, when the compensation that investors demand for interest rate risk around that anticipated path of short rates becomes less positive or more negative. This might happen for a number of reasons.

If investors are reasonably confident that official interest rates have peaked – because they believe that the economy is likely to slow – then those investors are likely to demand relatively little compensation for the risk that official interest rates rise further. Alternatively, if investors are increasingly concerned about the state of the economy and the potential losses that they might incur on risky assets, then they might each try to relocate their portfolios towards safe assets like long-term government bonds. In both cases, concerns about the economic outlook will tend to inflate the price of long-term bonds via the term premium, driving the long-term yield and the slope lower (for a given short rate).

However, the term premium can compress for a whole host of reasons contrary to an increased (perceived) risk of recession. The term premium in conventional government bonds traditionally constitutes two elements: a real term premium embedded in the yields on index-linked government bonds, which provides compensation for news on real interest rates; and an inflation risk premium, which provides compensation for news on inflation that influences the return on conventional bonds.

Assuming the real term premium is positive, both a structural reduction in either the perceived volatility of real rates over the business cycle (perhaps thanks to more sophisticated forward guidance by

central banks) or the correlation of real interest rates with broader market returns would likely lead to a compression of the real term premium. This would not necessarily have any obvious consequences for the economic outlook.

Forecasting future output paths from movements in the inflation risk premium feels yet more arbitrary. If investors are less concerned about the risk of higher inflation, they should similarly be less concerned that central banks will need to dis-inflate the economy with an abrupt interest rate shock – one obvious route to recession.

In any case, if the mechanism which underpins the slope's reputation as a super-forecaster of recessions one year into the future operates via the underlying forces that shape the term premium, then we should consider the parts of the curve where these term premium effects arise. Perhaps we should focus on the predictive power of movements in the term premium itself rather than the changes in the spread between short and long-term rates, which might be influenced by shifts in that term premium. We should test the predictive power of specific drivers of the term premium (Benzoni, Chyruk and Kelley (2018)). Unfortunately, breaking up long-term rates into a term premium and an expectation of the policy rate is notoriously difficult in practice: there is not always even agreement on the sign of the term premium across the most popular measures (Li, Meldrum and Rodriguez (2017)).

Results and reflections

In their recent study, Bauer and Mertens' (2018b) find that Estrella and Mishkin's favoured forecaster (the spread between the 10 year and 3 month rate) is still the most reliable recession predictor, but there is little to choose between various proxies of 'the slope'. They argue that:

> 'all of these term spreads are fairly accurate predictors and quite informative about future recession risk; the differences in forecasting accuracy are small'.

This may be true, but the result is not particularly satisfactory as these spreads rely on distinct mechanisms. Moreover, it is not entirely obvious what specific theoretical mechanism the supposed winner of this econometric horse race – the spread between the 10 year and 3 month rates – is intended to capture.

There remains the broader question of whether it is sensible to confine our attention to the so-called 'rates' market (that is, the information from the market for government bonds) if we want to search for signals about the state of the economy. One might imagine that the price action in markets in which securities issued by companies are traded might contain additional useful information about the state of the economy. It is at least conceivable that the credit risk premium and equity risk premium – the excess compensation that investors demand for holding corporate bonds and equities – might be more sensitive to emerging signs of distress in the corporate sector before it became clear that a recession was likely. In practice, it seems that incorporating additional information into our recession prediction models has a meaningful impact on the output. For example, Ergungor (2016) concludes that:

> 'Although the 12-month-ahead recession probabilities estimated using only the term spread have not exceeded 30 percent since the financial crisis, the estimates using credit spreads and corporate profits tell a different story. The recession probability in the first quarter of this year may have risen to 73 percent excluding the quarterly change in profits or as high as 81 percent including them. These probabilities later declined to around 30 percent'

- SECTION 2 -
A FAKE FORECASTER

Due to the consensus that the price of a security will move in a particular direction in the event of a recession, it is reasonable to assume that the price of the security will embed an implicit expectation of the probability of a recession. However, the yield curve slope – or almost any asset price – is not necessarily fit for purpose as a recession forecaster.

In theory, we could construct a binary option that delivers the holder a given return in the event that a recession occurs within a specified time period, and gives zero if it doesn't. In this case, the value of that option would indeed be driven by the perceived probability of recession. However, this is not how conventional long-term government bonds operate.

