Quantitative Easing and Quantitative Tightening – speech by Silvana Tenreyro

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Speech

Good morning. It is a pleasure to speak at the Scottish Economic Society annual conference, and it is certainly appropriate to be in Glasgow this year, marking 300 years since the birth of Adam Smith.

Over the past year, the MPC's decisions on Bank Rate have rightly been the main focus of public discussion on monetary policy. After more than a decade below 1%, the MPC has taken Bank Rate from just above zero up to 4.25%, in little more than a year. And these changes have large direct impacts on borrowers and savers across the country. It is also the level of Bank Rate, and expectations of its future path, that will determine where inflation will fall back to over the next two to three years.

I will return to my recent votes on Bank Rate at the end of the speech. But for the rest of the talk today, I will discuss another policy tool: quantitative easing (QE), and its reversal, quantitative tightening (QT). QT and QE have very much been in the background in terms of news reports, and also, by design, in my own policy decisions over the past few years.

My speech will set out why QE and QT in the UK context need not, and indeed in my view should not, be part of our month-to-month thinking on monetary policy. Although it is currently in the background, it has attracted a lot of attention at different times. It was the topic of a recent **inquiry by the House of Lords Economic Affairs Committee**, and a current **inquiry by the Treasury Committee**. It has also been heavily discussed and analysed by Bank policymakers and researchers, with around 100 different publications materially related to QE since 2009 – averaging one every two months.[1]

Despite this wealth of discussion and analysis, a key finding of a recent **Independent Evaluation Office** assessment of QE, was that the tool was 'poorly understood' by the public, and for some, 'contentious'. In my view, these two assessments are closely related: any controversies stem in large part from misunderstandings about QE. In the words of the economist **Ken Rogoff (2017)**, QE is surrounded by 'hocus pocus and confusion about the channels through which it has impact'. Some of this was probably inevitable, for a tool about which policymakers and experts learned as they went, and there is no settled consensus. Today I will seek to take stock on the evidence we have gathered over time.[2]

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[1] See Chart 2.2 in **Independent Evaluation Office (2021).**

[2] These are very much my own views, and not those of the Bank or the MPC. That said, I have of course drawn extensively on the work of my colleagues in forming them, including Busetto, Chavaz, Froemel, Joyce, Kaminska and Worlidge (2022), **'QE at the Bank of England: a perspective on its functioning and effectiveness'**, **Bailey (2020)**, **Broadbent (2018)**, **Hauser (2020)**, **Pill (2022), Ramsden (2021)**, and **Vlieghe (2018)**, as well as my own analysis and reading of the literature.

At the same time, many longstanding misconceptions could perhaps have been avoided, if, as suggested in the **Independent Evaluation Office** report, QE was framed as 'a change in an interest rate rather than the creation of a quantity of money'. As noted by **Bailey et al (2020)**, increases or decreases in the quantity of reserves (a central bank liability, and also a type of money) are a by-product of QE and QT just as they are for a range of other central-bank operations. But in a system where the Bank pays interest on reserves and where reserves are one of many liquid assets held by commercial banks, the quantity of reserves is completely incidental to how the policy works, its aims, or its success. Despite this, the framing that money was being 'created' or 'printed' probably fed into some of the most pernicious myths about QE, including, as the **Independent Evaluation Office** report notes, that it was in some way a transfer of wealth to banks.

Instead, we should think of QE as a tool, which, just like changes in Bank Rate, can potentially affect longer-term interest rates (under circumstances I will discuss). This could happen through different channels, possibly involving the reduction of liquidity premia through a liquidity or market-functioning channel, term premia through a portfolio balance channel, or expected future short rates through a signalling channel. Thinking about QE in this way leads me to four key points, which I will discuss in detail in the rest of my speech:

- QE is an asset swap: it does not create new private-sector assets, which is how some may understand 'money printing' descriptions. Nor does it involve spending money in the sense that fiscal policy does. No private-sector banks, firms, households or governments end up with higher net worth from QE transactions themselves.

- QE affects the economy only to the extent it affects interest rates. There is no *separate* 'money' channel that can unleash inflation. In crisis times, QE can be powerful, as it can prevent increases in spreads via liquidity or market functioning channels, which would otherwise tighten financial conditions and lead to inflation below target.

- But outside crisis episodes, I judge that the effects on yields (and therefore on the economy) are likely to be small and temporary. This means that attempting to come up with fixed Bank Rate equivalents, or 'headroom' in billions, can lead us astray. Effects and headroom depend on the yield impact, which is smaller outside crises.

- Irrespective of its precise effects on interest rates, the MPC has not used QT as an active tightening tool. Since Bank Rate is being used to influence shorter and longer-term interest rates, which we can freely observe, then the pace and size of the QE and QT programmes need not have any effect on the *overall* amount of policy tightening. To the extent that QT affects yields, these impacts are reflected in the MPC's forecast, which can then inform decisions on Bank Rate, the active tightening tool.

1. QE is an asset swap

At a high level, QE aims to affect interest rates using central bank purchases of government bonds, or debt, held by the private sector, financed by issuing central-bank reserves.[3] Reserves are part of a central bank's 'base money', but for the public sector as a whole (the government and central bank together), they are just one type of (zero-maturity) liability. So QE effectively involves swapping one type of public-sector debt for another, changing its composition, but not the total amount.

For the private sector, reserves are deposit accounts at the central bank, used by commercial banks to settle payments between each other. This position as the ultimate settlement asset makes them the most liquid asset in the economy. In the past, many central banks did not pay interest on these reserves. And in some jurisdictions, and in basic textbook models, commercial banks are subject to reserve requirements, which gives reserves a unique role in providing liquidity to the banking system, and a mechanical link with the quantity of lending in the economy.

If this was ever an adequate simplification of banking, it certainly is not in the UK today.[4] The Bank of England pays interest on reserves and banks are subject to broader liquidity regulation, which also encompasses other interest-bearing liquid assets such as short-term government bonds. In periods of acute market disruption, such as the 'dash for cash' in March 2020, reserves and short-term government bonds can become less substitutable, as bonds become less liquid and there is increased demand for the ultimate settlement asset.[5] But outside of such extreme episodes, reserves and short-term government bonds are close substitutes, since they have similar maturity, liquidity and risk characteristics, and with interest on reserves, pay a similar return. So for the private-sector as a whole, QE involves swapping one type of liquid asset – reserves – with another – government bonds.

That is why descriptions of QE as 'money printing' fall wide of the mark. The net amount of assets and liabilities held by the private sector, and held by the consolidated public sector, remains unchanged. But a plain English reading of the term is suggestive of additional assets or wealth being created, or being spent. This framing of the policy probably fed into several common misconceptions about QE, some of which I will now try to dispel.

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[3] When I refer to QE in this speech, I am referring to central bank purchases of government bonds. In the UK, they represent more than 97 percent of the QE stock of purchases (the rest is corporate bonds).
[4] See McLeay, Radia and Thomas (2014), **'Money Creation in the Modern Economy'.**
[5] See **Hauser (2020)**.

First, QE did not involve giving money to banks.[6] Some banks were recapitalised by governments during the Global Financial Crisis. But other than the fact it was in response to the same crisis, QE was completely unrelated to that. From the perspective of a commercial bank, QE either changes the composition of the balance sheet or expands it. For example, a commercial bank can sell a government bond worth £1,000 to the central bank, and it will receive £1,000 of central bank reserves in return (**Case A on Chart 1**). There is an asset swap involving two claims on the public sector with different maturity.

Alternatively, another counterparty of the central bank might sell a bond worth £1,000 to the central bank, and deposit the £1,000 received from the central bank with our commercial bank (**Case B on Chart 1**). In that case, the effect on the counterparty balance sheet is identical to Case A, with a simple asset swap. For the commercial bank, it now has a new asset (£1,000 reserves), but also a new liability (a £1,000 deposit). The bank's balance sheet has expanded, but there is no transfer of wealth. The net worth of the bank (and the counterparty) is, to a first order, unaffected by the QE transactions.

