A feature not a bug – speech by Megan Greene

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Speech

Introduction

Many thanks for inviting me to NIESR for this speech. I have spent many hours in this building, contributing to regular discussions previously as a market participant and attending board meetings for Rebuilding Macroeconomics when it was based here. It's lovely to be back in this setting.

Social scientists like to talk about structural changes, and my speech today is no exception. I'm going to use it to explore one of the most important – and often overlooked - structural changes happening in macroeconomic policy at the moment: the shift of central bank balance sheets towards new steady states and what this means for monetary policy specifically.

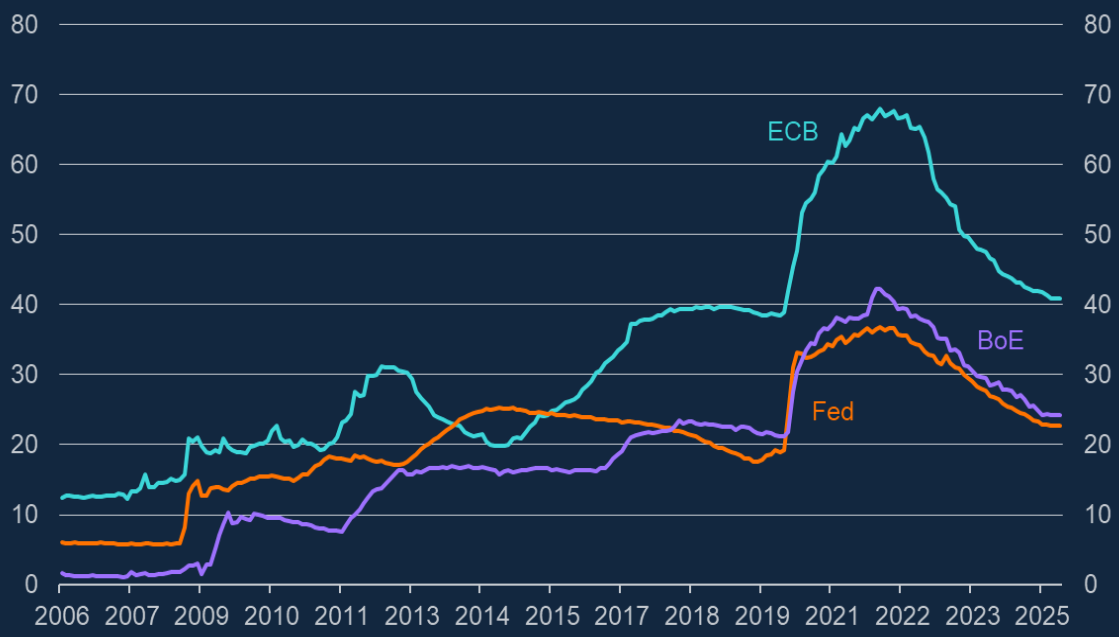
The size and composition of central bank balance sheets can provoke "passionate reactions" as Andrew Hauser, the former Executive Director of Markets at the Bank, once noted **(Hauser, 2019)**. Perhaps this is not surprising given how crucial a role the central bank balance sheet plays in the functioning of our financial system and economy and how dramatically various central bank balance sheets have changed over the last decade.

During the Global Financial Crisis, as rates fell to their effective lower bounds, major central banks turned to more unconventional policy tools, such as Quantitative Easing (QE), to stimulate lending and spending in the economy in order to meet their inflation targets. This led to a significant expansion in many central bank balance sheets. Additional shocks such as Covid prompted further rounds of asset purchases over the following decade, leaving the size of balance sheets at historically elevated levels.

Following Covid, most major central banks began to slowly shrink their balance sheets – a process known as Quantitative Tightening (QT)[1] – as seen in Figure 1.

[1] The US Federal Reserve also conducted QT from 2017-2019.

Figure 1: Central bank assets as a share of national/regional GDP
Per cent (%) [(a)]



Source: Bloomberg Finance L.P. and Bank calculations. Latest data point is June 2025.

(a) Daily data has been transformed into monthly averages.

But how central banks have undergone the transition towards smaller balance sheets, what the end states will look like, and what facilities are used to support interest rate control and financial stability is not uniform. I'd like to explore some of these differences.

First, I aim to talk through the theory behind different end states and why many paths lead to the same destination. Next, I'll review what central banks have actually been doing, focusing on the Bank of England (BoE), the European Central Bank (ECB) and the Federal Reserve (Fed). To be clear, this is not an exhaustive list of central banks undergoing this transition; I've simply chosen them for their impact on the UK economy.

Finally, I'd like to ask whether there are any pricing differentials that create trading opportunities for banks given the differences in how the Bank of England, ECB and Fed are managing their balance sheets. To be clear, I am examining this purely through the lens of monetary policy implementation: do financial arbitrage opportunities impact central banks' abilities to implement monetary policy? When I refer to arbitrage today, I do not mean the academic economic definition of a risk-free trade. I am referring to banks taking profits from trading opportunities.

At the Bank of England, the day-to-day management of the balance sheet, including the design and implementation of balance sheet operations, lies with the Bank's Executive – which includes the Governor and Deputy Governors – and not the Monetary Policy Committee (MPC). But our remit on the MPC is to set monetary policy to "maintain price stability; and subject to that, to support the economic policy of His Majesty's Government, including its objectives for growth and employment."[2] That requires having sufficient control of instruments impacting monetary conditions – broadly defined as the quantity of inside money and general level of market interest rates[3] (hereafter referred to as 'rate control'). These will be impacted by, among other things, developments in our balance sheet and spillovers from abroad.

My main message today is that different end states for central bank balance sheets may, at face value, create financial arbitrage opportunities for banks, but they are fairly limited. Financial arbitrage opportunities present incentives for banks to participate in our facilities, enhancing rather than undermining our ability to maintain rate control. This is a feature, not a bug.

Now that I've given you my thesis statement, let me walk you through some of the theory behind central bank balance sheet frameworks.

Theoretical frameworks

There's an extensive body of literature detailing the theory underpinning monetary policy frameworks, going back to the seminal work of **William Poole (1968),** in which he analysed the choice central banks faced between targeting the interest rate or the supply of reserves. But fear not – I won't take you on a long journey through economic history today. I'm going to draw on **Annette Vissing-Jorgensen's (2023)** recent work to help illustrate not only *what* options are available to central banks for their steady-state balance sheet frameworks, but also *why* these different frameworks can all be effective at achieving rate control.

The starting point here is understanding the role that central bank reserves play in the financial system. Reserves are deposits that commercial banks hold at the central bank. They are considered the most liquid form of money; they act as the ultimate means of settlement for transactions in the economy; and they are only created by the central bank.

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[2] See **Monetary policy remit: Mansion House 2024**.