Firstly, the coupon and principal repayments on conventional government bonds are not mechanically linked to the path of output (cf. GDP-linked bonds; see Benford, Joy and Krueger (2016)). In deep recessions, the probability of a default on future coupon and principal repayments increases, thus reducing the value of the bond via a larger credit risk premium.

As previously discussed, the price of a long-term government bond could increase as investors become increasingly concerned about the possibility of recession.The expected future path of short rates will fall, and rising risk aversion may lead investors to reallocate towards safe assets, thus driving yields down lower. However, the relationship between shifts in beliefs about the future path of the economy and about the future path of short-term rates and the extent of risk aversion is complex and unpredictable. Simply put, **there is no plausible, stable mapping between a percentage point increase in the perceived (or actual) probability of a recession and the slope of the yield curve; be it the corresponding shift in either expectations of short rates or the term premium.**

Take the first channel: the impact of recession risk on the path of short rates. Market expectations of the future path of short rates will tend to fall in response to bad news about the state of the economy, as investors understand that central banks tend to cut interest rates to support spending in these circumstances. However, those rate expectations will not shift in a predictable and consistent fashion to a given perceived change in the risk of recession. Central bankers care about the *path* of demand, not just whether that path happens to meet the definition of a technical recession at some point. In fact, a prolonged stagnation in activity may be considered more of a problem in terms of disinflationary pressure than a brief recession. But the policy response will ultimately be driven by the anticipated path of inflation and the central bank's preferences over output and inflation stabilisation, which in turn may hinge on the perceived slope of the short-run Phillips Curve and the credibility of the monetary policy framework. Initial conditions are also significant. If the economy is strong and interest rates are high when bad news arrives, then a significant number of rate cuts could be priced into the yield curve without investors being unduly concerned about the risk of recession. In contrast, if the economy is weak and interest rates are close to the lower bound, then the arrival of bad news could spell the near certainty of a recession with only a modest inversion of the yield curve.

Indeed, one could argue that as the policy rate rises – often along with a flattening yield curve – the medium-term risk of recession *falls* with the all-important proviso that *the case for raising rates is warranted in the short run*. After all, a higher policy rate is likely in the short run to depress activity via the monetary transmission mechanism. But in the medium run, a higher policy rate implies that the central bank will have more scope to ease monetary policy in a future downturn; potentially reducing the risk that the economy will slide into recession as the central bank runs out of ammunition. However, this argument should **not** be used to justify raising rates when the economy is still weak.

Finally, even if one could pretend that the price of a long-term government bond primarily reflected the perceived probability of recession; it would surely reflect the probability of recession over the *lifetime* of the bond, and not the next one or two years.

In short, the investors who trade government bonds do not view these securities as a binary option that pay out only in the event of a recession in the near future – and for very good reasons. Therefore, we should not treat the yield curve slope as a fit-for-purpose, early warning indicator for recessions in the near future.

- SECTION 3 -

THE RATIONALE FOR LOOKING IN A FLAWED MIRROR

The debate in markets about the credentials of the yield curve slope as a reliable recession forecaster often proceeds as if the slope is an independent source of information on the evolution of the economy, distinct from more familiar economic data and forecasts. In reality, it is anything but.

Asset prices are not set in a vacuum. Instead, the price of securities that are traded in deep and liquid markets like US government bonds should reflect the value that the countless investors in those markets attach to those securities, and those valuations will in turn reflect a considered assessment of fundamentals.

To fix ideas, consider a well-specified macroeconomic model $g(\blacksquare)$ which transforms a set of economic variables X (that would include bond yields among other financial variables) to a point forecast of the probability $P_g\{t+k\}$ of a recession occurring at time in the future, given the output of that model $g(\blacksquare)$. That point forecast is a useful summary statistic of what economics has to say about the likelihood of a recession given our current knowledge of the system and the available data.

Let us assume for a second that financial markets are efficient and investors process all available information when setting prices – including economic information about the likelihood of a recession. That is, investors can observe $P_g\{t+k\}$. Bond prices will then continue to adjust until the slope is consistent with that probability. However, the risk of recession is but one of many factors that determine the slope of the curve. Those factors should contain little to no incremental information about the macro outlook (and the risk of recession in particular), but they can shift the slope of the curve. A given probability of recession could therefore be consistent with a range of possible outcomes for the slope, depending on the value taken by those other driving factors. Neither the slope, nor indeed any obvious transformation of bond prices, can plausibly offer a reliable summary statistic of the probability of a recession due to the noise created by those other bond price determinants. To put it bluntly, when forecasting recessions, there is a lot of noise surrounding the signal of the slope.