Chart 1: QE effects on a stylised bank balance sheet
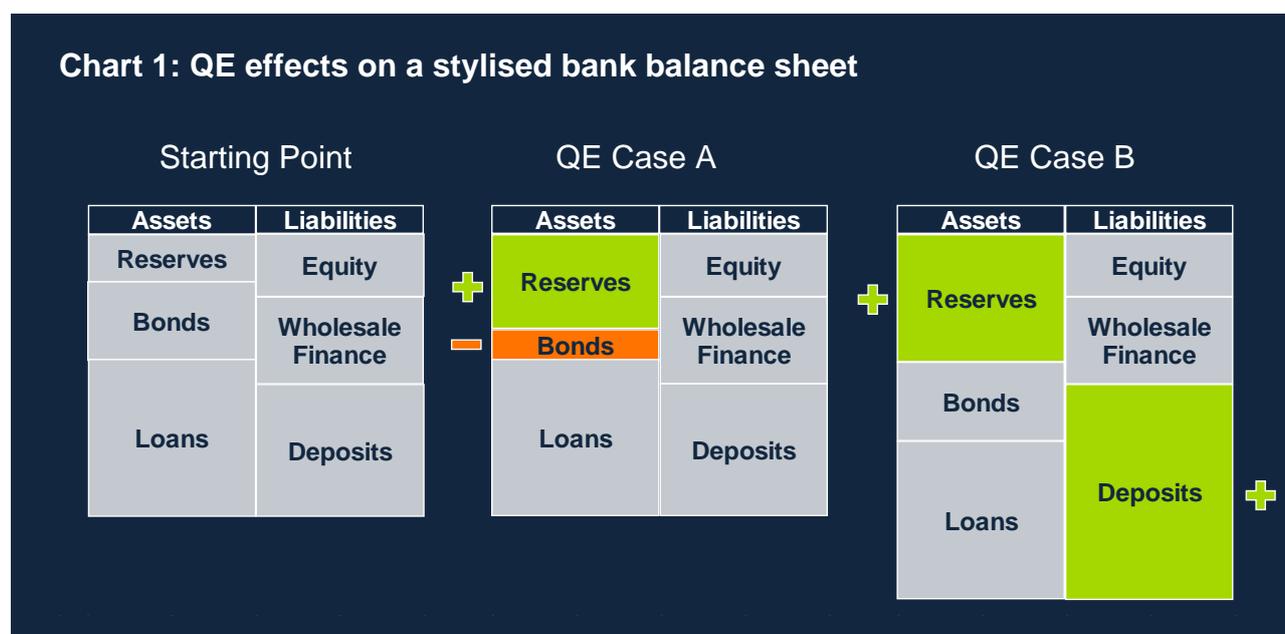
Second, QE is not government financing. By design, QE shortens the maturity structure of consolidated public-sector debt. Following a QE programme, the public sector as a whole has less long-term debt than it otherwise would have had, but more short-term debt. In principle, the Treasury could achieve much the same outcome by issuing more short-term debt and less long-term debt. Other than this change in the maturity structure, QE does not directly change the consolidated public sector finances.

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[6] A related misconception, perhaps drawing on the old textbook models, is that this money was passed to banks to 'lend out' to firms and households. See McLeay, Radia and Thomas (2014), **'Money Creation in the Modern Economy'** for a discussion.

The notion of QE as government financing may stem from the fact that asset purchases have typically taken place when the government deficit was expanding. However, the reason for that correlation is that both fiscal policy and monetary policy acted counter-cyclically, responding to a common shock; in particular, they were both loosened in response to the Global Financial Crisis and the Covid-19 pandemic. Monetary policymakers undertook QE in order to achieve their inflation targets, not to support fiscal expansions.[7] Of course, countercyclical monetary policy (whether through Bank Rate or other tools) can push down on borrowing costs in times of crisis for both the public and the private sector. But as long as independent central banks are implementing QE based on their inflation-targeting remits, then this is not a form of government financing.

To avoid these and other misconceptions about QE, I think that discussion of the policy should focus how it impacts interest rates, which is what determines how QE affects the economy. There are at least three advantages to this framing, in preference to discussing the impact of QE on asset quantities. First, there is evidence that public understanding of interest rates is higher than for other economic concepts, which might make the policy more accessible.[8] Second, it would make clearer the similarities between QE and Bank Rate, and avoid the impression that there is an independent 'money' channel of QE.[9] In many of our models, and in some operating frameworks with scarce reserves, there is a duality between the quantity of reserves and the interest rate, such that changing the quantity of reserves can influence demand and inflation.[10] But in these models and frameworks it typically does so because it changes the interest rate, not through an independent mechanism. And third, because that duality breaks down in frameworks such as our own, which pay interest on reserves. In such a system, the quantity of reserves is detached from the interest rate, and becomes entirely incidental to the stance of monetary policy, other than as a by-product of QE operations.

Instead, the aim of QE is to help meet the inflation target by pushing down on longer-term interest rates through various channels. And lower longer-term interest rates should stimulate demand and economic activity in much the same way as conventional rate cuts. The key questions are: how much QE purchases can push down long-term rates? Under what circumstances? And how persistent are these effects?

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[7] My colleagues **Ben Broadbent (2020)** and **Dave Ramsden (2021)** explain this point in more detail.

[8] Runge and Hudson (2020), **'Public Understanding of Economics and Economic Statistics'**.

[9] Of course, considering the effects of changes in monetary quantities has a proud history in theoretical and empirical economics. And the duality between quantities and interest rates means it is perfectly legitimate to do so in principle, even if experiences of monetary targeting call in to question how useful it is in practice.

[10] Poole (1970), **'Optimal Choice of Monetary Policy Instruments in a Simple Stochastic Macro Model'** is the classic discussion of whether to use the interest rate or the money stock to implement monetary policy.

2. QE works mainly through liquidity and market functioning

The literature has focused on three channels through which QE could potentially reduce longer-term interest rates, as outlined in **Chart 2**: a market liquidity or market functioning channel, a portfolio-balance channel, and a signalling channel.[11]

Chart 2: Stylised QE transmission mechanism
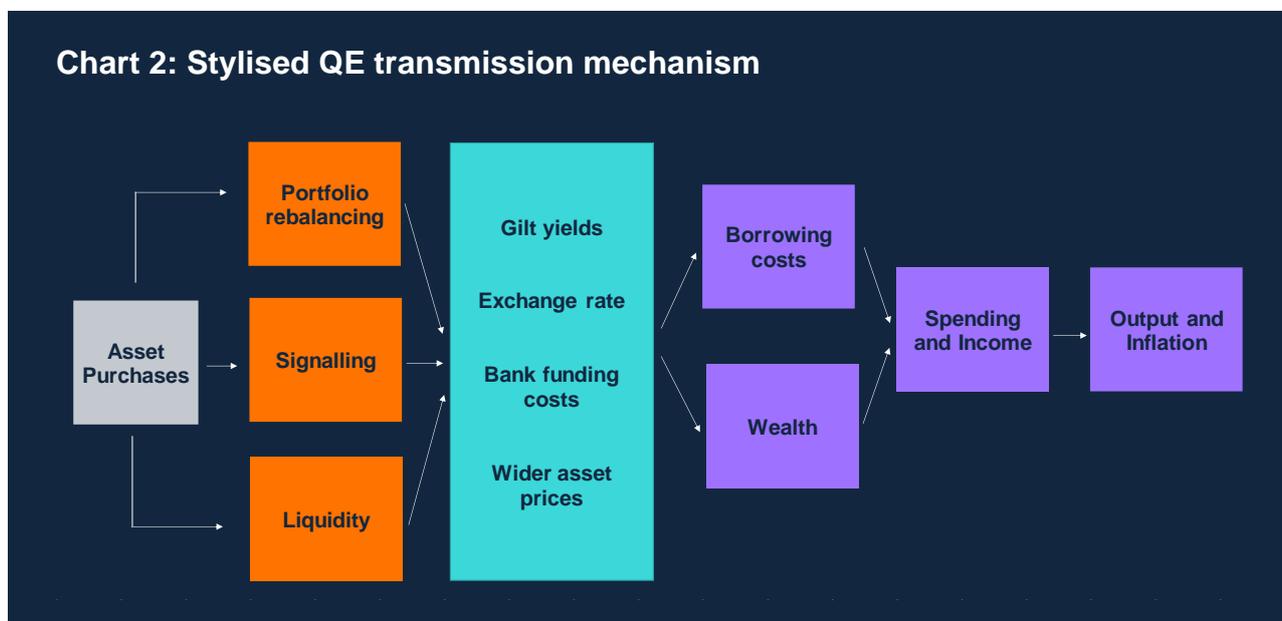
Source: Adapted from **Bailey et al (2020)**.

