

SPEECH

The benefits and costs of asset purchases

Speech by Isabel Schnabel, Member of the Executive Board of the ECB, at the 2024 BOJ-IMES Conference on “Price Dynamics and Monetary Policy Challenges: Lessons Learned and Going Forward”

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Since the global financial crisis in 2008, many central banks around the world have used asset purchases when conducting monetary policy. In the euro area, for example, asset purchases were actively used in 13 out of the past 15 years.

In response to the post-pandemic surge in inflation, most central banks stopped net purchases and started to reduce their bond holdings. As this process is unfolding, it is now a good time to start reflecting on the experience of using asset purchases and to evaluate their benefits and costs by drawing on the growing body of research on their effects on financial markets and the broader economy.

My main message today is that asset purchases can be a powerful tool when financial markets are in turmoil. Outside these periods, however, central banks need to carefully assess whether the benefits of asset purchases outweigh the costs.

Why central banks use asset purchases

Central banks have used asset purchases for two main purposes.

One was to respond to disturbances in monetary policy transmission and to stabilise financial markets in periods of illiquidity and turmoil.

In the United States, for example, the first large-scale asset purchase programme, QE1, was launched with a view to supporting market functioning after the outbreak of the global financial crisis in 2008.^[1]

In the euro area, asset purchases were first used to revive the covered bond market in 2009, which had been affected particularly severely by the global financial crisis.^[2] One year later, in 2010, the ECB started to purchase securities under the Securities Markets Programme to address severe tensions in certain market segments, which had been hampering the monetary policy transmission mechanism.^[3]

More recently, the Bank of England conducted asset purchases to restore market functioning after gilt bond yields rose sharply on forced selling by pension and liability driven investment (LDI) funds.^[4]

The second, complementary purpose, which became increasingly important after the global financial crisis, was to ease financing conditions with a view to stimulating aggregate demand in the vicinity of the effective lower bound on interest rates.

Starting in the mid-1980s, structural changes in savings and investment implied that the natural rate of interest, or r^* – the real rate at which monetary policy is neither contractionary nor expansionary – had steadily fallen (Slide 2, left-hand chart).^[5] This decline largely reflected the effects of an ageing population and lower productivity growth.

So, when the global financial crisis hit in 2008, many central banks had to lower their key policy rates to close to zero and make use of other instruments to deliver financing conditions that would be consistent with their mandates (Slide 2, right-hand chart).^[6]

Although the use of these instruments differed across economies and over time, asset purchases, together with forward guidance and longer-term refinancing operations, eventually became part of the toolkit of many central banks.

In the euro area, it was only in 2015 that the ECB started to use bond purchases as a tool to counter downside risks to the inflation outlook.^[7] Under the asset purchase programme (APP), the ECB bought large amounts of government and private sector bonds with the aim to bring inflation back to the ECB's target.

After the outbreak of COVID-19 in 2020, many central banks, including the ECB, used asset purchases with both objectives in mind: to stabilise financial markets and to ease financing conditions in the pursuit of price stability.^[8] The ECB's pandemic emergency purchase programme (PEPP), for example, explicitly embodied both purposes in one programme.^[9]

How do asset purchases work?

Although asset purchases have by now become much less “unconventional” – as also acknowledged in the ECB's 2021 monetary policy strategy review –, their use remains controversial among both central bank observers and policymakers. Part of the controversy reflects the difficulty in drawing robust conclusions about how asset purchases work, and what long-term socio-economic consequences and side effects they may have.

Ben Bernanke once famously said that “the problem with quantitative easing is that it works in practice, but it doesn't work in theory”.^[10] The case for irrelevance is based on the “Wallace neutrality”, which states that changes in the size and composition of a central bank balance sheet should – under certain conditions – have no effect on asset prices, output or inflation.^[11]

The concept of Wallace neutrality gave rise to the belief that asset purchases may predominantly work through a *signalling channel* – that is, they would be similar to forward guidance in that they signal a commitment to an extended period of low short-term interest rates.

According to this channel, the central bank's exposure to duration risk underscores its commitment to follow through on its promise, as raising interest rates would lead to losses on its bond holdings.^[12] And,

indeed, research shows that announcements of asset purchase programmes lowered policy rate expectations.^[13]

The experience over the past two years, however, is likely to have significantly weakened the role of asset purchases as a commitment device. The determined response to the surge in inflation by central banks worldwide was a forceful reminder that policymakers cannot tie themselves to the mast of a ship as Odysseus did in Greek mythology.^[14]

Central banks can only credibly communicate about the likely future direction of monetary policy in a “Delphic” way – that is conditional on how the economy evolves.

So, while asset purchases may convey signals about how central banks see the economy evolving, they will not make central banks less determined in their pursuit of price stability if conditions change unexpectedly.