Moreover, our efficient markets assumption may not hold in practice. Investors may not be so diligent with the data and they may use rather more simplistic heuristics to forecast macro outcomes (rather than rely on the forecasts of economists). Thus bond prices and the curve slope will not reflect all available information about the probability of recession, but only a subset of the data and a crude approximation of our understanding of how the economy behaves.

We may hope that the slope of the yield curve will tend to move in the right direction when there is a material change in the probability of a recession; that this macro influence on the slope will dominate other determinants. Consequently, the slope provides a useful, qualitative (if not quantitative) signal. However, there is no guarantee whatsoever.

This then begs the question: *if we are interested in the risk of a recession, why not focus on Þ$_g$ {t+k} instead of becoming preoccupied with the flawed reflection of fundamentals found in the yield curve?*

The temptation is to answer that as economists do not know the true model of the economy and are instead dealing with a large set of flawed models, then investors can have little faith in any fundamentals-based forecast of recession risk. It therefore makes sense to focus on the signal in the yield curve; and this response entirely misses the point.

The information regarding the likelihood of the recession that can be found in the yield curve slope is ultimately derived from economics. If macroeconomic forecasts of recession are worthless then it is implausible to expect to find any value in their flawed reflection in the yield curve. Indeed, one could plausibly argue that the less conviction investors have in macro forecasts, the smaller the influence those fundamentals are likely to have on bond prices. So, the quality of the reflected image is likely to degrade as the quality of the original input declines. In other words, the less confidence you have in economics and economists, the less weight you should place on forecasts derived from the yield curve.

It is only when we believe that the *market* has a superior track record at forecasting the economy to those individuals and institutions who place their forecast in the public domain (that is, investors know more about economics than economists do) *and* that those superior forecasts remain (unobservable) private information that we should rely heavily on the imperfect reflection in the yield curve mirror to forecast recessions. Under these assumptions, the yield curve reflects the market's superior macro forecast, albeit imperfectly. Even here, the yield curve cannot perfectly reveal those superior forecasts; otherwise there is no incentive for investors to spend resources producing them in the first place (Grossman and Stiglitz (1980)).

- SECTION 4 -
FEEDBACK, MARADONA AND TANTRUMS

One fundamental problem with using the yield curve to predict recessions is that the very mechanism on which we rely to justify the forecasting performance of the curve only confuses the prediction. That is, as soon as the curve inverts,supposedly sending a strong signal that a recession is likely, the yield curve is also providing a stimulus that should support demand and subsequently reduce the risk of that recession.

The transmission mechanism of monetary policy operates primarily through financial markets. If the central bank could only influence very short-term, nominal interest rates, then it would have virtually no traction on spending in the economy, or on inflation. It is only when investors expect that the reduction in very short-term rates is likely to persist for the foreseeable future, and see a reasonable chance of impending further cuts, that the central bank gains traction on activity. Longer-term market interest rates adjust, thus driving a response in the broad constellation of asset prices, which in turn influences spending decisions.

Investors do not have to wait for the permission of the central bank to revise those expectations of the future policy rate path. Whenever those expectations fall – whether or not this is guided by the central bank– we get a *de facto* loosening in financial conditions that, other things being equal, will support spending. Market expectations future central bank decisions can help to stabilise the present economy's response to shocks.

A former Governor of the Bank of England labelled this mechanism the *Maradona Theory of Interest Rates* (King (2005)). It is unclear how powerful the Maradona stabilisation mechanism is, but in theory if the market is sufficiently convinced that the central bank will respond aggressively to bad news; triggering a sufficiently large shift in rate expectations and yields; *and* spending is sufficiently sensitive (both directly and indirectly) to short-, medium- and long-term interest rates; then the effect could be quite powerful. In other words, if the central bank is trusted to be sufficiently quick off the blocks in response to bad news, then it may be able to completely avoid the looming recession, precisely due to the stimulative effect of the shift in the yield curve that supposedly presages a recession.

The inverted yield curve slope that was supposed to send clear recession signals is now found to conflate two different effects: a gloomy signal that economic prospects are bleak, and an optimistic signal that the anticipated, aggressive policy response will support the economy. Credible central banks – those whom investors trust to monitor the state of the economy and respond with a sense of urgency – are rewarded with steep curves given the arrival of bad news about the state of the economy.

