

Quantitative tapering: Why bond yields will rise much more than the Fed is letting on.

"The greatest trick the devil ever pulled was to convince the world he didn't exist". Roger 'Verbal' Kint.

Have you ever been in a conversation where the other party has a vested interest in convincing you why an upcoming event should be ignored? Strategies the person could be expected to utilise to sway your opinion might include; referencing similar events in history, quoting some straight forward statistical analysis and demonstrating that they have taken a broad assessment of the potential actions of all stakeholders.

Yet as we embark on the quantitative tapering (QT) road of central bank balance sheets, it is striking that none of these strategies have been deployed. A lack of historical parallels has instead seen central banks rely on opaque statistical modelling of the impact of gradual tapering of their individual quantitative easing (QE) programs. The collective impact by other central banks, let alone allowing for the interaction of other financial market participants, has been largely ignored.

The world's major central banks have taken a position that QT will have only a very small impact on financial market prices - although it would be almost unthinkable for them to suggest anything else. Philadelphia Fed president Patrick Harker coined the phrase that the Fed intends to make shrinking its balance sheet about as boring as "watching paint dry." This phrase has been repeated by Fed Chair Yellen and several other Governors over recent weeks. Moreover, similar opinions are now being echoed by central banks around the world. However, we present a framework below that suggests that bond yields may rise by up to 130bps once the actions of other central banks are also taken into account and controlling for the economic cycle - this would be rather quick drying paint.

The evidence that QT will have only a small impact is not based on any historical parallel. How could it? The dramatic expansion of central bank balance sheets via the magnitude of the buying, the waves of different versions of quantitative easing in the major economies and the strategy of overt forward guidance has no historical precedent. Hence the central banks have leaned on their own academic research. The empirical evidence the Fed presents that QT will have minimal impact is two tiered; statistical and survey-based.

When complexity is your shield.

"I guess I should warn you, if I turn out to be particularly clear, you've probably misunderstood what I've said". Alan Greenspan

The main statistical estimate quoted by the Fed was conducted by the Kansas Fed which expands upon the often quoted Holston, Laubach, Williams model of the time varying neutral real interest rate (r^*) and included estimated variables for the bond term premium and a risk premium variable. In short, the Fed has taken an academically terse and often debated model of r^* and added to it a highly complex form of estimation for the bond term premium in addition to adding a risk premium which is simply proxied by the spread between US treasuries and Baa corporate bonds. Apart from the obvious point that corporate bond values have not been independent to the actions of QE (indeed one of the key side-effects of QE was an orgy of debt-fuelled equity buy-backs), neither the bond term premium nor the equity risk premium are observable in real life.

In short, the Fed's best empirical guess on the impact of QT is based on the interaction of three unobservable time varying variables (r^* , risk premia and the bond term premium) estimated over a historical period in which embraces an unprecedented monetary experiment during the largest economic contraction since the Great Depression. While the attempt to quantify the impact can be admired for the complexity of the statistical techniques employed, one could be excused for thinking that these estimates are far from robust, let alone to be treated seriously.

There is little that is straight-forward or transparent about the approach and little that lends confidence in the accuracy of the estimate. Nevertheless, the Fed is prepared to stand by its best guess and suggests that QT will be equivalent to one 25bps rate hike. Albeit, given the inherent uncertainty in the modelling, the Fed's working paper does acknowledge that the impact of its own QT could be as high as 75bps - which would be sufficiently fast drying paint to cause some sticky moments for financial markets.

Tell me what you think I will do?

"Don't hide these things from me. I'd rather you ask me these things straight out, and I'll answer all your questions." Marilyn Monroe

For survey evidence, the Fed has relied upon its survey of financial market participants to gauge what financial markets think the impact would be from QT in the US. That sounds like a more reasonable approach. However, it is worth remembering that the reason for the existence of the survey of financial market participants is that the Fed relied upon its survey of primary market dealers to give it an estimate ahead of policy action which subsequently became named the 'taper tantrum'. The survey of primary dealers indicated that tapering would not be a problem and that the impact of the Fed's planned tapering was well understood and embedded in market pricing. It quickly became apparent in May 2013 that neither were remotely true.