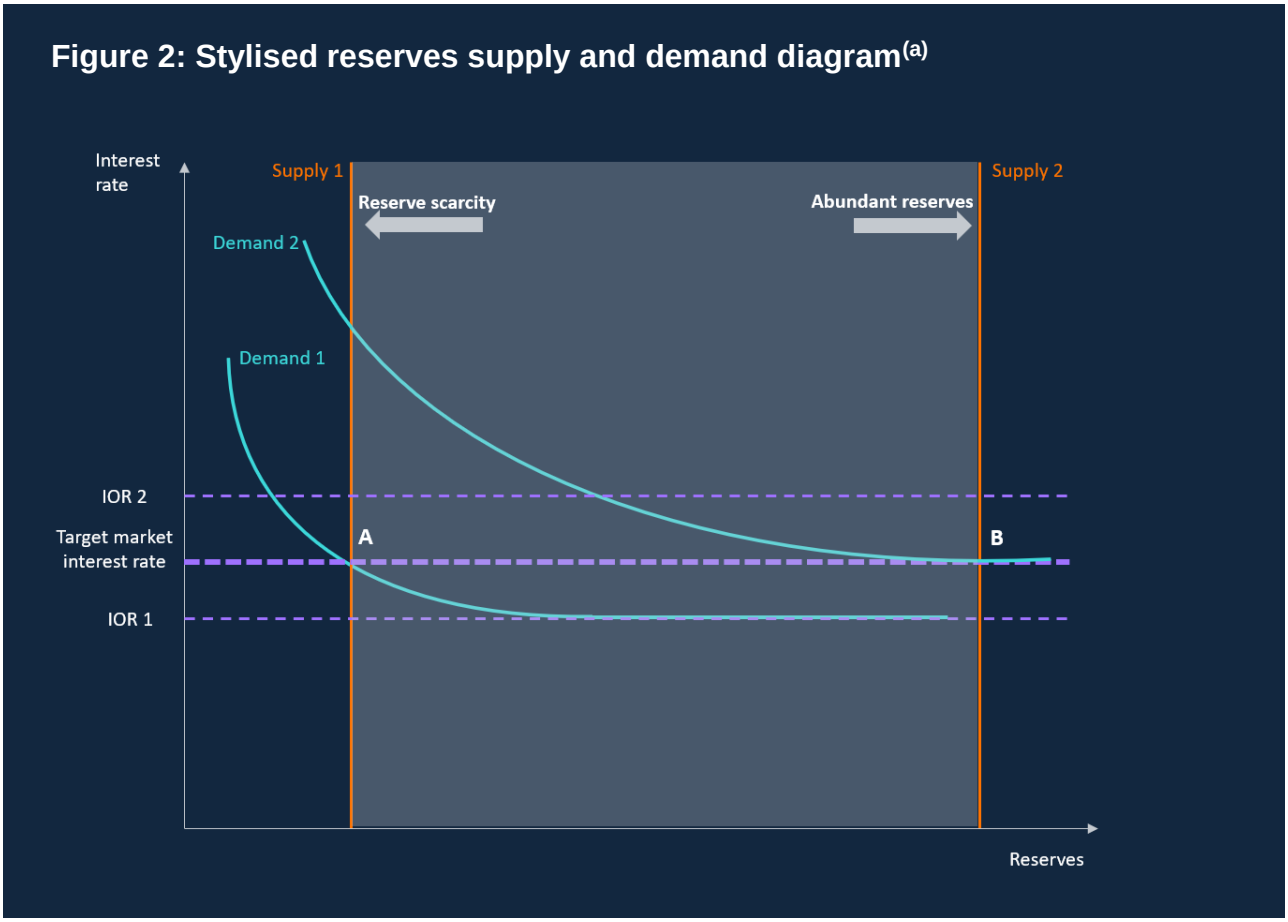
[3] Principles of engagement - **Governance of the Bank of England's balance sheet: principles of engagement | Bank of England.** In practice, the MPC intends to use Bank Rate as its active policy tool when adjusting the stance of monetary policy. The parameters of the QT strategy are amended at a lower frequency than decisions on Bank Rate and are not calibrated with a view to fine-tuning the monetary policy stance (**August 2024 Monetary Policy Report**).

There are three main reasons commercial banks would want – and need – to hold them (**Hauser, 2023**).

First, banks are mandated to hold a certain amount of liquid assets, known as 'High Quality Liquid Assets' (HQLA) – of which central bank reserves are one form – to ensure they can meet the payment obligations created by their customers at all times. Second, banks may choose to hold additional reserves to meet higher-than-expected demand, including outflows in periods of stress. Third, banks may wish to hold additional reserves in excess of their precautionary needs or lend them to other banks if these options are financially attractive.

We can formalise these options in a general and simplified way using the economist's favourite tool: the supply and demand diagram - as shown in Figure 2. This figure is a stylised example rather than a representation of any one central bank's specific approach.

Figure 2: Stylised reserves supply and demand diagram[(a)]



(a) Note: adaptation from **Visseng-Jorgensen (2023)**. In this chart, I have simplified such that the IOR and target market interest rate effectively act as floors for the demand curve. In practice, there might be some demand for reserves below the IOR from participants who are not eligible for a deposit account at the central bank (so-called 'leaky floor').

The starting assumption here is that the supply of reserves and interest paid on reserves (IOR) are both set exogenously by the central bank. Supply is therefore fixed and

unaffected by the interest rate in this stylised framework. You can see this in Figure 2 represented by the straight, vertical orange lines. An expansion in the supply of reserves is demonstrated by an outward shift of the supply curve – for instance, from Supply 1 to Supply 2 – while a reduction in supply is represented by a movement in the opposite direction.

The demand curve, shown in aqua, illustrates the amount of reserves demanded by commercial banks at any given interest rate. The short–term market interest rate is determined by the intersection of the supply and demand curves.

There are a couple of things to note about the demand curve. First, the level of the IOR influences the level of the demand curve. Any change in the IOR leads to a vertical shift in the demand curve, moving the market to a new equilibrium interest rate. For example, as the IOR increases, reserves become more attractive as a store of value so the whole demand curve shifts up. It is also worth noting that the spread between the IOR and the market interest rate matters since it impacts the opportunity cost of holding reserves and therefore influences how many reserves banks choose to hold.

Second, the demand curve is downward sloping in nature - as is typically the case for goods, services and other assets. As their price – or their market rate – falls, banks demand more of them.

But there are two more specific reasons for this. First, as banks hold more reserves, the convenience benefits they get from holding extra reserves – notably that they are already in the form of the settlement asset, and are more convenient than monetising other, less liquid assets – diminishes so they are willing to pay less of a so-called ‘convenience yield’ for them. Second, as market rates go up relative to the IOR, banks face a higher opportunity cost: banks benefit more from lending out funds to other banks or using them to invest in other assets, rather than holding on to them in the form of reserves and earning the IOR (and vice versa).

A final note on the demand curve is that it is non-linear. As reserves increase, the demand curve becomes flatter until demand for reserves is fully satiated and the demand curve is completely horizontal. Here, any change in supply has no impact on the market rate since reserves are so abundant. On the other hand, as reserves become less abundant, the demand curve becomes steeper and market rates become increasingly more responsive to changes in supply (**Afonso et al, 2024**).

Now that we’ve covered the basics, let’s take a look at some options for a framework that central banks can choose to set their market rate. Our supply and demand diagram shows two distinct approaches to achieving the same target market interest rate: Point A and Point B.

At point A, the central bank has set a low IOR (IOR1), resulting in a low reserve demand curve (Demand 1), and has chosen to supply a scarce amount of reserves. With this approach, the central bank is able to create the conditions for its target market interest rate. However, in committing to a scarce reserve framework, the market rate is susceptible to volatility, given the equilibrium lies on the steep part of the demand curve. Here, even small shifts in supply and demand can lead to a considerable change in the market interest rate.