Taken to its logical conclusion, the Maradona theory implies that the central bank might not even need to adjust short rates very aggressively to stabilise the economy, as long rates (which embed expectations of short rates) do most of the work:

> *'During 2002 the Bank of England was able to achieve its goal by moving on a straight line with unchanged official interest rates. But, although interest rates scarcely moved, expectations of future interest rates – as embodied in the forward curve – did move around as the economic outlook changed from an expectation of a swift recovery to worries about a protracted slowdown. And in turn those changes in expected future rates affected activity and inflation. In other words, monetary policy was able to respond by less than would otherwise have been necessary because it affected expectations'*
> *Similar arguments can be made for the compression of the term premium that drives a flattening of the curve at longer horizons. To the extent that aggregate demand is directly or indirectly (via asset prices) sensitive to long rates – a channel on which the effectiveness of QE hinges – then the flattening that is supposed to signal an increased risk of recession should in fact go hand in hand with a stimulus for spending.'*

In effect, the Maradona Theory suggests a negative feedback mechanism: the configurations of the yield curve that supposedly foretell a contraction in demand also stimulate demand, thus reducing the risk of recession. The same cannot be said of say a material widening of credit spreads that tends to occur in a financial crisis. Here, we uncover a positive feedback mechanism. Other things equal, wider spreads will tend to depress spending as from a borrower's perspective, they imply higher, not lower, interest rates and that could exacerbate rather than alleviate the crisis.

The Maradona Theory suggests that providing investors understand and trust the monetary policy framework, the yield curve should reflect the state of the economy via the expected path of short rates implicit in the curve. **It follows that the real cause for concern might not be when the yield curve inverts as medium- and long-term yields fall, but rather when interest rates become decoupled from fundamentals** *and are too high*.

In those circumstances, the shift in the yield curve represents an unwarranted tightening in financial conditions. The Taper Tantrum is a recent case in point: the yield curve steepened significantly and by more than any reasonable assessment of the improvement in fundamentals, which ought to have slowed the economy.

- SECTION 5 -

LOCAL RECESSION RISKS WITH INTERCONNECTED BOND MARKETS IN AN ERA OF GLOBAL QE

Another fundamental problem with the claim that the yield curve contains valuable information about the risk of a recession – and in particular that the term premium contains valuable information – is that it ignores the fact that bond markets have become increasingly interconnected.

It might once have been the case that the investors who were active in a particular market were overwhelming domestic; however, that is no longer so. For example in the US, according to the official data, "foreign and international investors" account for roughly half of the stock of US federal debt held by the private sector.

It does not necessarily follow that just because the investor base is no longer local that prices are no longer determined by local factors. When a US investor buys an equity stake in a company based in the Emerging Markets, they are unlikely to view that stock as a close substitute for an equivalent claim on a US company. However, when it comes to high-quality government bonds issued by sovereigns in a small number of major advanced economies, much of the investor base does indeed view these assets as close substitutes; whether official institutions and sovereign wealth funds, or pension funds and insurance companies. Bond prices are likely to be co-determined, at least to some extent, by global outcomes (or perhaps local outcomes are more highly correlated thanks to increased integration of product and even labour markets). US Treasuries in particular are viewed as a safe haven by global investors, and the demand for and price of those bonds is likely to be driven by global shifts in risk appetite. Certainly, Diebold, Lie and Yue (2008) find that global yield and slope factors account for a significant and increasing fraction of the local variation in sovereign bond yields for Germany, Japan, the United Kingdom and the United States; and that those global factors appear linked to global macroeconomic fundamentals.

Moreover, if the advanced economy bond markets were already highly interconnected in 2008, then surely events since then will only have strengthened those linkages. Most of the world's major central banks have engaged in large scale purchases of bonds – known as Quantitative Easing (QE) – which persistently reduced the net supply of bonds available to private sector investors. The literature has identified non-trivial spill over effects from these QE programmes, with global bond prices adjusting to local purchases (Neely (2010)). One of the key transmission channels of QE is the portfolio rebalance effect where the investors who sell bonds to the central bank reinvest the proceeds in other markets, prompting further adjustments in asset prices. It seems reasonable to assume that the global market for high quality government bond was one of the chief beneficiaries of local QE through this portfolio rebalance channel. For example, as the Eurosystem increased its holdings of German government bonds, it is likely that some of the investors who sold bunds purchased US Treasuries. These spill-over effects are likely to show up in a cross-market compression in the term premium because in practice (if not in theory) the term premium acts as a residual.

