BANK OF ENGLAND

Speech

# Bigger, broader, faster, stronger? How much should tomorrow's central bank balance sheets do – and what should we leave to financial markets? Some principles for good parenting

Speech given by

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## Introduction

I am delighted to be opening the 2021 IFABS conference. Your subject is 'the financial system of tomorrow' – and I want to kick things off by doing some crystal ball gazing at the role that central banks, as market participants, might play in that future system.

It's actually reassuring to see in that crystal ball that central banks have a role at all. Because whenever central bankers get too big for their boots, it's worth reminding them that, for most of history, humankind has prospered without them. As late as 1900, there were only 18 central banks globally.[1] Just over a century later, speakers at the Bank of England's 2017 inflation targeting conference predicted the passing of 'peak central bank'.[2] And the favourite pastime in cryptocurrency circles is to imagine a world – immeasurably superior in their view – in which the rulebooks, committees and hallways of Frankfurt, Washington, Tokyo and London have been replaced with a few tightly-coded algorithms floating in cyberspace.

Yet as of autumn 2021, central banks dominate financial market discourse as never before. There's been particular focus on the sharp increase in the size of central bank balance sheets, most recently as the result of the extraordinary steps required to respond to the economic impact of Covid. In due course, those balance sheets will start to shrink again as the recovery takes hold. But as that tide recedes, what's left will not be what we knew 10-20 years ago. And that's because fundamental shifts in economic and financial structures mean that central bank balance sheets are also set to play a much broader role in the future. Helping to meet the heightened demand for safe assets in financial markets. Playing a more active, countercyclical part in monetary policy setting. And potentially providing new retail payment media, in the form of Central Bank Digital Currencies.

Central banks can't choose whether to take the actions necessary to deliver their monetary and financial stability mandates: they are obligated to do so. But they do have choices about how they go about it – and a key factor in those judgments is the role they want financial markets to play. In my remarks today, I want to do three things. First, to show just how dramatically the role of central bank balance sheets has changed in recent years, and the forces shaping the future. Second, to review the complex and shifting inter-relationships between central banks and financial markets over history. And, third, to suggest some possible principles for shaping central bank operations of the future in ways that harness the benefits of financial markets.

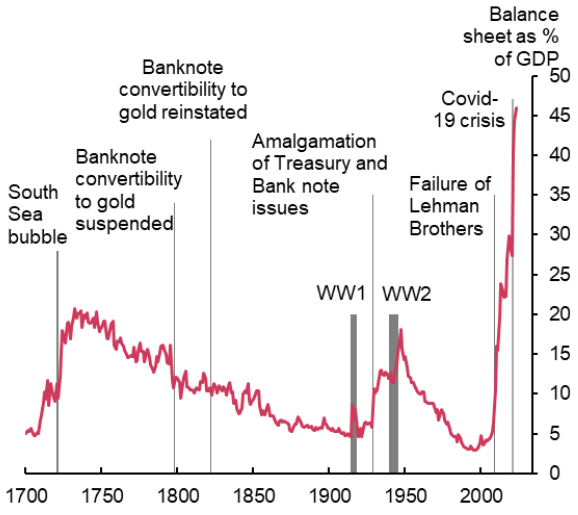
[1] What has central bank independence ever done for us? - speech by Andy Haldane (bankofengland.co.uk)
[2] Independence - 20 years on | Bank of England

**Bigger, broader, faster, stronger? The central bank of today (and tomorrow)**

The scale of central bank balance sheet growth has certainly been extraordinary. The Bank of England, for example, now has assets of nearly £1 trillion – equivalent to almost half the annual output of the UK economy. That ratio is 10 times what it was in 2006, and more than double any previous peak in our 327 year history – including the wars of the 18th and 20th centuries (Chart 1).

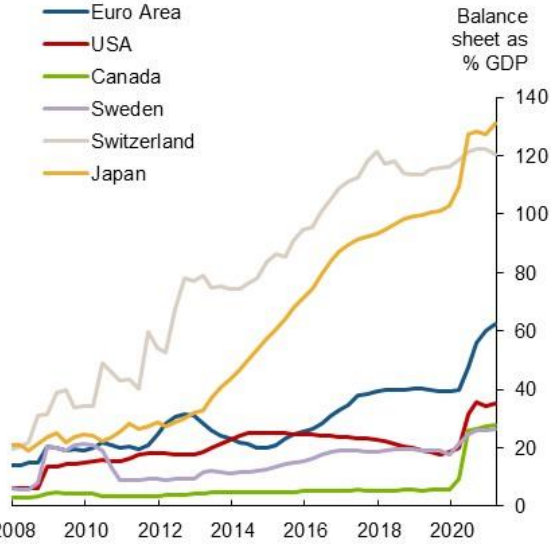
And we're not alone: other central banks have seen similar increases (Chart 2).