Asset purchases have broader effects on the economy, however, as the real world departs from the Wallace neutrality in several ways. For example, for asset purchases to affect asset prices, it is enough to assume that investors are not perfectly indifferent about the assets they hold, an idea going back to James Tobin.^[15]

A large class of investors, for example, values the liquidity and safety of government bonds, which is reflected in these bonds’ convenience yield.^[16] Financial intermediaries also generally face limits to arbitrage because of liquidity and risk constraints.^[17]

These imperfections and inefficiencies considerably broaden the way asset purchases can affect financial and macroeconomic outcomes. The economics profession has generally focused on two main transmission channels: the liquidity channel and the portfolio rebalancing channel.^[18]

Asset purchases are powerful in periods of stress

The experience from the past 15 years suggests that asset purchases have on several occasions been instrumental in stabilising financial markets and shielding households and firms from economic pain.^[19]

After the outbreak of COVID-19, for example, when balance sheet constraints and information asymmetries led to a freezing of financial markets, asset purchases supported dealers’ ability to intermediate the market.^[20]

This reduced systemic stress, prevented broader fire sales and thus averted an excessive tightening of financing conditions that could have threatened the stability of the financial system at large (Slide 3).

Empirical evidence for the United States shows that, when there is a “dash for cash”, it is the actual purchases that matter: the Federal Reserve’s announcement in March 2020 that it would conduct asset purchases was not sufficient to stop the rise in Treasury yields.^[21] The market only stabilised once the purchases started.

This is the *liquidity channel* at work. It is particularly effective when liquidity shortages arise outside the banking sector, as non-bank financial intermediaries – whose role in the financial system has grown steadily over the past years in the euro area – usually do not have direct access to the central bank balance sheet.

On other occasions, it has been enough for central banks to announce their intention to intervene if necessary. This is typically the case in the presence of “multiple equilibria” when concerns about a debtor’s ability to service its liabilities may become self-fulfilling.^[22]

Such belief-driven price spirals – if left unaddressed – can quickly turn a liquidity crisis into a solvency crisis, giving rise to huge costs for society as a whole.^[23]

The Eurosystem faced such risks during both the sovereign debt crisis and the pandemic.

This experience suggests that measures aimed at addressing belief-driven spirals tend to be most effective, and their impact longer lasting, if their potential purchase volumes are large and if they are communicated clearly.^[24]

That is, the more credible the announcement is, the less likely actual interventions become.^[25] This has been most visible in the case of the announcement of Outright Monetary Transactions (OMTs) in 2012. Although the OMT programme was never activated, it lastingly instilled confidence and allowed the market to coordinate on the “good” equilibrium (Slide 4, left-hand side).^[26]

The announcement of the operational details of the PEPP in 2020 had similar effects: the decision that purchases could be allocated flexibly across time, asset classes and countries removed concerns about policy space and thereby stopped price spirals before they could get out of control.

In the end, the overall deviations from the ECB’s capital key, which serves as a benchmark for the allocation of government bond purchases in the euro area, turned out to be limited and transitory (Slide 4, right-hand side).

Announcing the willingness to conduct asset purchases in certain circumstances can thus be a powerful tool to overcome market segmentation and protect the public from unwarranted, destabilising forces.

At the same time, market interventions, or announcements thereof, can create risks of moral hazard. These risks were limited in the case of the pandemic, which was an exogenous shock of unprecedented dimension. But they become larger in less exceptional circumstances.

For these reasons, the use of the OMT programme comes with strict conditionality in the form of a macroeconomic adjustment programme. In the same vein, when the ECB’s Governing Council announced the Transmission Protection Instrument (TPI) in 2022 – an instrument that can be activated to counter unwarranted, disorderly market dynamics to ensure smooth transmission of monetary policy across the euro area – it clarified that eligibility requires governments to pursue sound and sustainable fiscal and macroeconomic policies and that purchases could not be conducted if persistent tensions reflected country fundamentals.^[27]

These clauses are important for a central bank's credibility: inflation expectations will only remain anchored if the public believes that central banks' actions to stabilise financial markets will not undermine their commitment to achieving their primary objective of price stability.^[28]

Without a clear exit strategy, it would be difficult to distinguish purchases conducted for market stabilisation purposes from quantitative easing (QE).^[29] The Bank of England's response to the LDI crisis is a prime example of how such an exit strategy can be designed successfully. In other words, for an inflation-targeting central bank, there can be no trade-off between market stabilisation and price stability.^[30]

For the TPI, one may even argue that market stabilisation and price stability are two sides of the same coin: without the ECB's determination to ensure a smooth transmission of monetary policy across the entire euro area, the historically steep hiking cycle may not have been feasible.

Effects of asset purchases are weaker outside crises

The second main transmission channel of asset purchases is the *portfolio rebalancing channel*. This channel is at the heart of quantitative easing – a key tool used by central banks to stimulate aggregate demand and inflation when interest rates are constrained by the effective lower bound.

The aim is twofold: first, to reduce long-term government bond yields by removing aggregate duration risk from the market. And second, to encourage banks and investors to use the larger risk absorption capacity to extend credit to the real economy or to buy other, riskier assets, thereby compressing risk premia more broadly.^[31]

Measuring and evaluating the impact of the portfolio rebalancing channel is considerably more difficult, as it requires establishing a full chain of causality running from the effect of asset purchases on financing conditions and then further to aggregate demand and inflation.