Liquidity means different things to different people. The notion of liquidity I refer to here is broad or systemic. Market-wide liquidity can dry up in times of stress and QE can have material effects on yields in such times. There is ample evidence for a state-contingent market liquidity or market functioning channel from a large number of event studies.[12] In the UK, the first QE programme in 2009 and the fifth programme in 2020 both started during periods of market turmoil and pushed down strongly on long-term yields, helping offset the initial shock. By limiting spikes in term premia during periods of market stress,

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[11] Some discussions also suggest a bank lending channel could operate, though I view such a channel as less likely in the current UK context where the reserves and the gilts purchased are seen as equivalent assets in regulatory liquidity ratios. The empirical evidence also does not support a bank lending channel of QE in the UK (Butt, Churm, McMahon, Morotz and Schanz (2014), **'QE and the bank lending channel in the United Kingdom'**; Miller and Wanengkirtyo (2020), **'Liquidity and monetary transmission: a quasi-experimental approach'**; Giansante, Fatouh and Ongena (2020), **'Does quantitative easing boost bank lending to the real economy or cause other bank asset reallocation? The case of the UK'**), and indeed the Monetary Policy Committee did not expect QE to work materially through bank lending channels (see e.g. the **MPC Minutes from March 2009**.)

[12] See Busetto, Chavaz, Froemel, Joyce, Kaminska and Worlidge (2022), **'QE at the Bank of England: a perspective on its functioning and effectiveness'**. Note that there is less evidence for a narrower liquidity channel working through relative liquidity premia on specific bonds. I do not discuss this channel here.

QE can protect the monetary policy transmission mechanism and offset the demand impact of these shocks, helping the MPC to achieve its inflation target.[13]

But can QE add monetary stimulus above and beyond offsetting a financial tightening caused by a dash for liquidity owing to an external shock? That is, can QE stimulate the economy relative to the pre-shock path? To do so, it would have to operate through either the portfolio rebalancing or the signalling channel.[14] My reading of the evidence makes me sceptical about the quantitative strength of these channels, particularly outside of market stress periods.[15] That said, even if in calmer periods QE does not add much stimulus, it can still play an insurance role in case of further crisis episodes.

A first glance at the data reveals that the immediate UK yield response to QE-announcement surprises in calm market conditions was typically small (**Chart 3**). Some studies based on UK data do find statistically significant effects via portfolio rebalancing in calm conditions, but typically the quantitative effects are moderate.[16] There is additional evidence from other countries, such as the US and the Euro area, but it is difficult to read across to the UK.[17] The Federal Reserve bought significant amounts of mortgage-backed securities, which may have different effects to gilt purchases given different perceived risk characteristics. Similarly, ECB purchases of sovereign bonds may have a different effect depending on the risk and substitutability across bonds from different jurisdictions.

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[13] A term premium is the compensation that investors require for bearing the risk that interest rates may change over the life of a bond. Long-term rates can be decomposed into expected future short rates and term premia.

[14] Instead of emphasising a market liquidity or market functioning channel, one could articulate this view in terms of highly state-contingent and temporary effects via portfolio balance channels, with little or no effect in calm market conditions.

[15] Another important constraint on QE is that long-term yields are bounded at the perceived effective lower bound on the short rate. Once long-term yields are close to that level, QE cannot lower long-term yields much further, and hence it cannot add stimulus in benign market conditions when long term yields are already at the bound (**Vlieghe 2021**).

[16] E.g. Froemel, Joyce and Kaminska (2022), **'The local supply channel of QE: evidence from the Bank of England's gilt purchases'** and Kaminska and Mumtaz (2022), **'Monetary policy transmission during QE times: role of expectations and term premia channels'**.

[17] For example, D'Amico and King (2013), **'Flow and stock effects of large-scale treasury purchases: Evidence on the importance of local supply'**, Wu (2014), **'Unconventional Monetary Policy and Long-Term Interest Rates'** and Ihrig, Klee, Li, Wei and Kachovec (2018), **'Expectations about the Federal Reserve's Balance Sheet and the Term Structure of Interest Rates'** for the US; Altavilla, Carboni and Motto (2015), **'Asset purchase programmes and financial markets: lessons from the euro area'** and Eser, Lemke, Nyholm, Radde and Vladu (2019), **'Tracing the impact of the ECB's asset purchase programme on the yield curve'** for the Euro Area.

Chart 3: 10-year gilt yield change after QE announcement and purchase surprise

Basis points

(Chart plotting 10-year gilt yield change (Basis points, y-axis from -120 to 40) against Gilt purchase surprise (£bn, x-axis from -100 to 200). Labels: "Other QE announcements", "Fitted line", "Mar 2020", "Feb-Mar 2009".)

Gilt purchase surprise (£bn)
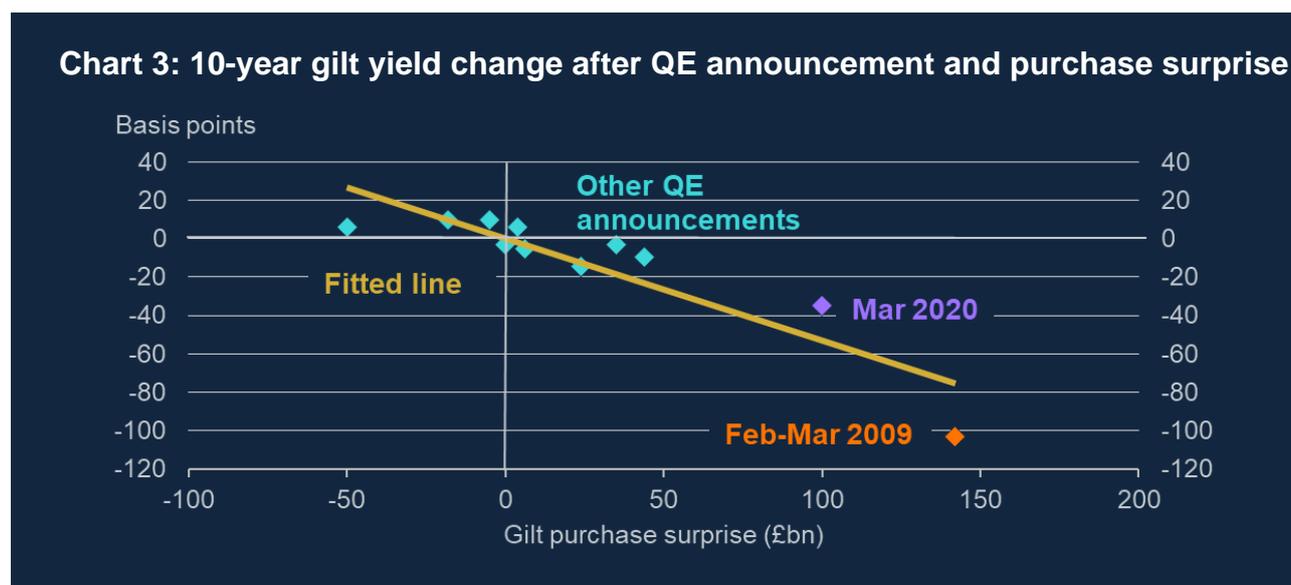
Source: **Busetto et al (2022)**.

How could a portfolio balance channel affect yields in calm market conditions? The channel is most prominently developed and discussed in the work of **Greenwood and Vayanos (2014)** and **Vayanos and Vila (2021)**, and rests on the idea of limits to arbitrage. There are 'preferred habitat' investors such as pension funds that have an inelastic demand for safe assets of certain maturities.[18] One would ordinarily expect arbitrageurs to undo any persistent effects on term premia and yields arising from the presence of those preferred-habitat investors.