**Chart 1: Bigger: in the UK…**




Sources: Bank of England, Office for National Statistics.

**Chart 2: …and overseas**




Sources: Individual central banks' published data, IMF.

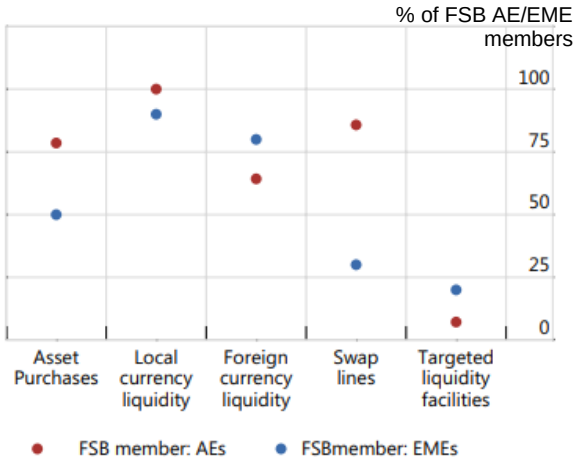
So-called 'Quantitative Easing (QE)' has of course been a key driver of this increase in many countries, including the UK. But while balance sheet size may have grabbed the headlines, arguably the more important trend in recent years has been the broadening scope or breadth of uses to which central bank balance sheets have been put.

That shift was particularly vividly on display during the early stages of the Covid crisis, when central banks reached for an unparalleled variety of policy tools, ranging from standard interest rate and liquidity operations or asset purchases, to term lending, foreign currency and targeted credit support operations (Chart 3). Many of those Covid-specific interventions have already begun to unwind. The UK's Covid Corporate Financing Facility, for example, closed to new lending in March 2021, and will liquidate completely early next year. The scale and frequency of operations backed by the dollar and euro swaplines have been

scaled back. And QE will start to run off too, when policy makers judge it to be warranted by the outlook for inflation and activity.[3]

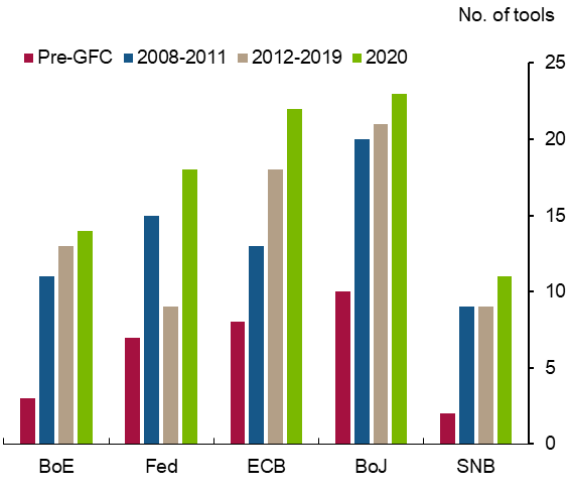
**Chart 3: Broader: during Covid…**

Balance sheet measures taken by Financial Stability Board (FSB) members during Covid




Source: "A global shock to a global system: Covid-19 and the post-2008 regulatory framework" by Dietrich Domanski, in: Monetary Policy and Central Banking in the Covid Era | VOX, CEPR Policy Portal (voxeu.org)

**Chart 4: …but over the longer run too**




Source: Bank estimates based on published material by individual central banks and the Bank for International Settlements.

Note: chart shows balance sheet tools developed/operated during each period including: short duration / term lending; asset purchases; and FX tools including swap lines (USD repo swap lines with the Federal Reserve Bank of New York counted as one tool; additional swaplines captured collectively as one additional tool for each central bank).

But the broadening in the scope of central bank balance sheet activities has been under way for longer, and goes much deeper, than the temporary response to the extreme circumstances of Covid alone. The Bank of England's balance sheet toolkit, for example, has more than quadrupled in size since the early 2000s – a trend evident at other major central banks too (Chart 4).

This broadening, and its likely further extension in the years to come, reflects three main structural drivers.

First, changes to regulation and market structure since the Global Financial Crisis (GFC) of 2008-9, amplified by a greater recognition of the importance of financial stability, mean financial market participants have a much higher structural demand for High Quality Liquid Assets (HQLA) to meet potential outflows. Central bank reserves are not the only form of HQLA – government debt also qualifies, for example. But reserves are clearly the most liquid. It is hard to estimate banks' future structural demand for these reserves with any

[3] The Bank of England recently set out a revised framework for guiding this process in the UK: see Box A in Bank of England Monetary Policy Report August 2021.

precision, not least because it will depend on the relative rates of return available on other forms of HQLA. But an exercise conducted by the Bank put UK banks' aggregate 'Preferred Minimum Range of Reserves' (PMRR) at some £150-250bn (c15% GDP) in 2019.[4] For comparison, reserves in 2006-7 were of the order of £20bn.