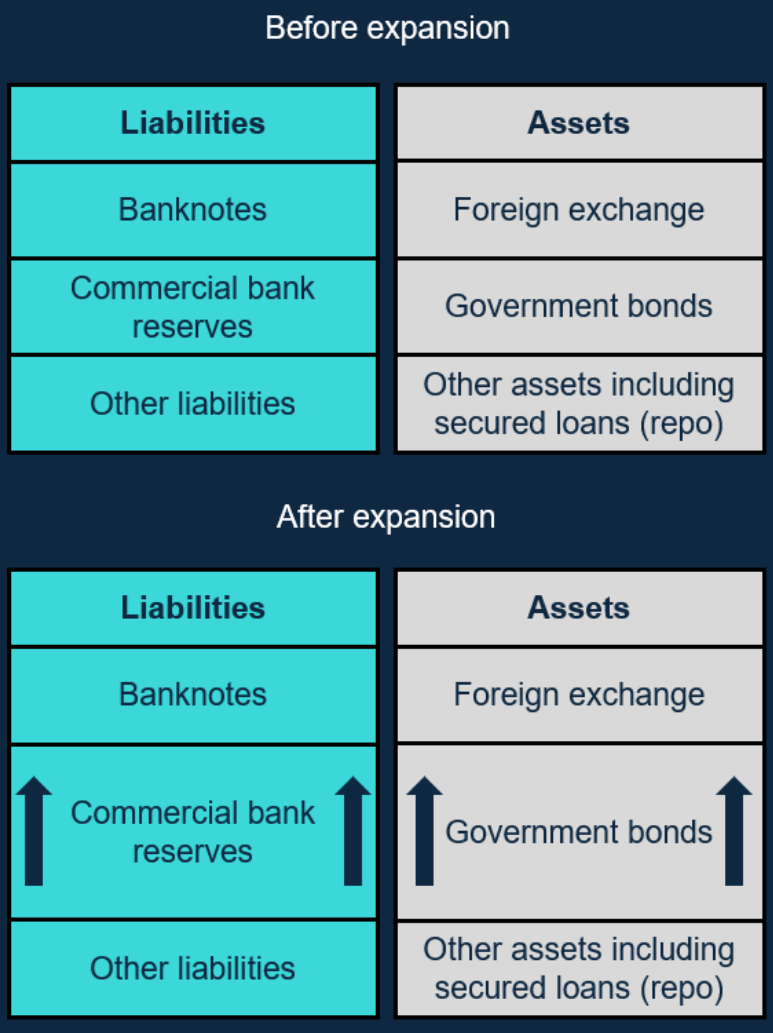
Alternatively, the central bank can achieve the same market interest rate at Point B. In this particular regime, the central bank makes use of a higher IOR (IOR2), resulting in a higher demand curve (Demand 2), and at the same time provides an abundant level of reserves. As such, demand is satiated, the demand curve is relatively flat and there is little scope for volatility in the market rate. The consequence of the central bank's choices here is that given its interest rate control target and its objectives, it has chosen to remunerate the reserves at a higher interest rate IOR2 and consistent with that it must provide a larger number of reserves.

The examples I've used – A and B – are relative extremes in regimes where central banks aim to set supply and influence demand. In theory, and absent any other restrictions, the central bank can achieve the same market interest rate using a plethora of combinations of reserve supply and IOR. For this reason, we see a variety of different frameworks implemented at different times in the real world.

Prior to the GFC, reserves were generally scarcer and central banks used regular open market operations (OMOs) to fine tune the supply of reserves to keep short-term money market rates aligned with the policy rate. Within these systems, market rates fluctuated within a 'corridor', with facilities setting the floors – as defined by the IORs in Figure 2 – and ceilings for rates.

The sharp economic downturn accompanying the GFC necessitated a historic reduction in interest rates, and most major central banks quickly approached their effective lower bounds. As a result, many central banks engaged in large-scale asset purchases – primarily government bonds – known as quantitative easing. To pay for these assets, central banks created reserves. These reserves became liabilities on the central bank balance sheet, mirroring the newly acquired assets - as illustrated in the stylised central bank balance sheet (Figure 3) below.

Figure 3: Stylised central bank balance sheet [(a)]

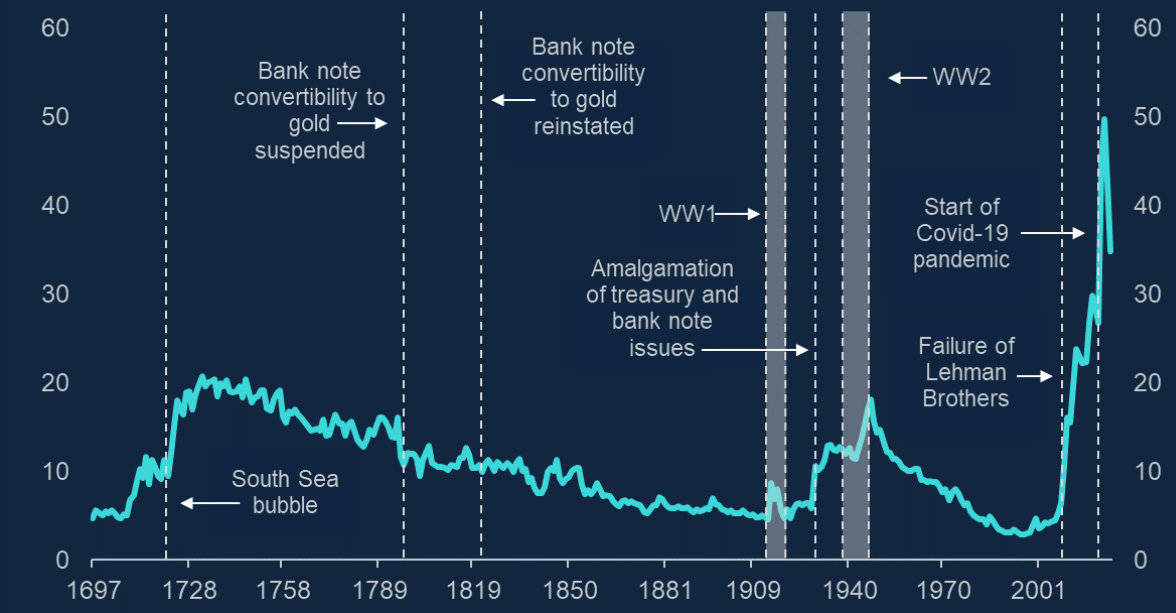


a) Note that in this simplified illustration, assets on the RHS do not necessarily represent the backing asset for the corresponding liabilities on the LHS.

As reserves became abundant, this pushed market rates lower. In order to effectively implement monetary policy, the policy rate acted as a floor to – and target for – market rates and we entered a decade where central banks used these ‘floor systems’.

The forceful actions taken by central banks in response to Covid expanded their balance sheets further, reaching historically elevated levels. This is shown for the UK in Figure 4.

Figure 4: The Bank of England's balance sheet as a share of nominal GDP
Per cent (%) [(a)]



Source: Bank of England, ONS and Bank calculations. Latest data point is 2024.

(a) Consolidated balance sheet as a percentage of lagged nominal GDP based on GB and NI definition. Data up to and including 2018 taken from "**Annual data on the Bank of England's balance shee**t" dataset. Data including 2019 and onwards is taken from the Bank of England's Annual Reports and Accounts and the ONS. Therefore, care should be taken when comparing over the time series.

Following Covid, many central banks began reducing their balance sheets. There are a number of benefits to this. For example, it reduces the risk of the balance sheet ratcheting higher in size, and thus increases the headroom for the central bank to be able to use its balance sheet in the future if needed in support of its remit (**Bailey et al., 2020**). Most central banks have been doing this through passive roll-off (allowing assets to come to maturity without reinvesting), but the Bank of England has also engaged in active sales. This is largely because the UK government bonds we purchased had, on average, a longer maturity than our peers so unwinding the balance sheet by relying on passive roll–off alone would have taken much longer. Passive roll-off would have also involved a lumpy profile of sales, so active QT has allowed us to smoothen this out.