But these arbitrageurs may be myopic, or risk averse; or perhaps they are subject to capital or liquidity constraints.[19] Limits to arbitrage would then imply that a reduction in net government bond supply at specific maturities could lead to a decrease in the real term premium at these, and potentially neighbouring, maturities. The theory suggests that this would reduce long-term yields, which would in turn stimulate economic activity.

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[18] Giese, Joyce, Meaning and Worlidge (2021), **'Preferred habitat investors in the UK government bond market'** provide evidence for preferred habitat behaviour in UK bond markets.
[19] The relevance of the portfolio-balancing channel, in the end, depends on the liquidity capacity and risk tolerance of arbitrageurs, which is similar to the liquidity and market-functioning channels I have discussed already (they boil down to the same fundamentals). Therefore, outside crisis periods, when financial frictions are limited, arbitrageurs can absorb changes in quantities without much effect on yields. In crisis periods, when liquidity is limited or financial markets are not functioning smoothly, QE effects would be larger. Although even in seemingly tranquil times, QE can still play a role in case of future crisis episodes.

Chart 4: Yield Changes by Maturity from QE for Gilts and Gilt-OIS Spreads (pp)

February 2009

Purchase Range

percentage points

Change in yield-OIS spreads

Change in yields

10-12 Feb

Years to maturity

March 2009

Purchase Range

percentage points

Change in yield-OIS spreads

Change in yields

4-6 Mar

Years to maturity
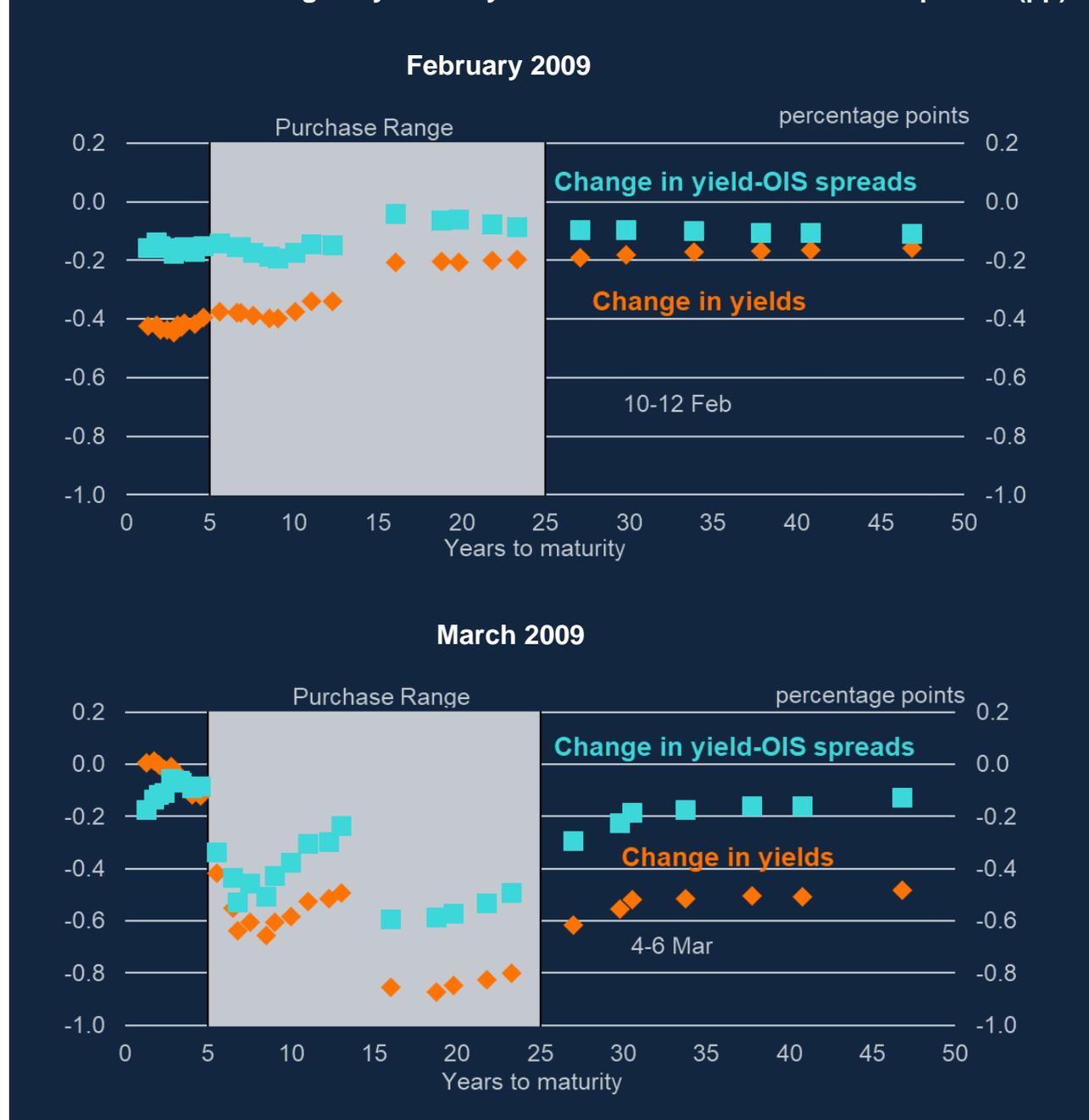
Source: **Joyce et al (2011)**.

The key question is whether these assumptions hold in practice. And in particular, whether they hold in a quantitatively meaningful way, and outside crisis times. We have event studies that find statistically significant effects of QE announcement surprises on yields. For example, **Joyce et al (2011)** showed that UK government bond yields fell more than OIS rates after UK QE announcements in 2009 (**Chart 4**), which suggests effects via term premia rather than exclusively via expected future short rates.

But a key limitation of event studies is that they can only identify effects in a narrow time window. That means event studies cannot tell us whether QE effects on yields really are

due to persistent falls in the term premium, or whether they merely reflect short-term liquidity effects that dissipate before they can have material effects on output and inflation. A number of observations in the data suggest that portfolio-balance effects on yields, if present, are only transitory and unlikely to account for the evolution of yields since the GFC. Let me summarise three of them to illustrate why I am sceptical about this channel as an independent driver of yield patterns.

First, plotting the yield response to QE surprises not just on announcement days, but over a longer time window (**Chart 5**), reveals that much of the effect on yields dies out quickly. Changes in yields are only significant for a month or two.[20] Even these short-term effects become insignificant when excluding May 2009 and March 2020, the two episodes when QE operated during acute market stress.

This is not a well-identified exercise, so it does not prove anything. It merely illustrates that the patterns in the data may be more consistent with a temporary liquidity effect rather than a persistent portfolio-balance effect.