Non-bank financial intermediaries (NBFIs) have historically relied on banks and government assets for liquidity. But a key lesson of the 'dash for cash' in March 2020 was that the liquidity of both could dry up in a sufficiently severe stress, triggering asset fire sales and amplifying instability. Primary responsibility for ensuring they are resilient to such shocks lies with NBFIs themselves, enforced through appropriate regulation and supervision.[5] But self insurance cannot cover every threat to stability – so central banks that want to avoid having to use monetary policy tools like QE again may have to develop more targeted backstops against future market dysfunction, providing liquidity to a wider set of market participants that meet appropriate regulatory safeguards.[6]

A consequence of these trends is that there will be some level of reserves supply, varying over time and states of the world, but materially higher than in the pre-GFC period, below which central banks cannot go without driving short-term market rates up above policy makers' target levels. Today, the size of the Bank of England's balance sheet is set by the level of QE assets required to set monetary policy. As QE unwinds, that role will shift to the system's desired demand for reserves. QE unwind does not need to stop when reserves hit that level – but we will need to replace long-duration QE assets with shorter term repos or other Open Market Operations to maintain the size of the balance sheet (Chart 5).

The second driver of structurally higher central bank balance sheets relates to trends in global interest rates. Monetary policy works through nominal interest rates, with the goal of pushing real interest rates up or down relative to their long-run sustainable level, known as the 'equilibrium real rate' or 'r*'. r* itself is driven, not by central bank policy, but by fundamental global economic factors, such as desired savings and investment flows and technological progress. Estimates of trend r* have fallen significantly in recent decades (Chart 6 illustrates this for the US). That would not constrain policy if nominal interest rates could go negative to an unlimited degree. But in practice that is not possible: they are subject to an 'Effective Lower Bound (ELB)'.

[4] Speech given by Andrew Hauser and hosted by AFME, ISDA and ICMA, London on Wednesday 17 July 2019 (bankofengland.co.uk)
[5] The Financial Stability Board is currently co-ordinating international efforts to strengthen these protections: see Lessons learnt from the COVID-19 pandemic from a financial stability perspective: Interim report - Financial Stability Board (fsb.org).
[6] See for instance From Lender of Last Resort to Market Maker of Last Resort via the dash for cash: why central banks need new tools for dealing with market dysfunction (bankofengland.co.uk)

**Chart 5: Stylised Bank of England balance sheet as QE exit proceeds**

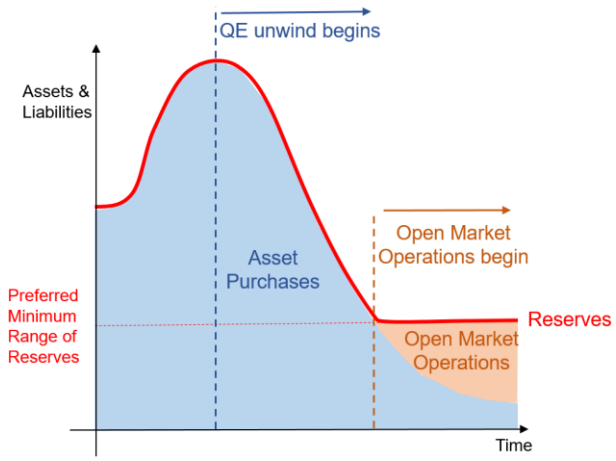
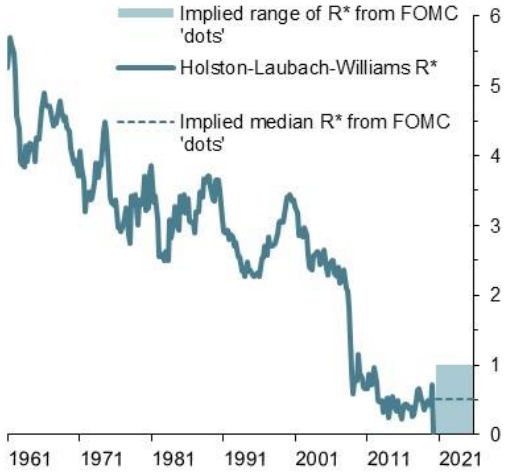



**Chart 6: Estimates of the US equilibrium real interest rate**




Sources: Bloomberg Finance L.P., Federal Reserve Bank of New York, June 2021 Summary of Economic Projections Federal Open Market Committee and Bank calculations.