This move away from an environment of abundant reserves, which has been the status quo for over a decade, represents a significant transition for central banks. And as with any transition, it carries some risk. As we get closer to the minimum level of reserves required by commercial banks without causing them to bid up money market rates, central banks have laid out their plans for what their respective steady-state frameworks will look like. As mentioned, there is a whole range of frameworks between abundant and scarce reserves that can in theory ensure effective interest rate control.

But there are two main considerations central banks need to take into account when determining the likely end state for their balance sheets. First, we cannot observe the minimum range of reserves – known at the Bank of England as the preferred minimum range of reserves (PMRR) – so while we have estimates for where it might be, these are uncertain and this number changes over time.[4] Second, policymakers will need to ensure a new monetary framework does not jeopardise financial stability objectives. In practice, this likely means not going back too far to the left in Figure 2 – into the territory of scarce reserves. Put together, the optimal framework is likely to have ample reserves, but less abundant than the levels observed in the period after QE (**Saporta, 2025**).

Steady-state balance sheets across Central Banks

With some theory under our belts, I'd like to explore how central banks have been transitioning to their new steady states and what steady-state frameworks they've chosen. I'll focus on three major central banks – the Bank of England, the ECB and the Fed.

Figure 5 outlines the journeys and destinations for these three central banks. As you can see, the Bank of England and ECB have chosen relatively similar steady-state frameworks – with a demand-driven floor – while the Fed has opted for a supply–driven framework. I'll briefly outline each of these frameworks in turn and how they can ultimately help to achieve similar interest rate outcomes, starting with the Bank's.

Figure 5: An overview of current QT policy settings across major central banks(a)

Central bank	Approach to QT	Current pace	Steady state reserves regime	Level of bank reserves	
				QE peak	Current
BoE	Passive roll-off and active sales	£25bn a quarter	Repo-led, demand-driven framework	£979bn	£671bn
Fed	Passive	$40bn per month ($5bn USTs, $35bn Agency-MBS)	Supply-driven framework	$4.3tn	$3.4tn
ECB	Passive	c.€40bn per month (APP and PEPP)	Demand-driven framework	€4.9tn	€2.9tn

(a) BoE current pace assumes even distribution of the Sep 2024 – Sep 2025 £100bn envelope across quarters for simplification.

Sources: Bank of England, Federal Reserve, European Central Bank.

[4] The latest survey conducted asking banks what their preferred minimum range of reserves is suggests that the PMRR is £385-540bn, marginally higher than £385-530bn in Q3 2024 (**Saporta, 2025**)

The Bank of England

The Bank of England began passively unwinding its balance sheet in early 2022 before also actively selling gilts later that year.

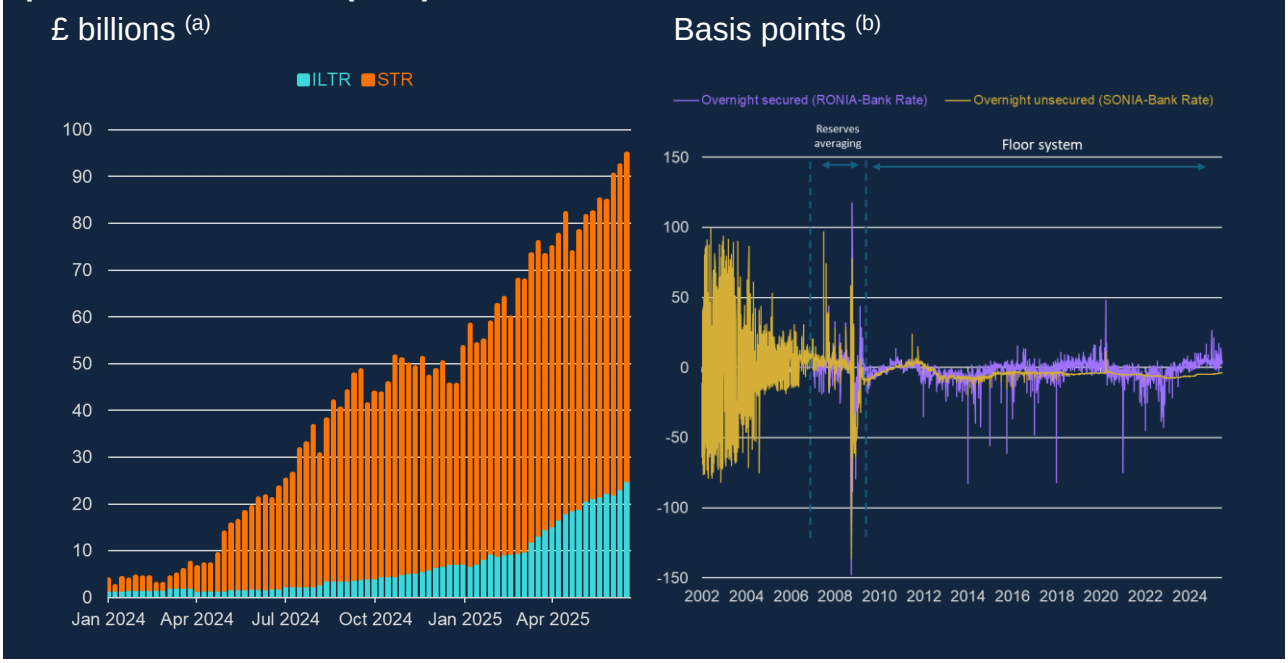
As reserves become scarcer, the risk of volatility in short term market rates rises, as I outlined earlier. To avoid this, the Bank introduced the Short-Term Repo facility (STR). This repo facility allows commercial banks to borrow an unlimited amount of reserves at Bank Rate for a 7-day term. In exchange, they must offer up high-quality collateral (such as Gilts), using this to bid on reserves at weekly auctions.[5] This facility ensures that money market rates do not rise too far above Bank Rate, since banks could then borrow reserves at cheaper rates from the Bank than in the market. Another repo facility, the Indexed Long-Term Repo Facility (ILTR),[6] will play an increasing role to complement the STR in providing the stock of reserves.

In practice, this requires operational readiness of the Bank and commercial banks to ensure these facilities are used effectively and seamlessly. Indeed, the increasing usage of repo facilities over the past year as money market rates have stayed relatively close to Bank Rate, as is shown in Figure 6, goes some way to demonstrating this is the case.

As QT reduces reserves, the Bank expects a growing share of reserves to be backed by its repo operations. Once reserves fall to the level of banks' "true" demand – the so–called PMRR – we expect banks – in aggregate – to replace any reserves lost due to the unwinding of QE and TFSME[7] roll–off by participating in our repo operations. At that point, the aggregate quantity of reserves will be repo-led and demand-driven. The Bank's regular repo facilities will help to ensure short-term market interest rates remain aligned to Bank Rate, maintaining the effective transmission of monetary policy.

[5] A haircut applies to this collateral, so the effective rate paid on the facility is slightly above Bank Rate. Borrowed reserves are then paid back a week later and the collateral is returned.
[6] For more detail, see **Using the ILTR: a guide for participants** (June 2025).
[7] Term Funding Scheme with additional incentives for SMEs (TFSME) was a scheme introduced during the Covid crisis, which offered four-year funding at or very close to Bank Rate to eligible banks and building societies to reinforce the transmission of the reduction in Bank Rate and support lending to the real economy, particularly to SMEs.

Figure 6: STR and ILTR usage (LHS) & Overnight secured and unsecured rates as spreads to Bank Rate (RHS)



Source: Bank of England, Bloomberg Finance L.P. and Bank calculations. Latest data point is 19/06/2025.