In the aftermath of the mess of the taper tantrum, the wider survey of financial market participants was born. Let's hope it is more accurate. However, there is a principal and agent information problem here. The survey participants' expectations are heavily dependent on the Fed's own guidance - the central bank is after all the experts on its own balance sheet. Few researchers have attempted to independently quantify the impact of



global QT and fewer still portfolio managers would have the time and statistical skillset to replicate Fed's approaches and test the assumptions. Financial market reactions will more likely be informed by the price trends once QT commences rather than opinions collated today. What financial market participants say they will do and what they actually do are often two very different things.

The evidence from the Fed's latest survey of financial market participants is that of the 21 respondents (from the 30 financial firms asked to complete the survey), most thought US economic growth and inflation in 2018 were the most important factors influencing their bond yield forecasts. The actions of other central banks or indeed other countries economic performance were seen as mostly unimportant. Moreover, when it came to assessing the impact of shifts in the Fed's balance sheet the respondents were fairly evenly split. 8 of the 21 thought QT was an important or very important factor while 7 of the 21 thought it was not very important or of no importance. 6 of the 21 were undecided.

Exhibit 1: Fed survey of financial market participants: What's most important to your 10 year yield forecasts in 2018?

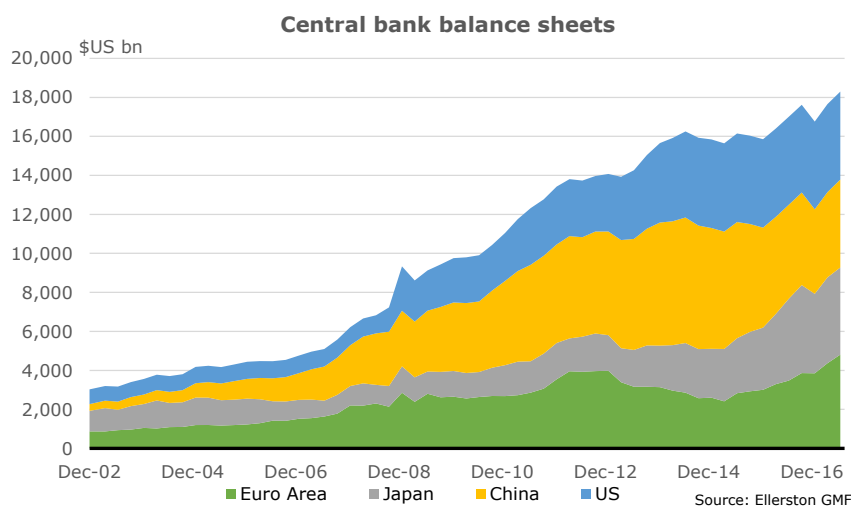
2018	Changes in outlook for U.S. economic growth	Changes in outlook for U.S. inflation	Changes in outlook for U.S. fiscal policy	Changes in outlook for Federal Reserve's balance sheet	Changes in perception of the neutral nominal fed funds rate	Changes in perception of the FOMC's reaction function	Changes in outlook for foreign growth/inflation	Changes in outlook for foreign monetary policy	Other
1 - Not Important	3	2	2	4	5	6	4	7	1
2	4	1	4	3	7	3	7	3	0
3	3	9	5	6	6	8	6	5	1
4	6	4	7	4	3	3	3	5	0
5 - Very Important	5	6	4	4	0	1	1	1	1
Total Respondents	21	22	22	21	21	21	21	21	3

The Fed seems to have been less than enthused that only a third of respondents indicated QT is not something to be concerned about. Indeed, instead of referencing their own survey, the New York Fed Governor William Dudley recently referenced a WSJ survey of US economists' estimates on the impact of QT.

To quote the WSJ article "More than half said letting maturing assets run off the central bank's balance sheet would raise the yield on 10-year Treasury notes by 0.2 percentage point or less. About 41% said the effect would amount to an increase of 0.1 percentage point or less. About half also said shrinking the balance sheet would tighten monetary policy less than would a quarter-percentage-point increase in the Fed's benchmark interest rate. Another 20% said shrinking the balance sheet wouldn't tighten policy in any meaningful way."