Notes: R* is the trend value of r*. Implied range derived from FOMC members' published projections for long run Fed Funds rate and inflation.

To the extent that r* remains low in the future – and few expect a rapid rebound – central banks will have to become used to operating much more frequently at or around the ELB. In some cases, central banks may be able to lower the ELB somewhat through the development of negative interest rate tools. Policy rates in the euro area, Switzerland and Japan have been negative for some time – and the Bank of England recently confirmed that practical preparations to implement a negative Bank Rate were in place, should the MPC judge that necessary.[7] But, at best, official rates can go only modestly negative. So a lower r* is also likely to mean more active use of the central bank balance sheet to implement monetary policy. That does not mean that today's QE will never unwind: indeed, quite the reverse, unwind will become an integral part of future tightening strategies, as the Bank's August 2021 Monetary Policy Report sets out. But it does suggest the balance sheet will expand and contract more regularly, on a counter-cyclical basis, than it has in the past.[8]

[7] See paragraph 62, Monetary Policy Summary and minutes of the Monetary Policy Committee meeting ending on 4 August 2021 (bankofengland.co.uk)
[8] Andrew Bailey discussed these points in some depth in his 2020 Jackson Hole speech, and an associated academic paper: The central bank balance sheet as a policy tool: past, present and future - speech by Andrew Bailey | Bank of England

**Chart 7: Central bank R&D on CBDCs**

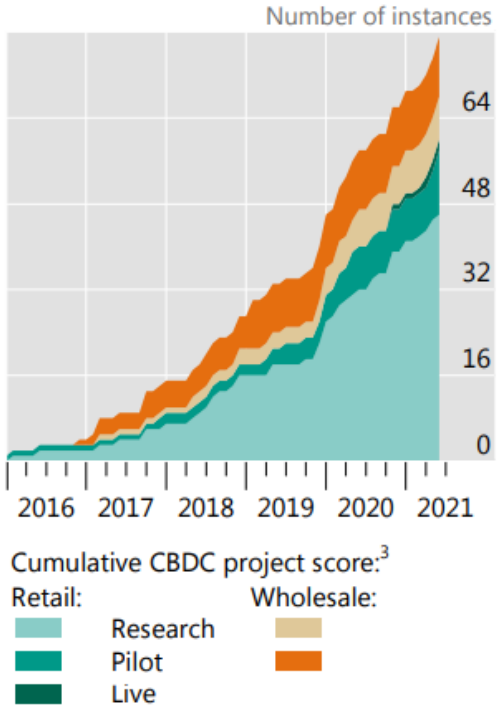
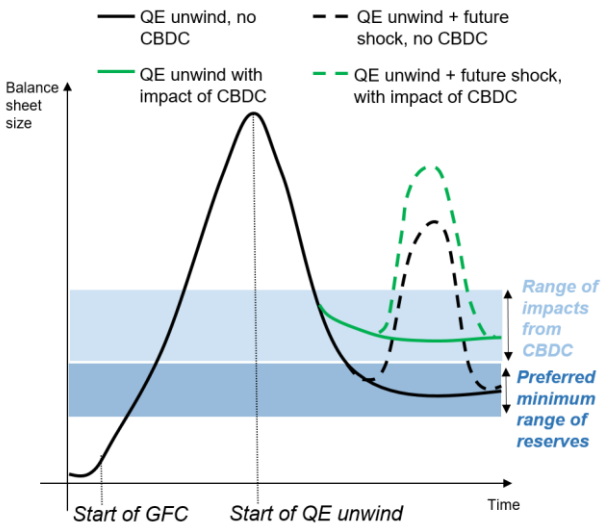



**Chart 8: Adding it all together: a highly stylised picture of the central bank balance sheet of tomorrow**




Source: BIS Annual Economic Report 2021

A third, very different, trend shaping the outlook for central bank balance sheets is the potential development of Central Bank Digital Currencies, or 'CBDCs'. Research work in this area has exploded recently (Chart 7), as the debate about the need for an unquestionably safe state-backed retail digital payments medium for online transactions has intensified.[9] No decision has yet been made as to whether to introduce a sterling CBDC, or what form it might take – and the technological development work required would take some years to complete. But the implications for the size of the Bank's balance sheet could be significant: an illustrative scenario in the Bank's June Discussion Paper, for example, considered a world in which a fifth of household and corporate deposits, worth upwards of £400bn[10], transferred to a new digital currency.