(a) LHS shows stock outstanding.

(b) Prior to 2006, the Bank ran an operationally intensive framework of multiple daily operations to supply a small number of large commercial banks with just enough reserves to settle intra-day payments and the overall supply of reserves was extremely low compared to today. In 2006, the framework of reserves averaging was introduced by the Bank. In this framework, the Bank started to pay interest on reserves, which incentivised banks to hold positive reserve balances. As well as this, this framework had two main elements: voluntary reserves targets set by participants themselves, and weekly lending operations. **(Saporta, 2025**). Spread is calculated as RONIA or SONIA minus Bank Rate.

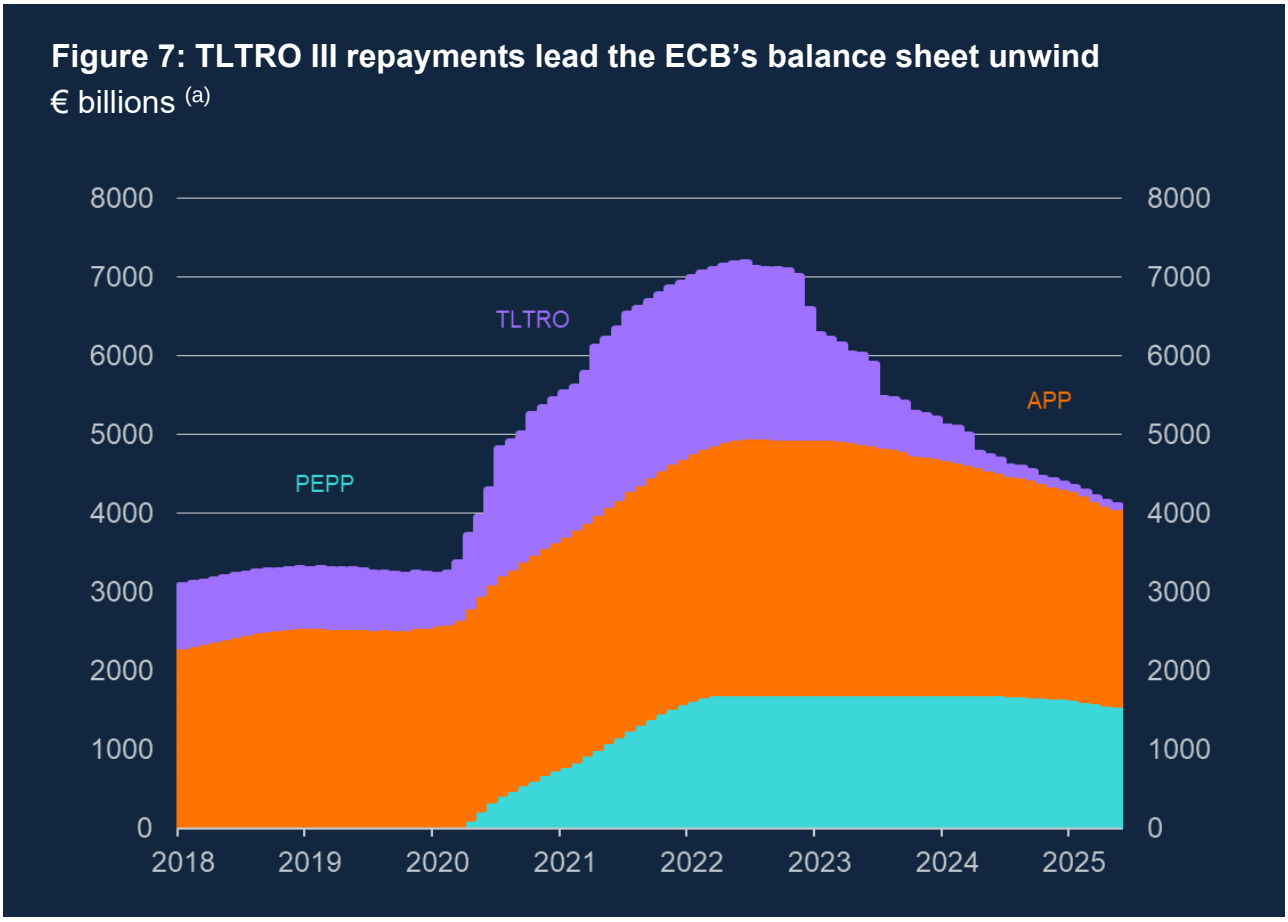
The ECB

The ECB began shrinking its balance sheet in 2022, later than the Bank of England but the pace has been swift.

The ECB has taken a passive approach to QT, allowing expired holdings to roll off across its QE portfolios including the Asset Purchase Programme (APP)[8] and the Pandemic Emergency Purchase Programme (PEPP). Despite these reductions in the ECB's QT portfolios, the majority of the roll-off in the balance sheet has so far stemmed from repayments of the ECB's targeted longer-term refinancing operations (TLTROs) – see Figure 7.

[8] Consists of four separate programmes: the Corporate Sector Purchase Programme (CSPP), Public Sector Purchase Programme (PSPP), Asset-Backed Securities Programme (ABSPP) and Third Covered Bond Purchase Programme (CB3PP3).

Figure 7: TLTRO III repayments lead the ECB's balance sheet unwind
€ billions [(a)]



Source: European Central Bank and Bank calculations. Latest data point is May 2025.

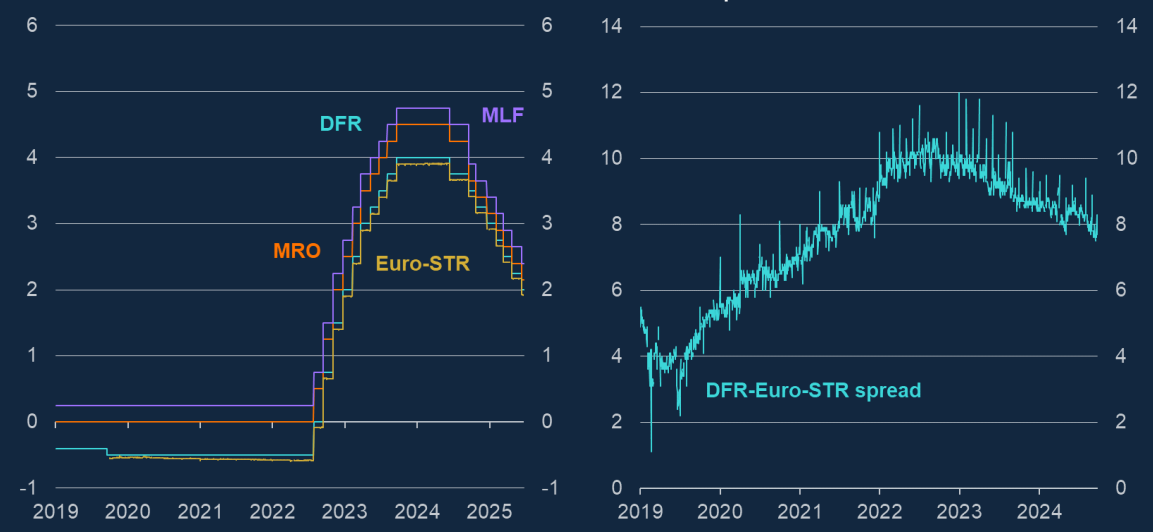
(a) TLTRO is Targeted Longer-term Refinancing Operations; PEPP is the Pandemic Emergency Purchase Programme; and APP is Asset Purchase Programmes.

Policymakers have highlighted that even with balance sheet roll offs, liquidity remains ample in the eurozone for the time being (**Schnabel, 2024**).