These spill-over effects from monetary policy abroad are not restricted to the long end of the curve; after all, bond buying is not. The European Central Bank (ECB) and the Bank of Japan (BoJ) have both taken their policy rate into negative territory and the ECB has bought short-term bonds at yields below that negative policy rate, whilst the BoJ has actively targeted a ten year yield only marginally above the negative policy rate. Both central banks are therefore putting downward pressure on yields in the so-called belly of the curve, albeit in different ways. It seems reasonable to conclude that this downward pressure will not have been restricted to their respective local bond markets, but will instead have spilled out in the global market for high quality sovereign bonds at comparable yields.

In short, local yields appear to be increasingly determined by global factors. And if the yield curve is increasingly determined by global factors, it is hard to believe the yield curve sends reliable signals about the local risks of a recession. It may be more realistic to argue that local yield curve send signals about the risks of a global recession, manifested locally.

- SECTION 6 -
THE SLOPE WHISPERER

The dominant explanation for the flattening of the yield curve over the period from early 2017 to late 2018 – i.e. excluding the most recent period – appears to be along the following lines. The policy rate is getting ever closer to the (unobservable and unknown) equilibrium rate that stabilises the economy in the long run, which in turn reduces the number of additional hikes that are likely beyond this point. The economy has enjoyed an unusually long period of expansion since the last recession, so the US economy is surely late in the expansion phase of the business cycle; which in turn implies that the interest rate cycle is probably close to its peak. And with growth expected to fall back towards trend at home and concerns mounting over the health of the global economy, investors are increasingly coming to the conclusion that rate cuts will soon be required.

However, there is an alternative explanation for recent moves in the shape of the curve, which has very different implications for the likelihood of a recession in the near future. Rather than signalling that the US economy is 'late cycle', the yield curve may in fact be signalling the opposite: that investors believe that the expansion phase is likely to continue for some time. To understand why, we need to think about what defines the business cycle and what causes economic expansions to end.

Economists naturally recoil from the idea that expansions die of old age. A recession will likely be caused by a trigger that leads to a coordinated shift in behaviour by a sufficiently large number of economic agents, or by a small number of sufficiently important economic agents. Consider the following four stylised recessions.

Countries can obviously import recessions. If demand collapses abroad, spending on domestic output overseas (exports) and investment spending at home are likely to be hit hard. Indeed, countries which produce and export a small number of goods and services can be driven into recession by a collapse in the demand for those particular items, rather than a more broad-based contraction in global activity.

Recessions can certainly be made at home too. These home-grown recessions are often attributed to the build-up of 'financial imbalances' during the preceding boom that were perhaps fostered by what ultimately turned out to be unrealistic expectations of growth in productivity and prosperity. At some point, perhaps prompted by a tightening in credit standards and/or a sharp correction in asset prices, there is a retrenchment, with agents saving more and spending less in order to repair stretched balance sheets. If enough agents feel compelled to save, demand will slow.

An alternative home-grown recession mechanism is often referred to as 'animal spirits', although we ought to distinguish between three distinct types of belief. First, there is the best guess of the future; second, there is uncertainty around that forecast; and third, there is fear of particularly bad outcomes. Shifts in any of these aspects of beliefs can cause a correction in spending: if you are more pessimistic about your likely income prospects; if you expect greater volatility around your best guess of future

income; and if you believe you are more at risk of earning a very low income. It is worth keeping in mind that these beliefs do not have to be anchored in reality to influence spending: beliefs can prove self-fulfilling (Cass and Shell (1983)). It is at least theoretically possible that if individual CEOs keep reading that the risk of recession is increasing then they might each rationally choose to cut back on investments in jobs and physical capital, weighing on aggregate demand.

The final class of recession mechanism we consider is the one triggered (albeit usually inadvertently) by *policymakers*. Central banks need to prevent the level of aggregate demand rising too far above the underlying level of supply if they want to achieve their price stability remits. Otherwise, the so-called output gap is likely to generate chronic pressures for costs and prices to rise, ultimately causing inflation to persistently over-shoot its target. Central banks are therefore obliged to raise interest rates in order to bear down on demand when they believe a large positive output gap has opened up. The output gap cannot be measured, so the decision to tighten policy may be triggered by actual evidence of mounting, domestically-generated inflationary pressure rather than a pre-emptive decision based on a forecast of rising inflation. In other words, it is evidence that inflation is spiralling out of control that brings about the end of the expansion via abruptly higher interest rates. Indeed, recent comments by the Vice Chair of the Board of Governors imply that the FOMC plans to follow this reactive strategy (Clarida (2019)):

> 'were a model to predict a surge in inflation, a decision for preemptive hikes before the surge is evident in actual data would need to be balanced against the considerable cost of the model being wrong.'