Combining these three drivers together allows us to draw a stylised picture of the central bank balance sheet of tomorrow (Chart 8): (a) structurally larger than it was pre-GFC, even after the unwind of the current QE programme – reflecting the higher demand for reserves,

[9] The Bank of England's own work in this area is available at Central bank digital currencies | Bank of England, and includes in particular two key discussion papers: Central Bank Digital Currency: opportunities, challenges and design | Bank of England and New forms of digital money | Bank of England. Jon Cunliffe, the Bank's Deputy Governor for Financial Stability, discussed the case for a digital form of public money in May 2021: Do we need 'public money'? - speech by Jon Cunliffe | Bank of England.

[10] Bankstats tables | Bank of England

and the possible provision of a CBDC; but (b) more variable too, as the balance sheet plays a more active countercyclical role in monetary policy and liquidity provision.

**How big should central bank balance sheets be? Some conceptual considerations**

Now this is all very interesting, you may say, but so what? Each of the drivers I've mentioned lies squarely in central banks' core mandate. So long as central banks are achieving those goals, why should their size have any implications over and above that?

There is certainly a respectable view that central banks should be relaxed about the growing size of their domestic-currency liabilities (reserves, banknotes or any future CBDC).[11] Such liabilities can be created at near-zero cost, and provide a social good by making the system safer. Any tendency for higher reserves supply to push market interest rates below policy makers' targets, imperilling inflation goals, can be avoided through the use of so-called 'floor' monetary control frameworks. And the potential for higher reserves to expand bank balance sheets beyond regulatory leverage limits, crowding out credit supply, can be fixed by exempting reserves from the calculation. Both mechanisms are in place in the UK.[12]

Those who do worry about central bank size tend to focus more on the asset side of the balance sheet, and the tools that underpin them, citing one or more of the following as potential costs:

- The first is a concern about the **potential risks to public money** if central banks hold large stocks of assets bearing market or credit risk. These risks are greatest for holdings of private sector assets (central bank purchases of government assets involve no increase in the gross exposure of the public sector as a whole);

- The second relates to concerns that, beyond some threshold, the scale or nature of a central bank's asset holdings might expose it to **heightened risk of political interference**, compromising its ability to deliver its core mandate. To this is sometimes added a worry that the optics of remunerating banks on large stocks of reserves may be problematic (though the merits of this view are unclear since such payments usually involve no net resource transfer from the public sector);

[11] A clear statement of this view is given in "The Federal Reserve's Balance Sheet as a Financial-Stability Tool", 2016, by Robin Greenwood, Samuel Hanson and Jeremy Stein, available at: 2016steingreenwoodhanson.pdf (harvard.edu). Ricardo Reis discusses broader central bank design issues in 'Central Bank Design - American Economic Association (aeaweb.org), 2013.
[12] Reserves are not currently exempt from the leverage ratio in the US – which adds an extra dimension to the debate there.

- The third relates straightforwardly to **organisational efficiency**: the larger and broader a central bank's operations, the greater the resource cost of developing, operating and risk managing its balance sheet, and communicating and resolving overlaps and tradeoffs between its tools; and

- The fourth relates to the potential implications for the **functioning of financial markets**.

Careful scrutiny and analysis of these potential costs has been a relatively under-researched area recently, and it would be great to hear more from IFABS members and others on this important issue in coming years. But I want to focus my remarks today on the last item in the list: the potential implications for financial market functioning.

**A short history of central banks and financial markets: family, friends or foes?**

Central banks have a close relationship with financial markets and the firms that participate in them. We rely on them, directly, to transmit policy to the wider economy; and, indirectly, to channel savings into investment, price and manage risk, provide – and innovate new – services to households and firms. But that reliance means we also need to be ready to intervene to ensure markets function safely and effectively. We do that by: setting appropriate safeguards as micro- and macro-prudential regulators; providing liquidity, and other interventions, in both 'peace time' and stress; and, on occasion, using our central position to encourage or co-ordinate stability-enhancing innovation.

But the relationship runs even deeper than this. Central banks and markets are not merely distinct entities that interact transactionally. The actions of each are fundamental to shaping the other's future development – their structures, strategies and investment programmes – which then feed back in turn. One important consequence of this is that even temporary changes, on either side, can have profound and lasting effects.

Academics sometimes compare this complex path dependency to that seen in biological systems. Clemens Jobst and Stefano Ugolini, for example, described it as a process of 'co-evolution'.[13] And Andy Haldane compared the financial sector as a whole to a 'complex adaptive system'.[14] But I want to frame my remarks today around a slightly more purposive analogy: that of parenting. According to the Maccoby and Martin model, summarised in

[13] The coevolution of money markets and monetary policy, 1815-2008 (europa.eu)
[14] Rethinking the Financial Network, Speech by Andrew Haldane, Executive Director, Financial Stability delivered at the Financial Student Association in Amsterdam on 28 April 2009 (bankofengland.co.uk)

Table 1, parental styles can be differentiated into four main types – 'neglectful', 'indulgent', 'authoritarian' or 'authoritative' – depending on the degree of affection felt by the parent to the child, and the degree of control exerted.