In order to keep control of money market rates, the ECB aims to transition in a "measured and predictable way" (**Cipollone, 2025**) to a demand-driven system[9] with a soft floor in steady state, whereby the marginal unit of reserves is supplied by standard refinancing operations. Within this framework, in a similar spirit to the Bank, the ECB uses a variety of facilities to keep money market rates anchored to its target rate (the Deposit Facility Rate), including the Main Refinancing Operations (MRO) and Marginal Lending Facility (MLF)[10] – see Figure 8.

[9] As characterised by **Schnabel (2024)**.
[10] Looking further out, the ECB plans to introduce structural longer-term credit operations and a structural portfolio of securities **(Buch and Schnabel, 2025)**.

Figure 8: Euro area money market rates (LHS) and DFR-Euro-STR spread (RHS)



Source: European Central Bank and Bank calculations. Latest data point is for 20/06/2025 for Euro-STR and 23/06/2025 for all other rates.

(a) MLF is the Marginal Lending Facility rate; MRO is the Main Refinancing Operations rate; DFR is the Deposit Facility Rate. The Euro Short-Term rate replaced the Euro Overnight Index Average (EONIA), which was discontinued on 3 January 2022.
(b) Spread is calculated as Deposit Facility Rate minus Euro-Short Term Rate.

While these facilities have existed in previous regimes too, one of the main changes in this new system – and what differentiates this system from the Bank's steady–state demand-driven framework – is the pricing of standing weekly repo facilities. The ECB prices both its short-term (MRO) and long–term repo (LTRO) at the same rate, currently 15bps above the deposit rate,[11] and the pricing does not depend on the collateral posted. In contrast, the Bank prices its short–term repo (STR) at the policy rate, with a haircut applied to collateral, but allows the price of the longer-term repo (ILTR) to be set higher depending on how much participants bid and what collateral they post.[12]

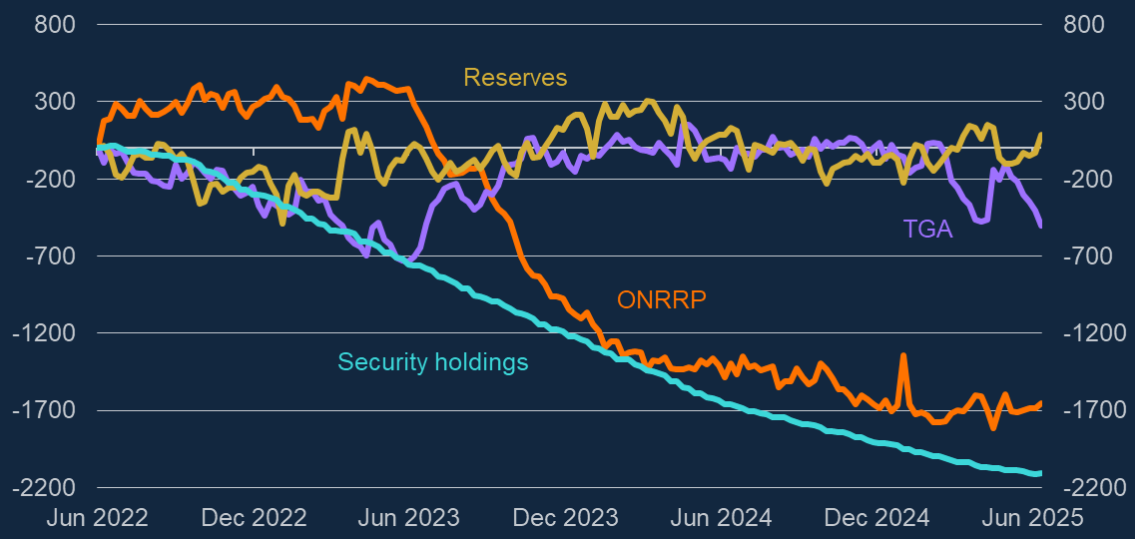
The Federal Reserve

The Fed was the first amongst these three central banks to shrink its balance sheet via passive roll–off from 2017, though this was halted after volatility in money markets in 2019. The current round of normalisation began in June 2022, though the pace of passive

[11] The ECB has reduced the spread on its MROs from 50bps to 15bps as it wants to incentivise greater usage of these weekly operations, while limiting volatility in short-term money market rates. At the same time, the ECB argues that a spread of 15bps will leave room for money market activity and provide incentives for banks to seek market-based funding solutions.
[12] The ECB supplies reserves at a constant price (15bps above deposit rate) and does not depend on collateral (not accounting for haircuts). The BoE STR also supplies reserves at a constant price (Bank Rate, ignoring the haircut on collateral) but only Level A collateral is eligible. Meanwhile, supply in the ILTR will vary with demand and with the type of collateral – with level A and B starting below the ECB price, and Level C at 15bps.

unwind has since been adjusted lower as the Fed approaches the level of reserves it intends to supply in its supply-driven framework.[13] As the Fed's security holdings (the aqua line in Figure 9) decline, the Overnight Reverse Repo (ONRRP) has accounted for the bulk of the shrinkage in Fed liabilities, unsurprising given these are the most rate–sensitive funds and the facility is intended as a backstop tool (**Logan, 2024**).

Figure 9: The ONRRP has borne the brunt of the Fed's balance sheet unwind
Change in $ billions[(a)]



Source: FRED and Bank calculations. Latest data point is for 11/06/2025.

(a) ONRRP is the Fed's Overnight Reverse Repo Facility; TGA is the Treasury General Account.

Unlike the BoE and ECB, which target policy rates, the Fed explicitly specifies a target range, rather than a single rate known as the Effective Federal Funds Rate. To keep the Effective Federal Funds Rate within a controlled channel, it uses Interest on Reserve Balances (IORB) to act as a floor for market rates.

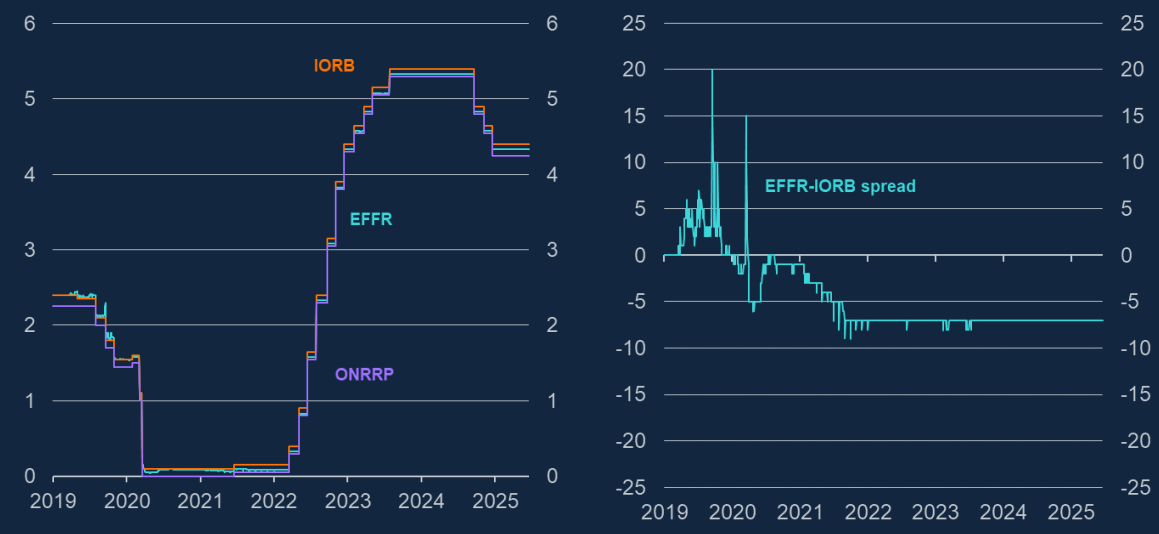
Admittedly, these market rates have fallen more markedly below the IORB during periods when liquidity has increased to excessive levels, as shown by the spread between the Effective Federal Funds Rate and the IORB in Figure 10. This is often attributed partly to the presence of significant lenders who cannot earn IORB on their balances at the central bank and so are willing to lend reserves at a lower rate than the IORB.[14]