Technically speaking, the monetary tightening does not necessarily have to lead to a recession – the output gap can close with demand expanding at a more modest pace than supply. But clearly there is a risk of an outright contraction in output when the central bank is actively trying to significantly slow the pace of economic growth; and that risk rises the lower the pace of underlying supply growth.

Taking each of these triggers in turn, if one was searching for a market-based, early indicator of recession, it would seem more reasonable to look for corroboration in the message from the domestic yield curve in other markets: in the slope of yield curves in your major trading partners for a signal that your country is likely to import a recession; in credit risk premia for a signal that domestic financial imbalances are just about to trigger a recession as credit investors are asymmetrically exposed to default risk; perhaps in equity markets for signals that animal spirits in the corporate sector are deflating as equity investors share in the upside of corporate profitability and are therefore sensitive to a defensive shift in corporate strategy; and in breakeven inflation rates for a signal that an over-heating economy is likely to trigger a recession in the near future.

The striking feature about the current constellation of market prices is that, despite frequent claims that the US economy is "late cycle", the market does not seem to believe there is any material risk of inflation significantly and persistently over-shooting the target. On the contrary, it appears that many investors need convincing that inflation can sustainably be held at the target. By extension, investors do not appear to believe there is a large positive output gap; or perhaps instead believe that the domestic output gap is no longer an important driver of domestic inflationary pressure. Nor in passing has it been obvious from the behaviour of credit spreads – at least until very recently – that the market is unduly concerned about a material build-up of financial imbalance that might cause a correction in demand. In short, when we look for corroboration of this supposed concern about recession in other market prices, we find little supporting evidence.

Chart 3: US break-even inflation

Spot rates, derived from inflation swaps
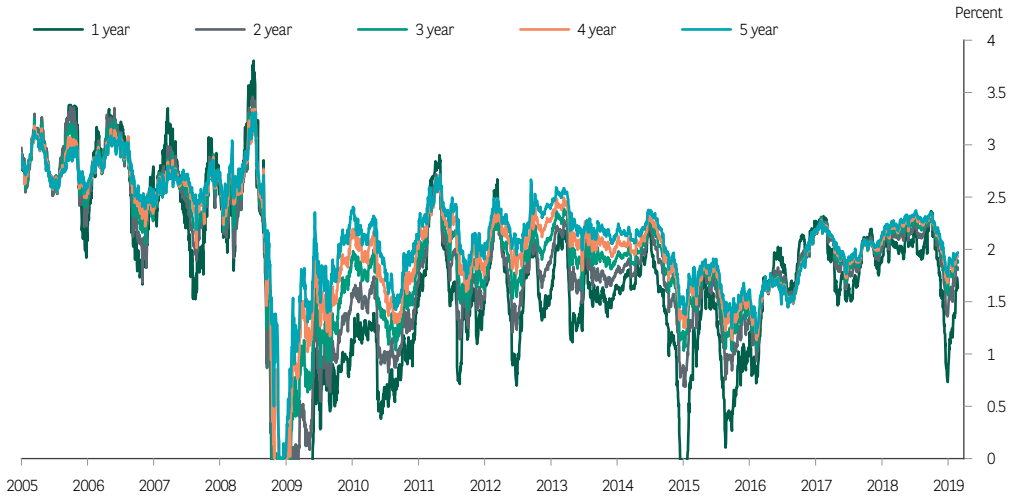
Source: Bloomberg, BNP Paribas Asset Management, 26 February 2019.

Chart 4: The US term premium

Academic estimates of the term premium implicit in ten year conventional bonds

Source: Bloomberg, BNP Paribas Asset Management, 26 February 2019.

The combination of a flat forward curve at the front end, a low term premium embedded in long-rates and low break-evens are surely better rationalised as a market view that output can continue to expand at its current solid pace without generating inflationary pressure. Under that view, there is no need for the central bank to tighten policy, nor for investors to demand compensation for interest rate and inflation risk. So, the message of the yield curve seems to be more about the outlook for *inflation* than output. In short, a policy-induced recession is seemingly nowhere in sight.