While financial market economist expectations may well differ from those of the Fed's survey, the WSJ survey seems to us to be an optimistic assessment. Why? Partly because if US financial economists are anything like Australian financial market economists, their answers are heavily framed by the central bank's stated views and have a tendency to seek protection from being wrong via herding. Nevertheless, it is interesting that market participants appear to have an even more benign view of QT than the Fed's estimate! This would seem to be a rather dangerous starting position for markets. Nevertheless, in coming months the Fed will continue to call out "Marco" and the financial markets survey participants will continue to reply "Polo" all the while hoping no one moves too far too fast in the central bankers' pool of liquidity.

Exhibit 2: The rise and rise of central bank balance sheets



Are there reasons to believe financial markets are too complacent?

There are 3 reasons why this degree of comfort in the face of QT may be misplaced;

1. **Shifting global demand for loanable funds.** If the mystery of why, say, Bund yields stayed above 300bps through the worst of the financial crisis and Euro-area recession and now offer little more than 30bps at a time of full employment is puzzling, then one may be better served thinking of the problem from the perspective of the demand of supply of loanable funds rather than unobservable concepts such as r^* and term premium.

Globally the government sector has been a very willing issuer of bonds in the post crisis period, however, that issuance has been met by 4 principal buyers, each with different motives willing to drive bond valuations into bubble-like territory.

- *Households:* Motivated by a seemingly insatiable thirst for yield, aging baby-boomers and the risk averse rushed to accumulate bonds via their yield seeking pension funds or in some countries via their sovereign wealth fund representatives.
- *Non-financial corporates:* Globally dominant corporates reluctant to return excess funds to shareholders or to invest in the physical capital stock spent much of the post crisis period accumulating significant quantities of government securities in their corporate treasuries. Apple alone owns \$53bn in US treasuries. Australia's entire holdings of US securities is \$37bn.
- *The financial sector:* The implementation of post crisis regulatory changes saw insurance companies and banks scramble to absorb available liquid government securities to meet new capital buffer requirements.
- *Central banks:* The QE bond buying programs of the US, ECB, UK and Japan provided both a material new incremental demand for bonds and perhaps more importantly a signalling effect to other bond buying participants which conditioned their behaviour.

Most assessments of the impact of QT on bond yields consider just the actions of reduced buying by the individual central bank in a particular country. However, the increased fluidity that capital flows across country borders makes this exercise somewhat naïve. Moreover, if the demand for bonds from the world's banking and insurance industry also tapers as they approach the regulated capital requirements, if corporates choose to run down their holdings of government securities to fund expansion, and if the actions of central banks in other countries matter just as much as the actions of the central bank in the home country, then the demand for bonds will diminish and yields surely rise.

While an improving economy would suggest the supply of government bonds should also decline, the government sector's under-delivery on promised spending restraint and a somewhat belated love of boosting growth via debt funded infrastructure projects suggests issuance will remain elevated well into the foreseeable future. It is possible that the household sector's demand for yield remains robust. However, it would be brave to assume that the household sector will lift its appetite for government bonds and absorb the declining incremental demand from central banks, the financial sector and potentially the corporate sector.