Chart 5: Cumulative response of 10-year yield to UK QE announcements

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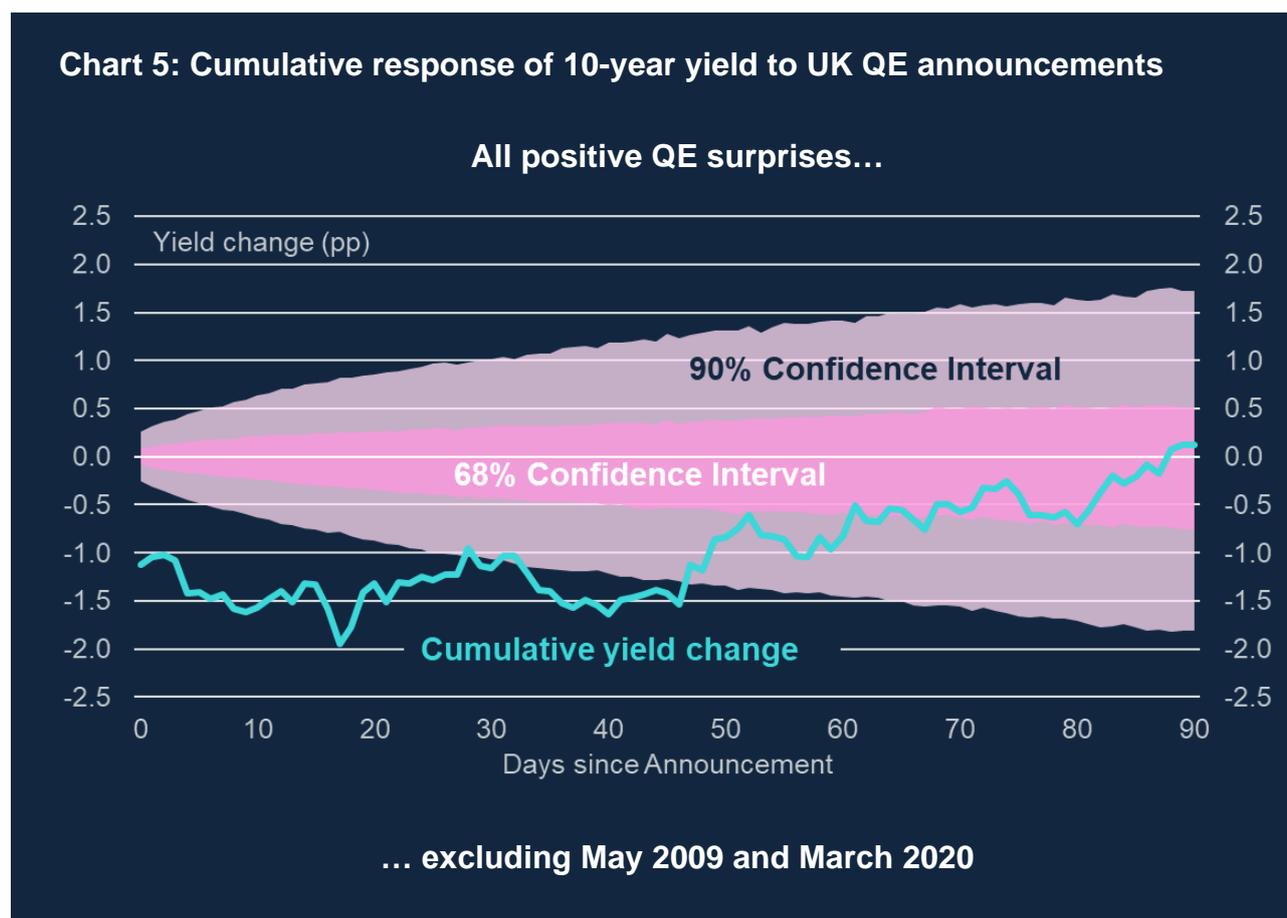
[20] Extending the exercise to six months does not change this result.
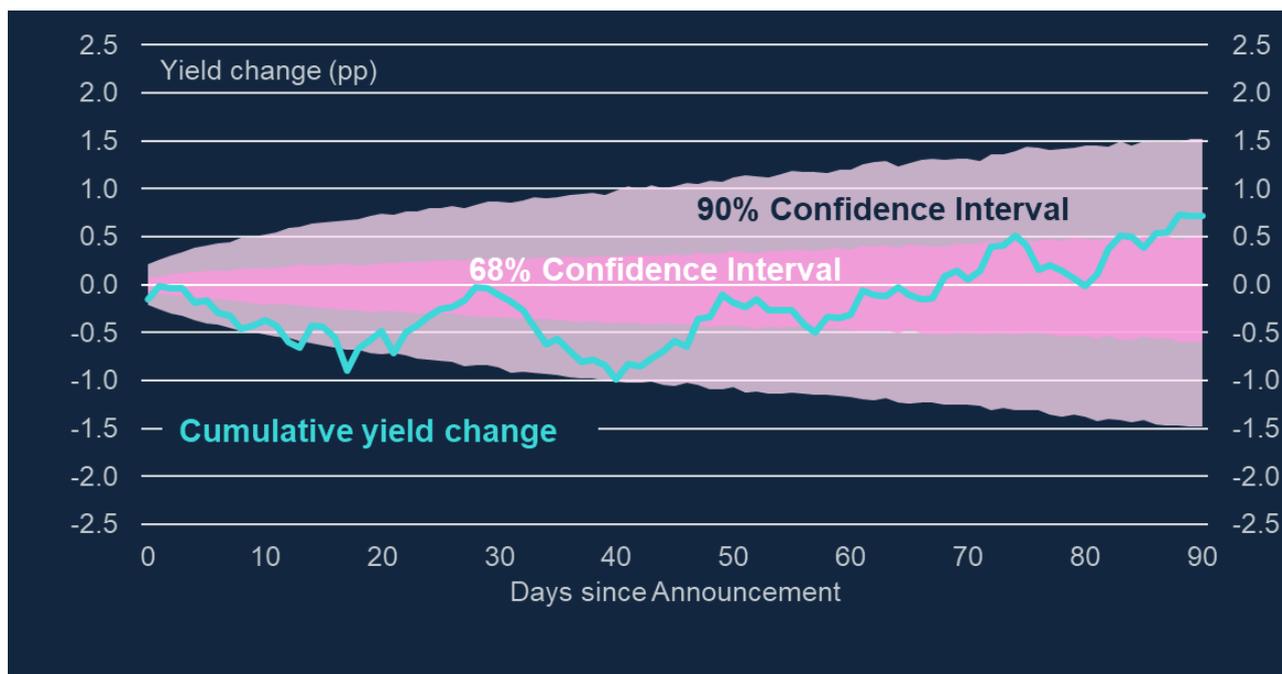
Source: Bank calculations based on **Mamaysky (2018)** and **Vlieghe (2018)**. The aqua line shows the sum of the cumulative responses of the 10-year spot yield to UK QE announcements that contained a positive surprise relative to market expectations (classification based on **Busetto et al (2022)**). The light and dark pink areas show bootstrapped confidence intervals for 10,000 randomly drawn start dates (instead of QE announcement dates).

Second, in the UK, long-term interest rates did not persistently fall in the years after the 2009 QE programme (**Chart 6**). Following the global financial crisis, long-term forward rates initially remained persistently high. The UK yield curve flattened slowly over the 2010s, most likely reflecting the evolution of expectations on the policy rate. There is no obvious relationship between the flattening of the yield curve and the timing of QE announcements or QE surprises, challenging the view that QE, via the portfolio balance channel, was a key driver of lower long-term rates.

Third, there is a naïve view that after 2008, central banks engaged in QE and term premia fell, so QE caused term premia to fall. That conclusion does not follow, however. What should matter for term premia – according to the portfolio balance view – is the total amount of long-term government bonds that the private sector has to absorb. All else constant, QE reduced that amount; but in absolute terms, and relative to GDP, it actually went up significantly after 2008. That is because government debt increased materially.

Chart 6: Evolution of UK forward rates

1-year, 10-year forward

percent

QE I
QE II
QE III
QE IV
QE V
QT

Source: Bank of England and Bloomberg Finance L.P.

The correct observation is that the market had to absorb a lot of additional long-term debt, and yet term premia fell, which is the opposite of what the portfolio balance view would predict (**Chart 7**). These are trends over a decade, so it is hard to identify causal effects. But to maintain the portfolio balance view as an explanation for persistently low long-term yields, one would have to argue that term premia would have fallen even more than they did over the past decade if the quantity of gilts the private sector had to absorb had remained constant. That is a hard argument to make; term premia fell to historic lows in the past decade, and long-term rates were often close to the perceived lower bound on the short rate, which should also act as a bound on long rates.