**Table 1: Maccoby and Martin's Four Parenting Styles[15]**

| | | Control: Low | Control: High |
|---|---|---|---|
| Affection | Low | **Neglectful** | **Authoritarian** |
| | High | **Indulgent** | **Authoritative** |

It might be thought that the 'parent' in this setup would typically be the central bank.[16] But relations can in fact run both ways. Indeed, many central banks grew out of the market as quasi-commercial undertakings, albeit with special note issuing rights granted by governments needy for (often war-related) finance.[17] [18] To say that these young upstarts were unwelcome offspring would be putting it mildly. The Bank of England, for example, was assailed from all sides following its birth in 1694. Banker Richard Hoare accused the Bank of being poised to 'engross most of the ready money in and near the City of London.' And an anonymous pamphleteer said the Bank risked giving 'a mighty damp to commerce … by cutting off, at one blow, all personal securities', whilst arguing that 'extract[ing] profits … from one another enriches not the Publick one jot'.[19]

[15] Maccoby E. Martin J. Socialization in the context of the family: Parent-child interaction. In: Mussen PH, editor. *Handbook of Child Psychology*. Wiley; New York: 1983. pp. 1–101.
[16] Public commentary has a tendency to see things this way! See eg How Much Do Central Banks Fear the Bond Toddler? - Bloomberg
[17] This section draws heavily on historical analysis by Charles Goodhart, set out in numerous papers including: "The business of banking: 1891-1914", 1972; "What do central banks do?", 1989; and "The changing role of central banks", 2010.
[18] As this discussion immediately reveals, the bipartite relationship between central banks and markets is of course really a tripartite one, involving governments too. The extra complexities of that three-way interaction are however too multi-faceted to cover in this speech!
[19] See David Kynaston, "A history of the Bank of England 1694-2013" and Angliae tutamen, or, The safety of England being an account of the banks, lotteries, mines, diving, draining, lifting, and other engines, and many pernicious projects now on foot tending to the destruction of trade and commerce, and the impoverishing this realm : with reflections thereon of great import to all sorts of people / by a person of honour. (umich.edu). The pamphlet is not universally critical of the Bank however: "…for, besides what have been already mention'd, it has almost crush'd several sorts of Blood-suckers, mere Vermin, Usurers and Gripers, Goldsmiths, Tally-Jobbers, Exchequer-Brokers, and Knavish Money-Scriveners, and Pawn-Brokers, with their Twenty and Thirty per Cent. at their Girdles, Procurations and Continuations, and the rest of that Fardel."

The battle over how best to constrain the Bank's commercial activities raged for more than a century. Progressively more binding convertibility requirements were applied, first to its issuance of banknotes (via the 1844 Bank of England Act) and later to its broader activities, as it became clear that the Bank could not credibly continue to compete with private markets it was simultaneously seeking to oversee. But old habits died hard. As late as 1910, it took a threat from the London clearing banks that they would establish a rival central bank to get the Bank to agree to run down its remaining commercial business.

While central banks outgrew these teenage tendencies and began acting more clearly as parents in the twentieth century, their role continued to co-evolve closely with that of financial markets:

- The period from the Great Depression in the 1930s to the 1960s/70s saw central banks acting as 'authoritarian' parents, reflecting low affection for the market, and a high desire for control. A panoply of macroeconomic, regulatory and market-facing interventions aimed to shape and channel markets to social ends.

- Just as authoritarian parenting is often the architect of its own downfall, the efficacy of these controls was ultimately undermined by a rebellion on the part of the markets. The development of eurobonds, largely outside the controls erected by central banks, undermined constraints on credit creation and the Bretton Woods regime of fixed exchange rates. That collapse in authority, amplified with a broader concern about 'government failure', led ultimately to the 'indulgent' parenting regime of the 1980s – in which high affection for the market led to a stripping away of controls. Central bank balance sheets during this period hit a cyclical low (Chart 1), and inflation targeting became the dominant monetary regime.