This conclusion may seem counter-intuitive given the recent shift in the stance of fiscal policy in the United States. The Trump Administration passed a large fiscal stimulus into an economy that was already in reasonable shape – that is, with an output gap that was likely close to zero. One might have expected that the Federal Reserve would have been obliged to significantly accelerate the pace of monetary tightening that it had otherwise planned to deliver in response to the fiscal stimulus, in order to prevent aggregate demand accelerating away from supply. However, that has not really materialised: growth remains strong and unemployment low. Investors could have become concerned about the inflation outlook in these circumstances, or at the very least demanded additional compensation via the term premium for the risk of above target inflation and the sharp monetary tightening that would have to follow in response. But that has not been the case.

- SECTION 7 -
A RETREAT FROM FORWARD GUIDANCE

One interesting feature of the recent episode has been the contrast between the central bank response to the recent behaviour of the yield curve and what transpired five years ago during the taper tantrum.

As discussed, short-term interest rates embed expectations of the future path of the policy rate. Of course, those market expectations don't necessarily have to align with the beliefs of policymakers. If investors and policymakers disagree over the economic outlook, we should expect them to disagree over the future path of policy.

The problem for policymakers is that those market expectations matter – they are effectively part of the monetary stance in that expectations will influence whether those policymakers achieve their objectives. For example, if investors consistently over-estimate the health of the economy and anticipate a sharp tightening in the stance of monetary policy that is not warranted by fundamentals, then the resultant tightening in financial conditions – higher interest rates, higher exchange rate and lower prices of risk assets – will tend to depress activity and inflation. Under these circumstances, central banks face a tough choice: ease policy to counteract the impact of the unwarranted expectations of tighter policy in the future; *or* try to talk those expectations back towards fundamentals; *or* accept that given tighter financial conditions growth and inflation may disappoint.

This is not a hypothetical concern: these are precisely the circumstances that confronted policymakers during the taper tantrum. Commentary by the Federal Reserve about the potential wind-down of its Quantitative Easing programme ultimately triggered a correction in market expectations about the path of monetary policy around the globe that was the antithesis of the Maradona effect. The correction in financial conditions was sufficiently severe that central bankers concluded that the nascent recovery in activity was at risk, and they chose to act.

The result was the launch of a more explicit form of forward guidance on the future path of monetary policy. Central bankers sought to convince investors that their expectations were not realistic, that expectations had moved out of line with fundamentals. As President Draghi explained at the July 2013 ECB press conference (Draghi (2013)):

> *'The Governing Council has taken the unprecedented step of giving forward guidance in a rather more specific way than it ever has done in the past. … "The Governing Council expects the key … ECB interest rates to remain at present or lower levels for an extended period of time." It is the first time that the Governing Council has said something like this.'*

Recent months have evidenced a very different communication strategy to the divergence between market expectations and the rate guidance that the Federal Reserve had until recently been providing, in the form of the so-called "dots" that describe the forecasts of individual FOMC members.

As recently as the FOMC meeting in late September 2018, the median dot in the guidance implied three rate hikes in 2019. A clear gap had already opened up between those dots and the rate path implied by market prices, with investors expecting far fewer hikes. Market expectations declined into year end, with the curve continuing to flatten.

The FOMC has effectively validated that shift in expectations, with one hike being removed from the median 2019 rate dot in December and the message pivoted to patience as the watch-word: the Federal Reserve wanted it to be known that it was in no hurry to raise rates. Indeed, the following key phrase that signalled the bias to continue raising rates was removed from the January 2019 FOMC statement:

> *'The Committee judges that some further gradual increases in the target range for the federal funds rate will be consistent with sustained expansion of economic activity, strong labor market conditions, and inflation near the Committee's symmetric 2 percent objective over the medium term.'*

Within the space of four months, the Federal Reserve had shifted from intending to raise rates three times in 2019 to effectively being on hold. When it comes to raising rates, patience is now the watch word (Federal Reserve (2019)):

> *'the Committee will be patient as it determines what future adjustments to the target range for the federal funds rate may be appropriate to support these outcomes.'*

Even now that the dust has settled, questions still remain as to the precise explanation for this abrupt shift in guidance. What is not in doubt is that the Federal Reserve has embraced the market's narrative on the path of rates, rather than challenging it.