[13] $60bn per month initially before slowing to $25bn per month and now to $5bn per month from April 2025.
[14] Entities that are not depository institutions ie, banks, typically cannot access IORB. This includes Federal Home Loan Banks, money market mutual funds and Government Sponsored Enterprises. This constitutes a "leakage" in the system. Therefore, the ONRRP, which qualified firms can utilise, makes use of a rate slightly below the IORB (**Chien and Stewart, 2024**) and ensures that money market rates do not consistently fall 10bps below the IORB (**Afonso et al., 2022**).

To reinforce the IORB as a floor, the Fed introduced the Overnight Reverse Repo (ONRRP), which is set at a slightly lower rate and open to a broader set of counterparties beyond depository institutions. This effectively acts as a backstop to ensure that rates do not fall too far below the IORB in periods where there is excessive liquidity. This 'corridor' between the IORB and ONRRP rates allows the Fed to manage day to day fluctuations in the Federal Funds market.

Finally, the Fed uses a Standing Repo Facility (SRF) to supply liquidity to prevent market rates going too high – effectively acting as a cap of sorts as institutions can always borrow cash from the Fed at that rate.[15] Banks can also access liquidity from the discount window, though use of this facility has a stigma attached to it.[16]

Figure 10: US money market rates (LHS) and EFFR-IORB spread (RHS)



Source: FRED and Bank calculations. Latest data point is for 17/06/2025.

(a) EFFR is the Effective Federal Funds Rate; IORB is the Interest on Reserve Balances; and ONRRP is the Overnight Reverse Repo Rate. The IORB replaced two separate rates on 29 July 2021 – namely, the Interest on Excess Reserves and the Interest on Required Reserve Balances.
(b) Spread is calculated as the Interest on Reserves Balance Rate minus the Effective Federal Funds Rate.

[15] The minimum bid rate for the SRF is currently set at 4.5%, which is equal to the top of the FOMC's target range for the Effective Federal Funds Rate (for more, see **FAQs: Standing Repo Facility**). Eligible collateral includes US Treasuries, agency debt and agency mortgage-backed securities, with a range of haircuts applied to collateral (for more, see **Repo Securities Schedule**).
[16] The pricing and terms for the Fed's Discount Window varies by the lending program in question: the Primary Credit program is available to "generally sound depository institutions" at a rate equal to the top of the FOMC target range for the Effective Federal Funds Rate. The Secondary Credit program is available for depository institutions that do not qualify for primary credit and is priced at the primary credit rate plus 50bp (for more, see **The Primary and Secondary Lending Programs**). The range of eligible collateral for the discount window is wider than the SRF, with higher haircuts applied to most forms of collateral under the Secondary Credit program (for more, see **Collateral Valuation**).

In steady state, the Fed aims to supply an ample level of reserves somewhere between an abundant level of reserves and the level demanded by counterparties. Reserves supplied above what the system needs implies that the Fed will remain on the relatively flat part of the reserves demand curve (Figure 2). In theory, this means money market rates should be within the FOMC's target range without the need for regular use of central bank liquidity facilities to actively manage reserve supply. Still, the SRF and discount window are in place as a release valve for when there are pockets of illiquidity in markets (**Logan, 2025**). This is different from the Bank and the ECB, for which these ceiling tools are intended to be used for regular liquidity management.

Implications for financial arbitrage and monetary policy

So far, I've discussed the different approaches to balance sheet normalisation being taken by the Bank of England, ECB and Fed. In steady state, these major central banks will offer lending facilities to market participants that operate differently.

A natural question therefore is whether this generates price differentials across markets that create trading opportunities for global banks operating in all these jurisdictions? I am referring to these opportunities here as arbitrage. If there are arbitrage opportunities, do I need to care as a member of the MPC; does this have implications for monetary policy implementation?

In short, the scope for arbitrage exists but appears limited. Most importantly, it doesn't undermine monetary policy implementation, but rather strengthens it.

I'll begin by considering why one might think the transition away from abundant reserves to new regimes may bring more arbitrage opportunities.

First, there are more tools and facilities being introduced by central banks in demand-driven systems. In these systems, banks operating in different jurisdictions will need to directly access facilities operated by multiple central banks, and these will have different pricing and eligibility requirements. This may, in turn, create opportunities for some form of arbitrage.

For example, the Bank and the ECB both intend for their market-wide repo facilities to be used as part of regular liquidity management, but they are priced differently. The BoE's STR is priced at Bank Rate – with an estimated all-in cost of around 5-10bps above Bank Rate once one accounts for the cost of haircuts on collateral (**Saporta, 2025**) – while its longer-term facility has pricing that will vary according to demand. The ECB prices both its

short and long-term repo at 15bps above the deposit rate – and with different collateral eligibility to the BoE.[17]

These discrepancies in pricing could in theory create an opportunity for global banks, present in both markets, to benefit through trades – making use of multiple central bank facilities. The potential for these mismatches may also be higher since there is likely to be greater volatility in money market rates given liquidity needs will need to be more actively managed rather than satiated by an abundance of reserves.

Second, different choices in frameworks for managing money market rates will also result in differences in pricing. Once all systems are in steady state, the theory would suggest that we're likely to see short-term market rates as a spread to the policy rate settle differently depending on whether the supply of reserves is lower or higher. Indeed, this is illustrated by points A and B in Figure 2, which show that – for a given set of assumptions – the IOR set by central banks would be higher relative to the policy rate in a system with more abundant reserves versus one with less abundant reserves.

A global bank could, at face value, trade fluctuations in the differential between these two spreads created by different systems. For example, if there were a shock causing euro area money market rates to fall significantly below the ECB's deposit rate, a tactical arbitrage opportunity could arise. The bank could borrow at the more favourable euro area money market rate, convert this into sterling via FX swaps, hedge the FX market risk, and then place this money into a reserves account at the Bank of England to earn interest at Bank Rate.

These are some ways in which arbitrage opportunities might emerge. Now I will lay out why, both in theory and in practice, these opportunities for arbitrage are not new per se, will likely be limited in scope and actually act as a feature in supporting rate control.

Arbitrage is an intrinsic and essential part of financial markets generally: it's what ensures assets are priced fairly and efficiently. And while frictions – such as some forms of regulation and transaction costs – mean that prices of assets may not perfectly adjust to what might be considered their 'fair value', financial markets are generally effective in reflecting the latest and most full set of information, correcting what might be considered 'mispricing' over the medium–term.

Opportunities for arbitrage exist across all asset classes, and also across central bank facilities. This could be one reason hedge funds have played an increasingly prominent role in QE and QT auctions in the UK (**Kaminska et al., 2025**) as they intermediate secondary bond markets – a trend that is visible across all major sovereign bond markets.

[17] See footnote 12 for more detail.