2. **Asymmetry.** Central banks have been willing to assert that the recovery in economic growth is largely attributable to their own actions, and in particular, to the success of QE. The world's leading advocate for this argument is currently Mario Draghi who recently asserted there were no downsides from the QE program that he could identify. If the importance of QE in lowering bond term premium is seen as such a significant economic benefit then the relaxed interpretation by markets to the commencement of QT highlights a distinct lack of symmetry. In the language of the ECB, QE should continue until the economic recovery is broad based, durable and self-sustaining. If the commencement of QT signals the world has entered a self-sustaining recovery then the risk to yields in global bond markets is not immaterial. Simple logic would suggest that as the world's major economies approach full capacity real yields should, in theory, normalise towards the new lower estimates of 'potential growth'. As QT accelerates the term premium should, in theory, be rebuilt. And as the transitory factors that have held down inflation abate nominal yields should, in theory, rise further. This lack of symmetry in the market's attitudes to QT is suggestive that the market has yet to fully turn its collective mind to the full impact of global tapering. An event that only 6 months ago seemed on a distant horizon now looms large.
3. **Financial stability and the fear of history.** Although financial markets have become somewhat desensitized to central bank bond buying, it is important to remember that the primary aim of QE was to provide liquidity into the banking sector as it attempted to recapitalise and, once the zero bound was reached, as an adjunct to official monetary policy. However, the pendulum has long swung from concerns about a lack of liquidity in the financial sector, and subsequently from a lack of liquidity in the real economy, to increasing concerns that imbalances are building that might risk future financial stability. Financial market participants may well hold lower real growth and inflation forecasts than the world's major central banks base line forecasts, and are therefore more relaxed on the path and implications of QT. However, it would be a mistake to underestimate the central banks' desire not to be seen to be a significant contributor to the next crisis. The desire to commence QT is not all about the debate whether growth and inflation objectives have been achieved. A good deal of motivation is how history will judge QE's primary architects.

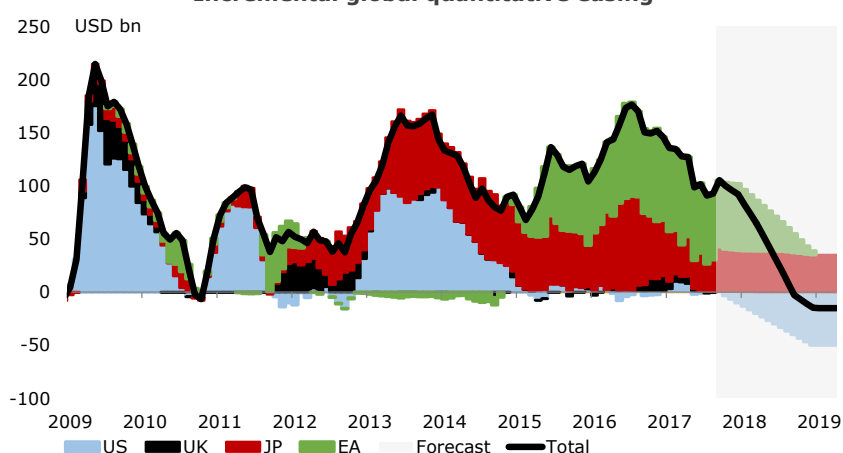
An alternative approach

"Truth is ever to be found in simplicity, and not in the multiplicity and confusion of things". Isacc Newton

My father was fond of the expression "Stand back and let the dog see the rabbit". After years of guessing at its meaning I realised belatedly it was his way of removing the complexity of a problem and focussing on outcomes. In the case of QT, the rabbit is the impact on government bond yields from the collective expected path of global QT. The working dog is a framework that practitioners can easily use to gauge the impact of QT in a transparent manner.

The starting proposition of our analysis is that it is the flow of anticipated future central bank purchases of securities that influences bond yields, not the stock of securities on the balance sheet. Exhibit 2 shows our projected path of QT based on the Fed's announced policy and a path of tapering for the ECB that slows the pace of purchases by US\$5bn per month starting from January 2018. That is, it will take the ECB the entirety of 2018 to complete its taper.

Exhibit 3: The projected path of quantitative tapering
Incremental global quantitative easing



Our second proposition is that it is global central bank purchases that are more influential than an individual country's independent actions.

Our third proposition is that current market views on the forward path of QT embedded in government bond yields can be solved for after controlling for the economic cycle via lagged values of the output gap, oil prices, underlying inflation and the ISM survey.

Equation 1 is the most parsimonious version of the model.

$$Bond_US_t = \alpha_1 + \sum_{t=6 \text{ to } 12} \beta_1 Flow_t + \beta_2 Core_PCE_{t-1} + \beta_3 Oil_{t-1} + \beta_4 ISM_{t-1} + \beta_5 Gap_{t-2} + \varepsilon_t \quad (1)$$

Where $Bond_US$ is US 10 year treasury yields, $Flow$ is incremental QE buying of the US, Euro-area, UK and Japan, $Core_PCE$ is Oil the core private consumption expenditure deflator in the US, Oil is the WTI oil price, ISM is the manufacturing PMI for the US and $Output\ Gap$ is the OECD's estimate of the US output gap.