Chart 7: Net supply of UK debt and 10-year spot term premia
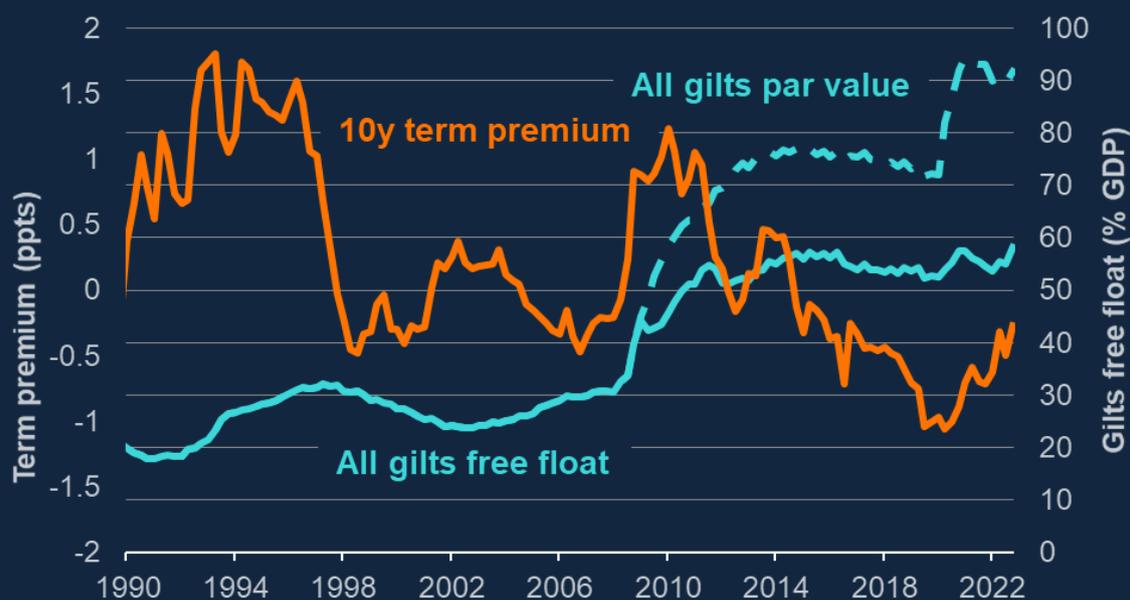
Source: DMO, ONS, **Vlieghe (2018),** Bank calculations. Term premia estimates from **Guimarães (2016)**, updated to February 2023. "All gilts" include both nominal and inflation-linked bonds. The free float is gilts less APF holdings. Solid lines show free float (% GDP), while dotted lines show free float (% GDP) minus Asset Purchase Facility purchases.

None of these three patterns in the data is conclusive proof that QE had no persistent effect on yields. Nevertheless, to me the data appear more consistent with a liquidity story. Shocks can push up term premia when arbitrageurs' capacity is temporarily constrained (and QE may have limited those spikes relative to the no-QE counterfactual). But eventually arbitrageurs do their job, so there is no clear persistent effect.

I should note that this reading of the evidence is fully consistent with the state-of-the-art model of **Vayanos and Vila (2021)**. QE effects on yields depend on the risk capacity of arbitrageurs. If that risk capacity is state-contingent, QE effects will be state-contingent and largest when market liquidity dries up. Theories of slow-moving capital provide another avenue to model this. With slow-moving capital, large changes in net bond supply can have large effects on yields until new capital flows into the affected markets to re-establish the no-arbitrage condition.[21] QE can be an important tool to offset large shocks in times of stress, which may otherwise tighten financial conditions. But QE may only have small and transitory effects through portfolio-balance channels when markets

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[21] See Greenwood, Hanson and Liao (2018), **'Asset Price Dynamics in Partially Segmented Markets'**.

are functioning well, making it unlikely to explain the medium-to-long term patterns in yields.[22]

If not portfolio balance effects, may signalling channels deliver large persistent effects of QE on yields? Signalling captures two separate proposed mechanisms. One is that QE purchases provide a commitment to keep rates low for longer, which helps strengthen forward guidance on rates. Another is that QE can help convey news about the state of the economy or communicate the central bank's reaction function at the effective lower bound.

The commitment-based signalling channel is expected to work like this: suppose inflation is too low but the central bank cannot cut the short-term interest rate because of a lower bound on interest rates.[23] The central bank could promise to keep the policy rate low for longer, adding stimulus by pushing down expected future short rates and hence longer-term interest rates. That would be an example of forward guidance. There are however limits to this approach. In particular, the central bank cannot credibly commit to a time-inconsistent policy. Markets will anticipate that once inflation rises above target, the central bank would want to raise rates even if it had previously promised otherwise.

In this view of QE as a commitment device, the premise is that QE could help central banks stretch the limits of forward guidance. But why should asset purchases provide any more commitment than forward guidance? For the commitment-based signalling channel to work, undertaking QE would need to make it more costly for the central bank to raise rates quickly once inflation rises above target. This could be the case if the central bank is committed not to raise rates before finishing an announced QE programme or before unwinding part of the programme. However, this has not been a constraint for many central banks. Indeed, the MPC made clear it would raise interest rates before unwinding the QE programmes.[24] Even in the case that there was a commitment not to raise rates before QE completion, it is not clear that QE really adds an additional hurdle: the same reputational damage could result from breaking forward guidance promises; after all, the announced tightening sequencing itself is a form of forward guidance.

Some have proposed balance-sheet concerns behind the commitment. If a central bank holds many long-term government bonds because of QE, raising rates would generate financial losses on these exposures. A central bank, they argue, may then want to delay rate rises to avoid losses, and begin raising rates only after reducing exposures via QT.

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[22] Many of my colleagues have emphasised the state-contingency of QE, including **Andrew Bailey (2020)**, **Dave Ramsden (2021)**, **Gertjan Vlieghe (2021)** and **Andrew Hauser (2022)**.
[23] See e.g. Jeanne and Svensson (2007), **'Credible Commitment to Optimal Escape from a Liquidity Trap: The Role of the Balance Sheet of an Independent Central Bank'** and Bhattarai, Eggertsson and Gafarov (2015), **'Time Consistency and the Duration of Government Debt: A Signalling Theory of Quantitative Easing'**.
[24] See e.g. 'The MPC's asset purchases as Bank Rate rises' in the **November 2015 _Inflation Report_**.

But in the UK, as in other countries, there are arrangements in place specifically designed to ensure that monetary policy makers focus exclusively on the appropriate monetary policy, and do not worry about the narrow financial implications of QE for the public sector.[25] And the economic benefits of QE go well beyond any financial profit or loss from changing the maturity structure of consolidated public-sector debt.[26] Particularly in times of crisis, such as in 2009 and 2020, QE purchases were an essential part of the policy response necessary to hit the inflation target, preventing even larger recessions. These macroeconomic benefits of QE are likely to dwarf the direct fiscal implications of QE. Moreover, indirect fiscal implications of QE, such as higher tax revenues owing to shallower recessions, are likely to outweigh any direct fiscal implications of QE.

In my view, QE is unlikely to commit central banks to any particular path for the short-term rate, at least not any more than forward guidance could. Indeed, recent central bank behaviour does not seem consistent with a commitment-based signalling channel. Many central banks, not just the Bank of England, have raised interest rates significantly over the past year, even though central-bank balance sheets are historically large relative to GDP and quantitative tightening has barely started. To the extent that markets did place some weight on a commitment-based signalling channel, this weight may decline over time, as understanding of QE develops.

A different signalling channel could operate if QE signals news about the state of the economy or reveals the central bank's reaction function at the effective lower bound.[27] By engaging in QE, a tool that might actively stimulate demand when interest rates cannot, an announcement to keep rates low for longer could carry more weight than guidance alone. A precondition for this expectations channel is that QE does work through other, non-signalling channels, or at least that the central banker believes this to be the case.[28] If QE had no material effects on yields, output or inflation, then QE would always be costless for the policymaker and hence could not send a more credible signal than words about the state of the economy or the central bank reaction function. But if, for example, QE effects through portfolio-balance channels are believed to be large, then the expectations channel could in principle amplify the effectiveness of QE.

Overall, it is conceivable that QE could work to some extent via signalling channels, but those effects should also be modest in size. It seems unlikely that large balance sheets will in future be seen as an impediment to raising rates quickly, which would prevent any

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[25] See e.g. Bell, Chui, Gomes, Moser-Boehm and Pierres Tejada (2023), **'Why are central banks reporting losses? Does it matter?'**.
[26] See e.g. **Carstens (2023)**.
[27] My former colleague **Gertjan Vlieghe (2018)** referred to this as an expectations channel.
[28] More precisely, market participants need to believe that the central banker believes this to be the case.

commitment-based signalling channel. And if portfolio-balance channels are also seen as limited and temporary, the expectations channel would also lose power.[29]

To summarise my stocktake on QE transmission, the key question is how much QE reduces long-term bond yields. The evidence is supportive of stronger effects on yields during times of stress via broad liquidity channels, while there may be some evidence for small and temporary effects on yields through portfolio-balancing and signalling channels.