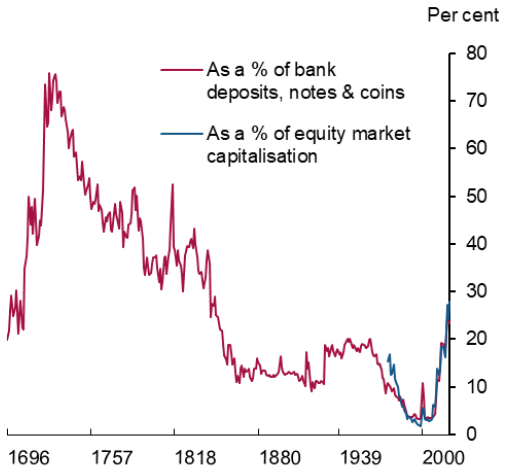
- The indulgent phase ended in 2008-9, with the GFC. Whilst inflation targeting continued on the monetary policy side, the subsequent 15 years saw a return to a desire for greater control over market forces, reflected in new global and national frameworks for microprudential, macroprudential and conduct regulation.

Greater control returns us to the right hand column of the model in Table 1. The question then is whether we aspire to be 'authoritarian' or 'authoritative' – which depends on our attitude to financial markets. And here we face a conflict. Households and firms rely on financial markets like never before – so we need them to thrive. But we also need them to be safe: we cannot risk exposing economies again to the sorts of volatility and cost

experienced in 2008-09, or those that could have occurred in 2020 had the policy response not been swift and decisive. And we need to continue to achieve our monetary policy goals.

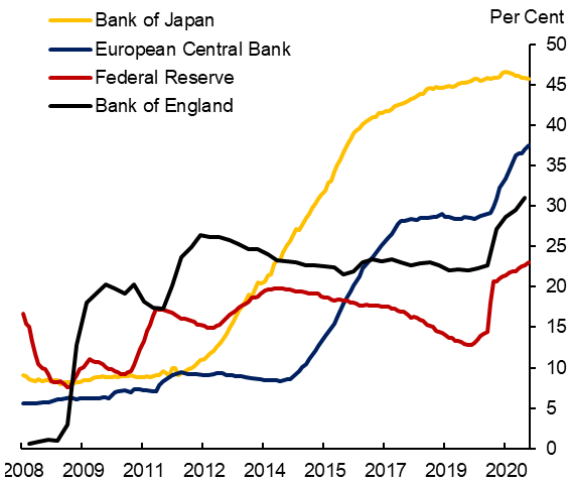
The tools used to deliver these outcomes are very different from those used in past periods. But the balance between central banks and markets has still turned. Judged on size alone, the Bank of England's balance sheet as a share of the UK financial sector has returned to levels last seen in the 1960s/70s – the height of the 'authoritarian' period (Chart 9). Central banks hold a significant share of their respective government bond markets (Chart 10). And our liquidity-provision toolkit is substantially more comprehensive than ever before.

**Chart 9: Bank of England balance sheet as a proportion of UK financial sector**




Source: Bloomberg Finance L.P., Bank of England, Bank calculations.

**Chart 10: Share of national government debt held by central banks**




Sources: public data from central banks, debt management agencies and fiscal authorities.

**How to be authoritative: some good parenting principles for tomorrow's central bank**

What does all of this mean for tomorrow's central bank balance sheets?

It cannot mean pulling back from taking the necessary steps to deliver our mandates in a changing world, of lower sustainable interest rates, structural change in wholesale and retail markets, and the need to maintain financial stability. Those are non-negotiable.

But history does I think suggest three broad principles to help inform how we design our interventions, in ways that help markets continue functioning and thriving safely, in the

service of the wider economy. I want to illustrate each principle with some observations on current market functioning and the design of future central bank tools.

Reflecting on the tendency for markets to adjust endogenously in ways that can induce hysteresis and path dependency, the first principle is that **central banks should gather regular and detailed intelligence on how market structures are evolving in response to the use of balance sheet tools.**

Central banks have long monitored the impact of their policies on core market prices and other variables observable day-to-day. But we also need to understand where participants in the broader markets supporting household and firms are committing their capital, where they are putting their most talented people, where they are spending their IT investment budgets, and how they manage and trade risk. Key questions in the current conjuncture include: the commitment of capital to making markets in core assets vs investment in capital-light matching technologies; the allocation of expert risk pricers and managers across more and less liquid markets; the extent to which investor relationships are being maintained in less heavily traded sectors; and the incidence of leverage, particularly outside the regulated sector.

The history I just reviewed suggested that central banks can exert a dead hand on market functioning where interventions are poorly designed, depressing social welfare and ultimately causing markets to evolve in ways that undermine the original policy intent. A second principle is therefore that **the burden of proof should lie squarely with those arguing for a new central bank intervention to explain why financial markets cannot do it better**. 'Do only what only you can do'.