The basic statistics of model are given below with the t-statistics in parentheses.

$$Bond_US_t = 3.7 - \sum_{t=6 \text{ to } 12} 0.011 Flow_t - 0.47 Core_PCE_{t-1} + 0.003 Oil_{t-1} + 0.019 ISM_{t-1} + 0.29 Gap_{t-2} + \varepsilon_t \quad (2)$$

(15.9)
(4.2)
(2.0)
(2.2)
(11.3)

R-squared = 0.87

SE or regression = 0.42

Estimated over the period Jan 2001 to July 2017

With reference to our starting proposition, it is notable that this model explains a high 87% of the monthly movement in US 10 year bond yields, yet the exclusion of the QE flow variable sees the explanatory power of the model drop to 67%. Note, we are not including lagged dependent variables, proxies for the future path of

the Fed funds rate, nor are we employing advanced time series techniques to improve the performance of the model. This is about as straight forward as economic modelling comes.

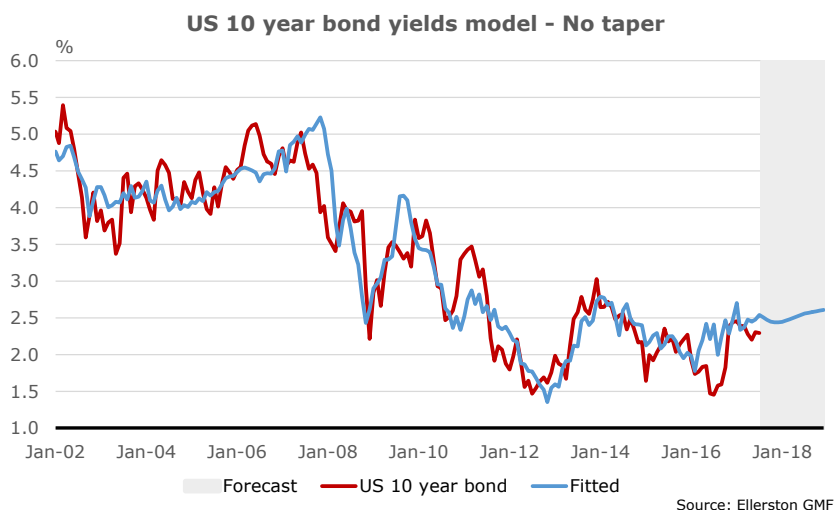
With reference to proposition 2, we find that the model fit deteriorates materially if only the QE flows of the home country are included. For instance, in the above version of the model substituting the US QE flows in place of the global variable sees the model fit slip to 69%. In other words, it appears that it is the collective efforts of major developed nations QE efforts, not that of an individual country, that matters most.

The third proposition is in some ways the more interesting, for it squares a circle. Exhibit 3 shows the model's forecast for the US 10 year bond yield based on the following set of assumptions;

- The Core PCE remains around 1.5%yoy until the end of 2018
- Oil prices remain unchanged from current levels
- The ISM moves slowly back to the low 50s consistent with moderate expansion
- The output gap evolves on the path forecast by the OECD which suggest the US output gap closes in 2Q18.
- The flow of global QE remains unchanged – QE continues at its current setting into the foreseeable future.

These assumptions are far more cautious than our base case, but are designed to reflect the broad status quo. What is notable from the model's projection is that it largely maps where bond yields have been in recent months. Importantly, unless financial market participants are currently embedding some very bearish views on the outlook for the economic cycle, it would appear that financial markets have taken the lead from the world's major central banks and assumed QT will be a relatively boring event. Perhaps financial markets are still assuming QT either isn't likely to occur at all or they are still so enamoured with the trajectory growth in central bank assets shown in Exhibit 2 that they are confusing the stock of assets with the flow of purchases.