It follows naturally from this description of QE transmission that some supposed side-effects of QE policies seem far-fetched. A strong current in the public debate on QE argues that asset purchases are a key driver of high asset prices, creating financial stability risks and contributing to rising inequality. But if QE mainly mitigates large increases in spreads in times of stress or impaired market functioning, it does not inject material additional stimulus in absolute terms. So asset prices are unlikely to be higher than they would have been absent the shock in financial markets.

When used in calm market conditions, QE effects on longer-term interest rates are likely to be more limited. Long-term interest rates have fallen significantly over the past two decades because the equilibrium real rate has fallen, not because of QE. It was not, therefore, an important driver of rising asset prices in the past decade. That said, even if its role in reducing yields is limited, QE can still play a role as an insurance device, helping to meet the inflation target in case of future episodes of financial stress.

A clear implication of the state-contingent nature of QE is that it does not make sense to try to think of fixed equivalencies between some quantity of QE purchases, and a change in Bank Rate of a certain size. Small amounts of QE purchases, or even just a commitment to purchase, could prevent large rises in yields during times of stress or illiquidity. But large quantities could translate into limited yield movements at other times. Similarly, we should not think about QE 'headroom' in terms of the quantity of gilts available to purchase. The available headroom depends on the prevailing level of yields, and whether there are significant liquidity or market frictions that QE can help alleviate.

## 3. QE did not contribute to above-target UK inflation

Having set out my understanding of QE transmission, I will touch on how QE relates to the challenge facing monetary policymakers around the world over the past 18 months – inflation rates well above our targets.

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[29] One important exception to this may have been the 2009 QE programme, which could have pushed down term premia significantly and permanently. That may have occurred if markets came to think it more likely that central banks could step in to purchase some types of assets at times of financial stress or market dysfunction. But this would be a one-off effect, which cannot be repeated. In its absence, signalling channels could be less powerful (**Broadbent, 2018**).

Some have argued that the high inflation rates we are seeing at the moment are to some extent, or even to a large extent, a consequence of QE. The same kind of argument was made back in 2009, when some commentators predicted that asset purchases would quickly result in very high inflation. Yet central banks around the world used QE for many years, but inflation rates remained at – and in some cases stubbornly below – their targets.

In this instance, three key points make clear why there is no link between QE and recent inflation outturns. First, inflation over the past 18 months was caused by large and unexpected external shocks, primarily the war in Ukraine, and the strong global demand for goods at a time of global supply chain disruption, which could not have been offset by any realistic monetary policy, be that Bank Rate or QE. Second, QE purchases announced in the second half of 2020 were, for my part, insurance in case of further market dysfunction, not to actively lower yields. Since dysfunction did not occur, the marginal impact of the purchases on yields and financial conditions is likely to have been limited. Third and most importantly, throughout, the MPC used Bank Rate as its active tightening tool, so the monetary stance was ultimately determined by decisions on Bank Rate, irrespective of the precise QE impact. I will briefly expand on each of these points.

First, several of my colleagues and I have set out how extremely large external shocks, and not domestic demand conditions, have been the overwhelming cause of this period of very high inflation. I discussed in November (**Tenreyro 2022**) how the majority of above-target inflation can be accounted for by the extraordinary increase in global energy prices caused by the war in Ukraine, and by the increase in globally-traded goods prices stemming from the effects and after-effects of the pandemic (**Chart 8**). My colleague **Swati Dhingra (2023)** recently showed evidence suggesting that much of the rest of the inflation increase stemmed from the indirect effects of these shocks via the supply chain.

Chart 8: Energy prices have been the main driver of above-target inflation
Contributions to difference in CPI inflation versus 2012-19 average [a]
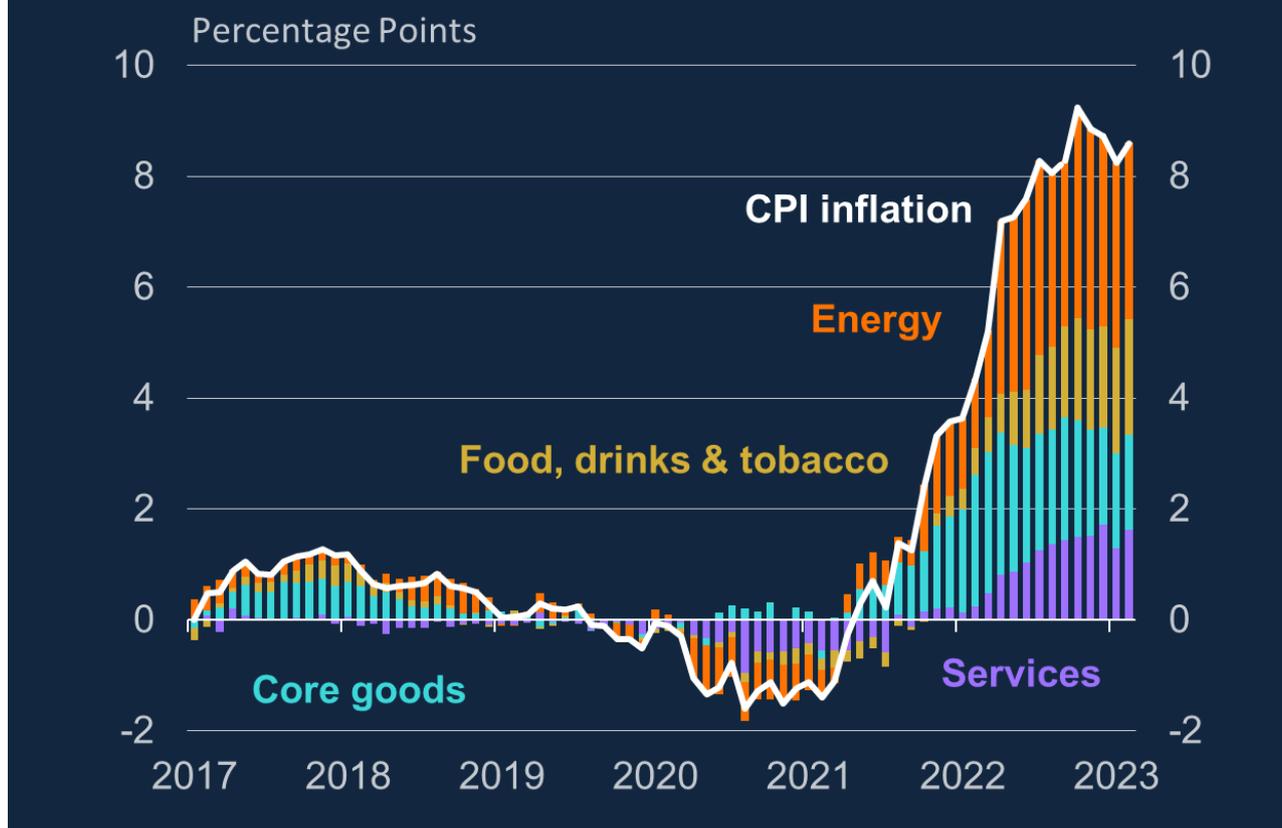
Sources: ONS and Bank calculations.

While monetary policy can always control inflation in the medium-term, much of its effect on the economy comes with a lag, which means the short-run inflation volatility from such large shocks is unavoidable, as is recognised in our Remit. Even if shocks such as the war in Ukraine were perfectly foreseeable years in advance, there is no realistic monetary policy that could have prevented their inflationary impact in a way consistent with our Remit. Mechanical policy extrapolations in **Tenreyro (2023)** show that even extremely high interest rates in the middle of the pandemic would not have prevented inflation rising far above target; would have required extremely high unemployment rates and even larger falls in real wages; and would have led to an enormous inflation undershoot when the energy shock faded. Such a policy would not have been desirable or even possible mid-pandemic, when the furlough scheme was preventing a large rise in unemployment.

Second, my motivation in the second half of 2020 for extending QE purchase programmes was for QE to act as insurance in case of further episodes of market dysfunction owing to the pandemic. The impact on yields, given markets remained calm and well-functioning, is likely to have been limited. This is consistent with the evidence on the transmission mechanism I have described, which suggests that QE's main effects come at times of

heightened market stress. Given limited impact on yields, which were already very low, there was little additional demand stimulus from these QE announcements or purchases.