The key interventions of recent years clearly pass this test. Markets cannot issue reserves – so they cannot implement monetary policy, get round the lower bound to nominal interest rates – or act as lenders, or buyers, of last resort. At the same time, central banks will never have the breadth and depth of knowledge required to price the huge majority of firm-, country- and scenario-specific risks that markets specialise in. And they are unlikely to be anything like as effective in bringing together borrowers and lenders, or developing innovative products to meet their needs. To the greatest possible extent, we need financial markets to be focused on these fundamental aspects of their job, not spending all their time trying to predict central banks' next moves.

Two current examples help bring this principle to life:

- First, meeting the demand for reserves as a safe asset is a core central banking activity, as I discussed earlier. But there is no need to provide more reserves than the system wishes to hold, once QE unwinds. That's why we expect to adopt a market-led approach, in which we allow reserves to fall as QE assets roll off, but stand ready to replace any demand shortfall that might arise through shorter term open market operations. This should allow us to run a 'lean' balance sheet – giving markets scope to function – without suffering excessive upward pressure on short-term rates.[20]

- Second, as we turn to consider the potential design of CBDC, there will be important decisions to take on whether to remunerate the instrument, whether to limit access to in some way, and how much functionality to provide in addition to its basic role as a retail payment medium. Different combinations of these characteristics will determine the likely level of demand, the impact on our balance sheet, and the extent to which CBDC competes directly with private deposits: running on a spectrum from relatively low (for a low-function, unremunerated, limited-access model) to potentially substantial (for a high-function, remunerated, unlimited-access model).

The third principle comes straight from the playbook of authoritative parenting: **where central banks decide their mandates require them to intervene, they should (i) set clear *ex ante* expectations of the conditions for intervention; (ii) minimise predictable adverse effects; and (iii) set clear exit strategies.**

A good example of the need for setting clear *ex ante* expectations comes in the area of potential future liquidity tools for market dysfunction. Some market participants may have concluded from the exceptional response of Spring 2020 that central banks would respond to future dysfunction in equal speed and size. But it is not clear that is the case. Any future targeted standing facilities are likely to make it clear that markets should not expect central banks to respond as aggressively to dysfunction unrelated to a global pandemic, and market participants should therefore build stronger self insurance, and expect greater regulatory scrutiny, in exchange for central bank access.

[20] Some commentators have suggested that market functioning would be better served if we went further and cease remunerating part or all of the reserves stock, incentivising banks to diversify their HQLA holdings. While this would indeed be likely to lead to a smaller central bank balance sheet, we do not believe this would be a desirable approach. Full remuneration of reserves has proved operationally highly effective as the basis for monetary policy rate setting for many years. And reducing average remuneration below the return on our assets would be an effective tax on the banking system, which could incentivise banks to run leaner or less liquid asset buffers than is desirable.

In common with most other central banks, the Bank of England has taken a number of steps to reduce some of the most severe adverse effects of its QE programme. These include limits on the proportion of any individual gilt that we can own, a gilt lending programme to relieve specific collateral shortages, and clear and transparent auction procedures.[21]

Finally, a credible exit strategy can help maintain market functioning, encouraging participants to maintain resourcing and counterparty relationships in expectation that key markets will come back onstream. The Bank's Monetary Policy Committee recently set out a new QE exit strategy, bringing forward the level of Bank Rate at which it would begin reducing its holdings of government bonds to 0.5%.[22] Clear conditions for exit can also help manage the potential adverse incentive effects of liquidity insurance tools.

**Conclusions**

Let me conclude.

The central bank balance sheets of the future will be very different to those we knew at the start of the millennium.

They will be structurally larger, even after current QE programmes unwind – as central banks meet a bigger share of the structurally higher demand for liquidity; and contemplate possible Central Bank Digital Currencies.

And they will be more variable – as lower global interest rates and a broader liquidity insurance toolkit mean balance sheets play a more active countercyclical role.

Central banks cannot shirk their responsibilities to maintain monetary and financial stability. But they do have choices about how to do so – and I've suggested three principles to help ensure they do so in ways that help markets function well and safely, in the service of the wider economy. By gathering regular and detailed intelligence on market structures. By placing the burden of proof on explaining why financial markets cannot do it better. And, where intervention is needed, by setting clear ex ante expectations, minimising predictable adverse effects, and developing clear exit strategies.

[21] These and other options were covered in a detailed report in 2019 by the Markets Committee of the Bank for International Settlements: Large central bank balance sheets and market functioning (bis.org).
[22] See Box A in Bank of England Monetary Policy Report August 2021

There is a huge opportunity for the research community to help central banks plot a future path in this area. Many of the issues I've discussed today have received only limited academic attention in recent years. It would be great if IFABS and its wide membership can help turn that tide. I look forward to that conversation.