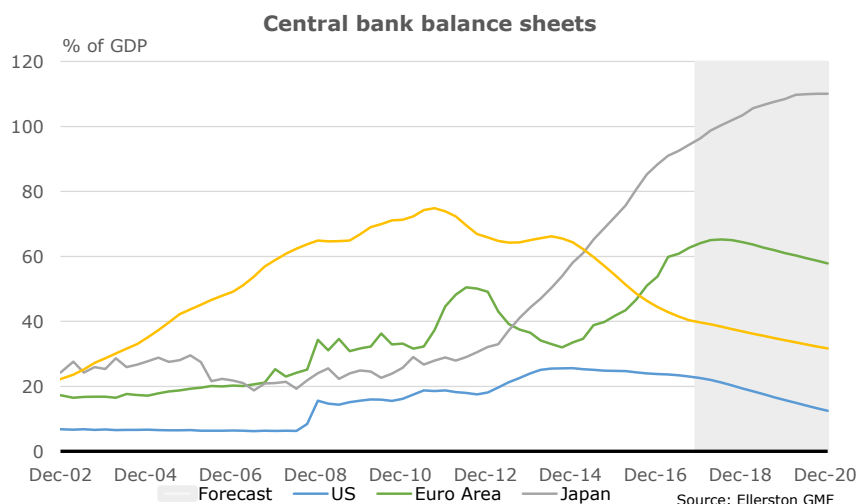
Exhibit 4: Projected path of 10 year yields: No tapering scenario



The idea that the removal of a \$100bn monthly buyer of securities from the market will have no influence on the marginal price of those securities, and will have no influence on the actions of other private sector holders of those assets, seems like a dangerous working assumption. Yet this is precisely what the vast majority of researchers have concluded.

It is quite easy to find a statistical relationship that equates movements in bond yields to the stock of assets held by central banks. We find that for every 1% of GDP that the Fed expanded its balance sheet in the post crisis period, US bond yields fell by ~5-6 bps. If the Fed's balance sheet shrinks to approximately \$3 trillion by the end of 2020, as many expect, then as a share of US GDP the Fed's assets will fall from its current level of 23% of GDP to 12.5%. All else equal, that equates to US bond yields rising 62bps over 3 years. While not immaterial, a gradual rise of that size distributed evenly throughout that time period would be manageable for risk assets.

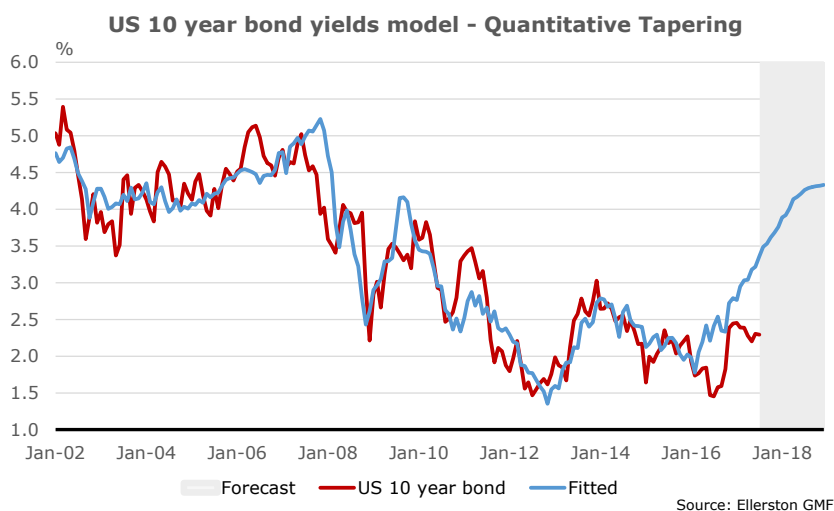
Exhibit 5: As a share of GDP QT has already commenced in countries



But all is not equal. The US will not be acting in a vacuum. In a quirk of history, as of mid-2017 the assets on the central bank balance sheets of the US, Euro-area, Japan and China are all of equivalent size, when converted into US dollars. All are expected to shrink their balance sheets as a share of their economy, except for Japan, yet even in Japan's case the trajectory of expansion is materially different relative to the prior 5 years. If global QE is as important as local QE then applying the same simple 5-6bps per 1% of GDP implies bond yields would rise by 140bps, excluding Japan, by the end of 2020. Thus even under the stock approach to QE its feasible that bond yields will rise well above current market estimates.