I also note that firms have always benefited from different pricing across jurisdictions, including in the recent period of abundant reserves. After all, they can earn interest by holding reserves at central banks, so global banks have an incentive to move cash to take profits on their location whenever a profitable FX basis arises between sterling, the US dollar and the euro. If it's profitable to shift money[18] across jurisdictions once accounting for the cost of exchanging and hedging the currencies and other constraints (such as regulation or stigma), banks will do so. It's very difficult to disentangle this in the data and provide specific evidence, but we should assume that if banks have an opportunity to make an attractive risk-adjusted return, they are likely to embrace it.

Still, opportunities for arbitrage are limited. If pricing differentials created opportunities across jurisdictions that led to firms swapping currencies to take advantage of this, one would expect exchange rate markets to adjust and remove this opportunity. In essence, this is macro 101: according to the covered interest rate parity condition (CIP), forward exchange rates adjust to remove the potential for arbitrage. If it were still profitable for a bank to take advantage of pricing in another jurisdiction's central bank facilities, even after accounting for exchange rate differentials, then one would expect the relative cost of borrowing and lending currencies – known as cross-currency basis – to adjust and act as a secondary means of absorbing any return.

Admittedly, frictions and regulatory frameworks in these markets may prevent this adjustment from being immediate or full, but they should reduce the opportunity for arbitrage and ensure that deviations of exchange rates from the standard CIP framework are temporary and therefore not relevant for me as a monetary policymaker with a medium-term time horizon.

Nuances underlying the headline pricing of different central bank facilities may also limit the scope for arbitrage. For instance, the different haircuts applied to collateral used in these facilities may outweigh the differences in the effective cost of using different facilities. And, looking ahead, it is worth noting that the pricing of and eligibility for these facilities could change in the future. After all, this pricing is currently calibrated to the current state of transition and could change once central banks reach their desired steady states. Indeed, as my colleague **Vicky Saporta (2025)** set out recently in the context of our own approach, central banks are likely to learn by doing. Therefore, the scope and magnitude for arbitrage opportunities might change in the future.

Finally, the willingness of banks to identify and act on pricing differentials is a feature of our system, not a bug.

After all, the usage of our facilities – whether it be for arbitrage opportunities or for other liquidity purposes – is crucial for controlling rates in short–term money markets and

[18] Note: we are not referring here to reserves, which cannot be shifted between central banks.

ensuring that they do not drift too far from the policy rate. Floor and corridor systems only work because central bank facilities provide incentives for banks to participate in them as part of the money market – and the presence of arbitrage opportunities can provide one such incentive.

This control of short-term rates is essential in ensuring the transmission of monetary policy is not distorted and can be used effectively to ensure price stability, which is my primary objective as an MPC member. This is especially important in the current context, since it ensures we can continue to undergo QT without the risk of losing monetary control on the way to and after the PMRR is reached.

The recent experience in the UK provides me with additional confidence that monetary policy implementation should be unaffected by this going forward. After all, there has been a welcome reduction in stigma associated with our repo facilities and a pickup in their usage; our facilities are very much “open for business”. Money market rates have been relatively contained, with limited volatility and no obvious distortions in relative pricing across jurisdictions.

All of this leaves me with the space to focus on being able to set monetary policy – which is all the better since there’s plenty to think about on that front at the moment too.

Monetary policy views

There is a significant amount of uncertainty both domestically and globally, and we’ve used scenarios to help us think through risks around our outlook. I’d like to take a few minutes to discuss what I think the key risks are.

The main messages for me remain the same: underlying activity is weak, the labour market has loosened further and the disinflationary process continues, albeit with an elevated plateau of inflation around 3.5% for the second half of this year.

I’m worried about both the demand and the supply sides of the economy. On the demand side, we assume a recovery in output to nearly 2% over the forecast period, driven by a pick-up in consumption and corresponding fall in the savings ratio. I’m not sure this will materialise. As I set out in a previous speech (**Greene, 2024**), mortgages resetting at higher rates are likely to continue to weigh on consumption even as interest rates are on a downward trajectory. And I expect precautionary savings will rise – not drop – as the labour market softens further. All else equal, this would be disinflationary.

On the supply side, both headline and underlying productivity growth have fallen considerably. We expect a sharp recovery in productivity growth over the forecast period, almost back to the 1% trend. I believe the risks to this are firmly to the downside. This could be exacerbated by recent trade policy developments. Trade policy uncertainty is

likely to remain a drag on business investment for some time to come as firms delay long-term decisions about capital allocation. Supply chain disruptions from tariffs could also serve as a negative supply shock. All else equal, these developments would be inflationary.

But trade policy could be disinflationary as well. Since the Liberation Day turbulence last round, signals on trade policy have broadly been positive, including UK trade deals with the US and India (and an agreement for closer cooperation with the EU) and a skeleton for a US-China trade deal. Still, if countries can no longer export to the US market as profitably because of US tariffs, they might seek to drop prices for goods exports to gain access to other markets, such as the UK. So far there is nascent evidence of trade diversion or re-routing from China, with goods export volumes to the US falling from April 2025 but rising to the UK, EU and particularly to ASEAN. Trade uncertainty has fallen back from April to May in line with our expectations, but I don't think we realistically have much more certainty about trade policy now than we did in May. I still expect trade policy to have a net disinflationary impact on the UK, but it may be muted relative to my expectations in May, when it was a factor in my decision to cut Bank Rate.

Meanwhile, the labour market has eased roughly in line with our expectations. A margin of slack seems to have opened up, with vacancies dropping materially in the latest print by 7.9% and the unemployment rate picking up – as expected – to 4.6%. Additionally, we saw the largest monthly fall in payrolls data in April 2025 in almost five years. But given the ONS's advice to view these estimates with caution, I place more weight on our own estimate of underlying employment growth, which points to stagnation in hiring rather than contraction. The corresponding picture on pay is somewhat more nuanced: so far pay settlements have come in between 3-4%, in line with the steer we are taking from the Agents' pay survey and the Decision Maker Panel (DMP) for 2025. Overall, I think the evidence points to a slowly softening labour market rather than one that is sharply deteriorating.

Finally, I worry about the near-term profile for inflation this year, which in my view now resembles more of a "plateau" than a "hump". We expect inflation to resume its fall towards our target from early next year. However, there is a risk that elevated inflation of roughly 3.5% the rest of this year will feed through into inflation expectations, and therefore wage and price setting behaviour. Aside from energy and regulated prices buoying inflation, food prices have surprised consistently to the upside. Energy and food prices are particularly salient for inflation expectation setting. Household inflation expectations have been rising for months and are at the upper end of the band we might expect given consumer prices. Business expectations are also elevated but are less out-of-line with the past. I think the risk that our near-term plateau in inflation feeds through into second round effects is skewed to the upside. This is even more a concern in light of the escalating conflict in the Middle East, which poses upside risks to oil prices.

So where does this leave me on the balance of risks? I continue to think the risks remain two-sided but skewed to the downside on growth and to the upside on inflation. This is an uncomfortable place to be for a central banker. Given the period of elevated inflation through which we have just come, I think price stability is the key priority. But extracting a clear signal on this amongst increased noise and uncertainty is difficult. On the domestic front, noisy data means that it will take longer for me to take comfort from recent disinflationary trends. On the global front, there are a number of key events playing out between now and our next meeting, including the deadline for the pause on so-called "reciprocal tariffs" from the US, the potential passage of a budget in the US and the unfolding of events in the Middle East. It's unlikely that the uncertainty from these events – and subsequent developments – will be resolved any time soon. I therefore think a careful and gradual approach to removing monetary policy restrictiveness continues to be warranted.

The views expressed in this speech are not necessarily those of the Bank of England or the Monetary Policy Committee. All omissions and errors are my own.

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