Third and most importantly, Bank Rate was the MPC's active tightening tool. I have set out why I judge that the overall monetary policy stance was appropriate, and why QE is unlikely to have had much impact on yields in this period. But even if one were to come to a different assessment of that impact, Bank Rate was the tool we were using to steer the overall monetary stance. If QE had had a larger impact on yields than I estimate, it would not have resulted in a looser policy stance than I judged to be appropriate. Whatever the marginal effect of QE on yields may have been, the MPC was able to observe these yields and adjust Bank Rate and guidance on Bank Rate to achieve the desired overall stance.

I think similar logic also applies when asset purchases are used for purposes other than in pursuit of the inflation target. As long as the MPC has an effective tool with which to adjust policy, then that tool can be used to meet its Remit.[30] The Bank's short-term gilt market operations in October 2022, for example, were designed to deliver the FPC's financial stability objective.[31] If I were ever to judge that asset purchases to maintain financial stability would alter the monetary policy stance, I would be free to vote on Bank Rate in a way that took that into account. This would be no different to how I would take into account the effect of any FPC policy decision that affected the inflation outlook. I will next turn to the similar set of arguments that apply to QT, and explain why I think it can operate in the background, with no impact on month-to-month policy decisions.

4. QT does not affect the overall amount of policy tightening

In February 2022, the MPC began stopping the reinvestment maturing gilts, and since November 2022 it has voted to actively sell bonds. So far, this has reduced the stock of government bonds held for monetary policy purposes from a peak of £875bn to £818bn.[32] But just as with the QE purchases made over 2021, the pace and size of the QT programme need have no effect on the overall degree of monetary tightening, and therefore on the outlook for inflation.

Although the MPC is unwinding QE, it is not using the stock of asset holdings as an active monetary policy tool. It has made clear over a number of years that once Bank Rate was away from the lower bound, and could move in both directions, it intended to unwind the

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[30] In many models, related to the logic of the Tinbergen rule that the number of instruments needed is equal to the number of objectives, the instrument assigned to each goal can depend on their relative effectiveness. For example, in Aikman, Giese, Kapadia and McLeay (2023), **'Targeting Financial Stability: Macroprudential or Monetary Policy?'**, it is optimal for the tool that is relatively more effective at achieving monetary goals compared to financial stability objectives to be used for that purpose, and vice versa. If the tools are state-contingent, it is therefore natural that the same tool can be used for different purposes at different times.

[31] See **Breeden (2022)** and **Hauser (2022)** for discussions of this intervention.

[32] As of 22 March 2023, the date that the March 2023 MPC meeting ended.

stock of QE gradually and predictably, and in a way that was not bound to underlying economic conditions. Instead, Bank Rate is the active instrument. And it is observed interest rates and asset prices that feed into our forecasts, which will automatically incorporate any effects of QT. Hence, whenever asset prices move persistently in a way that makes financial conditions too loose or too tight to meet the inflation target, whether caused by QT or anything else, then our forecast will reflect this. Decisions and plans on Bank Rate, which are informed by the forecast, can adjust in order to offset those moves.

Moreover, the programme of asset sales is designed in a way that it should have a minimal impact on asset prices. QT has been undertaken so as not to disrupt stable market functioning. This approach means that asset sales should have no material effects on yields through liquidity channels. At the same time, undertaking QT gradually and predictably in the background should detach it from the active monetary policy debate. That implies that QT should not have any material effect through signalling channels. That leaves the portfolio balance channel, which I argued had only small and temporary effects on yields in well-functioning markets. I expect the same to apply in the case of QT.

Identifying the size and persistence of QT effects on yields will be subject to all the same problems that have plagued research trying to uncover the effects of QE. But the critical point for setting monetary policy in real time, is that whether effects are large or small, they need not impact the overall policy stance.

5. Conclusion and current policy outlook

To conclude, QE has been a useful addition to the policy toolkit. It can help the MPC meet the inflation target, particularly during crises, when it can offset significant tightening that could otherwise be imparted by financial market dysfunction or market liquidity shortages.

QE affects the economy only to the extent it affects interest rates. I think it is crucial for public understanding that discussion of the policy focuses on this framing. Some longstanding misconceptions around QE and its effect on banks, government finances and inflation seem to relate to perceptions of 'money printing'.

In the UK context, and outside periods of stress and market dysfunction, my reading of the evidence is that QE is likely to have small and temporary effects on yields. This means that its impact is highly state-contingent, and one should not consider some fixed amount of QE as equivalent to Bank Rate, nor as a measure of policy headroom. It also implies that while QE can help prevent or offset some types of financial-market shocks, which might otherwise tighten financial conditions and make it difficult to achieve the inflation target, it may not be able to add much additional stimulus relative to pre-shock. Hence we

cannot be complacent about the ability of QE to substitute for interest-rate policy if, when inflation falls, we find ourselves still in a world of low equilibrium interest rates.[33]

Since the MPC has used Bank Rate as its active tightening tool to influence short-term and longer-term interest rates, QE and QT need not have any bearing on the overall degree of tightening, and therefore on above-target inflation in the recent past, or below-target inflation in our forecast. Any effects of QT are immediately observable in interest rates and asset prices, so factored into our forecasts and Bank Rate decisions just as with asset-price movements caused by anything else. By design, the impacts should be small, but policy can ensure the overall stance is the same regardless.

Larger impacts on asset prices were evident in recent weeks in bank funding markets, following the failure of Silicon Valley Bank in the US, and the purchase of Credit Suisse by UBS in Europe. The Bank of England FPC's assessment is that the UK banking system remains resilient, and with macroprudential tools the first line of defence against financial-stability risks, my recent decisions have focused on the outlook for inflation. We will observe in the coming weeks whether those increases in bank funding costs persist in a way that affects the inflation outlook. If so, the MPC will need to take into account the resulting extra tightening in credit conditions when choosing a Bank Rate path, just as it does for any other event, including QE or QT, affecting asset prices.

Even before recent financial-sector events abroad, there had been sizeable news to the outlook. In November, I set out three scenarios for my own policy strategy under different data outturns. Since then, the data have evolved most like my downside scenario, with high-frequency private-sector regular pay growth falling back sharply in recent months.

Moreover, all three scenarios were under the assumption that the terms-of-trade shock that has pushed UK inflation far above target would unwind in line with the market prices our forecast was conditioned on. In the event, this has reversed even faster. Oil and gas prices and futures have fallen sharply, while indices of global supply chain disruptions and shipping costs are back to pre-pandemic levels. Food-price inflation increased in February, though in part this reflects the lagged effects of the energy-price shock (through its impact on fertiliser prices, for example), as well as adverse weather conditions in agriculture.

This partial reversal of the terms-of-trade shock should have symmetric effects to the initial increase. Headline inflation will fall more sharply, as direct impacts and indirect effects via the supply chain reverse. There will also be lower price inertia from second-round effects via wage growth, given a lower rate of headline inflation. At the same time, we will see less of a drag on demand and the output gap from further falls in real income, which probably explains part of the recent tick up in near-term output indicators.

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[33] **Bailey et al (2022)**.

So far, however, the policy response has not been symmetric: in recent months Bank Rate has increased further into restrictive territory, to 4.25 per cent. As the effects of the large and rapid tightening in policy gradually come through over the course of 2023 and 2024, this is likely to drag demand well below its potential, loosening the labour market and pulling down on inflation. In the absence of further counterbalancing cost-push shocks, I judge inflation is likely to fall well below target.

Given that outlook, I have voted for no change in Bank Rate in recent months, rather than further tightening. With Bank Rate moving further into restrictive territory, I think a looser stance is needed to meet the inflation target in the medium term. In general, a looser stance can be achieved either through lower Bank Rate today, or through lower Bank Rate in future, which leads to a lower market curve. A lower market curve would then lower lending rates and loosen financial conditions today. At the same time, with Bank Rate moving further into restrictive territory, there are limits to the amount of loosening that can be provided through this mechanism. So I expect that the high current level of Bank Rate will require an earlier and faster reversal, to avoid a significant inflation undershoot.

As always, my future decisions on Bank Rate, as with those of my colleagues, will depend on how the data evolve. In any event, the MPC will set policy to ensure inflation returns to target in the medium term.