- SECTION 8 -
CONCLUSION

Many investors and some policymakers appear to attach, in our view, too much importance to the signal supposedly sent by the slope of the yield curve regarding the risks of recession. The theoretical foundations of the yield slope's forecasting prowess are fragile: the slope is not an exotic binary option that pays out in the event of a recession; globalised bond markets cannot be relied upon to send local signals; lower long-term interest rates that go hand in hand with flat yield curves should stimulate activity. It is only under extreme circumstances where the yield curve slope should be relied upon in preference to a considered assessment of the fundamentals – essentially, when investors have a clearer understanding of economics than economists do.

This is not to say that we disregard the risks of recession entirely. But we do not view the US economy as being at particular risk of recession. Indeed, growth will most likely be above trend this year in the US. The real concerns lie with open economies that are more exposed to the global trade cycle, where the growth momentum is less solid and there is relatively little policy ammunition to mitigate any downturn in demand. Paradoxically, the chief reason to be concerned about the risk of recession in the United States is the one that the term premium appears to dismiss: that too much inflation will force the Federal Reserve to raise rates aggressively to dis-inflate the economy.

In short, when it comes to forecasting recessions, the slope of the yield curve is best used as a cross-check on a comprehensive assessment of the fundamental and proper economic forecasts, and not a substitute. And this was in fact the original intention of Estrella and Mishkin in their ground-breaking work:

> *'a simple financial indicator such as the yield curve can be used to double-check both econometric and judgmental predictions by flagging a problem that might otherwise have gone unidentified'.*

REFERENCES

Adrian, T, Crump, R and Moench, E (2013), 'Pricing the Term Structure with Linear Regressions', *Journal of Financial Economics* 110(1), 110-138.

Bauer, M and Mertens, T (2018a), 'Economic Forecasts with the Yield Curve', Federal Reserve Bank of San Francisco Economic Letter, 2018-07.

Bauer, M and Mertens, T (2018b), 'Information in the yield curve about future recessions', Federal Reserve Bank of San Francisco Economic Letter, 2018-20.

Benford, J, Joy, M and Kruger, M (2016), 'Sovereign GDP-linked bonds', Bank of England Financial Stability Papers 39.

Benzoni, L, Chyruk, O and Kelley, D (2018), 'Why does the yield-curve slope predict recessions?', Federal Reserve Bank of Chicago Working Paper, 2018-15.

Bullard, J (2018), 'The risk of yield curve inversion – and how to avoid it', Federal Reserve Bank of St. Louis Regional Economist, Third Quarter.

Cass, D and Shell, K (1983), 'Do Sunspots Matter?', Journal of Political Economy, 91 (21), 193–228.

Clarida, R (2019), 'U.S. Economic Outlook and Monetary Policy', Speech, 28 February.

Diebold, F, Li, C and Yue, V (2008), 'Global yield curve dynamics and interactions: A dynamic Nelson-Siegel approach', Journal of Econometrics, 146(2), pp. 351–363.

Draghi, M (2013), Comments in the July ECB press conference, 4 July.

Ergungor, O (2016), 'Recession probabilities', Federal Reserve Bank of Cleveland Economic Commentary, August.

Estrella, A and Mishkin, F (1996), 'The Yield Curve as a Predictor of U.S. Recessions', Federal Reserve Bank of New York's Current Issues in Economics and Finance, 2(7).

Federal Reserve (2019), FOMC Statement, 30 January.

Grossman, S and Stiglitz, J (1980), 'On the impossibility of informationally efficient markets', American Economic Review, 70(3), 393-408.

Kim, D and Wright, J (2005), 'An Arbitrage-Free Three-Factor Term Structure Model and the Recent Behavior of Long-Term Yields and Distant-Horizon Forward Rates', Federal Reserve Board Finance and Economics Discussion Series 2005-33.

King, M (2005), 'Monetary Policy: Practice Ahead of Theory', Speech at the Mais Lecture, 17 May 2005.

Leamer, E (1978), Specification searches: Ad-hoc inference with non-experimental data, John Wiley & Sons.

Li, C, Meldrum, A and Rodriguez, M (2017), 'Robustness of long-maturity term premium estimates', Board of Governors of the Federal Reserve System FEDS Notes, 3 April.

Neely, C (2010), 'The Large-Scale Asset Purchases Had Large International Effects', Federal Reserve Bank of St. Louis Working Paper 2010-018D.

INVESTORS' ⌐corner⌐

BNP PARIBAS
ASSET MANAGEMENT

The asset manager
for a changing
world