In our unconstrained version of the model that focuses on QE flows (not stocks) a more extreme message is found. While we are not suggesting that US 10 yields will rise by around 200bps by the end of 2018, this should be considered as a base-case forecast, the model does highlight just how far bond yields would need to move to fully remove the impact of QE.

Exhibit 6: Projected path of 10 year yields: Full tapering scenario



Endogeneity and GOT

"Just when I thought I was out, they pull me back in!" Michael Corleone.

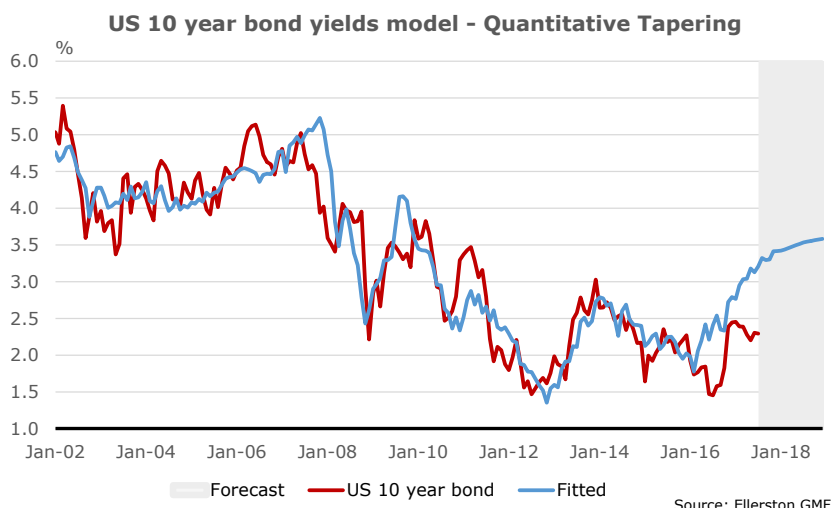
The New York Fed president Dudley has made it very clear that should markets excessively tighten financial conditions, the Fed will alter its path of short term interest rates and indeed alter its QT plans. Dudley almost always prefers to view the world through the prism of financial conditions and with the New York Fed, also the primary custodian of the US's QE efforts, he has every intention of ensuring both an orderly exit and favourable assessment of the whole QE experiment.

How do central bankers generate a path for bond yields that avoids a sharp tightening in financial conditions? Firstly, by signalling that QE was not a once off. By stressing QE will remain a permanent feature of the monetary landscape and reinforcing a flexible approach to adjusting policy on asset purchases, the market will be forced to accept the endogenous nature of central banks' QT policies and be unwilling to fully discount the path of QT

shown in Exhibit 3. Secondly, by highlighting that the next economic downturn may only be around the corner, central banks can keep the fear of a broad-based return to QE at the forefront of the market's mind. In Game of Thrones parlance, this would be 'The night is dark and full of terrors' approach to monetary policy. Both approaches can be expected to be deployed until central banks have returned their collective balance sheets to their terminal levels and dampening the response of bond yields.

We constrain our model to capture these strategies by assuming that either a modest slowdown in economic growth or inflation are sufficient to see global QT never move negative before the end of 2019. That is, we explicitly assume in our base case model for QT that the global central bank buying of assets will never move below \$30bn per month over the next 3 years.

Exhibit 7: Projected path of 10 year yields: base-case scenario



If that scenario proves correct, then our base case QT model suggests that US 10 year bond yields are set to rise 130bps by the time we enter 2019. Of course, the model suggests that bond markets are already behind schedule, however, we believe financial markets have yet to fully calibrate that QT is now upon them, inflation has likely passed its cyclical ebb and that economic growth prospects for the US and the developed world remain as bright as any time since the mid-2000s. If the Fed can manage to convince the world that QT is to be a paint watching exercise then 'Verbal' Kint should be nominated as the next Fed Chair.



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