Identification typically starts with high-frequency event studies that are used to quantify the effect of asset purchase programme announcements on asset prices. A large body of such studies suggests that QE announcements lower bond yields and raise other asset prices.^[32]

However, these effects have been found to be considerably smaller outside crisis periods, when balance sheet constraints and limits to arbitrage are less binding. For instance, evidence from the PEPP and APP announcements suggests that the effect on long-term yields could be as much as 40% smaller in non-crisis periods (Slide 5, left-hand side). This is consistent with evidence that, in the United States, QE1 was more effective than other asset purchase programmes.^[33]

The implication is that the purchase volumes required to ease financing conditions sufficiently to generate upward pressure on inflation are often considerable. Under the APP and the PEPP, the Eurosystem bond holdings reached, at the peak, more than €5 trillion, or around 35% of euro area nominal GDP (Slide 5, right-hand side). The holdings reached similar shares in the United Kingdom and the United States.

Whether such large purchase volumes are proportionate to the achievement of price stability critically depends on the effects of easier financial conditions on growth and inflation as well as the costs associated with conducting QE. The balancing of benefits and costs is at the core of the proportionality assessment that the ECB conducts for all its policy decisions.

The impact of QE on the economy is state dependent

Like for other jurisdictions, the available evidence points to notable benefits from using asset purchases as a policy instrument in the vicinity of the effective lower bound.

Specifically, asset purchases have been found to have lifted growth and generated upward pressure on inflation.^[34] They thus played an important role in meeting central banks' primary objective during the period of low inflation, also by contributing to inflation expectations not falling further during the long period of low inflation.

The evidence since the global financial crisis suggests, however, that the effects of QE on activity and prices are state-dependent and can vary over time.

There are two broad sets of conditions that seem most relevant.

The first is the strength of balance sheets.^[35] When the ECB first conducted QE between 2015 and 2018, governments were consolidating public finances following the sovereign debt crisis and banks were building up capital buffers, as non-performing loans remained elevated (Slide 6). As a result, the boost to credit creation was more moderate and underlying inflation responded sluggishly (Slide 7).

But during and after the pandemic, the picture changed dramatically. Fiscal deficits soared, lending to households for house purchases reached growth rates not seen since the global financial crisis, and loan demand by firms went well beyond the drawdown of pre-approved credit lines in 2020.

This reflected the solid balance sheets with which banks, households and firms had entered the crisis, as well as Europe's common policy response, mainly through Next Generation EU, which mitigated fiscal borrowing constraints at national level.

So, a key takeaway is that the extent to which the economy responds to QE fundamentally depends on the broader state of the economy. QE is most effective when banks, households, firms and governments are both able and willing to respond to low interest rates, thereby boosting economic activity and lifting inflation closer to target.

The second condition relates to the effective lower bound itself.^[36]

New research suggests that the responsiveness of aggregate demand to monetary policy shocks may decline when interest rates are already low, even when controlling for the state of the economy or other confounding factors (Slide 8).^[37]

This could be because the negative income effect from lower interest rates may partly offset the growth impulse from intertemporal substitution.^[38] Or it could be because there are limits to how much

consumption can be brought forward from the future to the present, especially after long periods of low interest rates.^[39]

Such non-linearities are not restricted to the use of QE. But monetary policy may experience diminishing returns just when QE becomes the marginal policy tool – that is, when the conventional policy space has largely been exhausted and inflation expectations are at risk of becoming unanchored to the downside.

QE may still be helpful in these circumstances, as was the case with the launch of the APP and the PEPP in the euro area. But the benefits may become smaller the larger the stock of acquired assets.

Going forward, central banks need to get a better understanding of how the zero lower bound affects inflation expectations before they act forcefully on them.

For example, new work by economists at the Federal Reserve suggests that the potential decline in the effectiveness of QE to stimulate demand in these conditions may not be that consequential.^[40] They find that, in the United States, the zero lower bound constraint exerted only a small drag on inflation expectations over the period from 2008 to 2019.

Whether this was a result of investors viewing the use of unconventional instruments, including asset purchases, as effective substitutes for interest rate cuts, or whether inflation expectations are predominately driven by structural factors outside the realm of monetary policy, remains subject to further analysis.

But related research for a broader set of countries shows that households and firms do not expect deflation even when deflation is likely.^[41] So, further evidence is needed to help central banks conduct policy optimally in the vicinity of the effective lower bound.

Taking stock of the costs of QE

Even if asset purchases have clearly quantifiable benefits, they also come with side effects. These may be difficult to assess, as they can materialise with considerable delay. The ECB therefore takes a comprehensive approach to assessing the potential side effects as part of its proportionality assessment.

The experience from the past will help inform future assessments in important ways. Although the side effects of QE have differed in their intensity and duration across countries, a few general observations can be made.

QE increases the risks of central bank losses

First, QE exposes central banks to considerable interest rate risk. After the pandemic, when policymakers were forced to raise interest rates in the pursuit of their primary mandate, these risks turned into substantial costs for taxpayers worldwide.

These losses need to be viewed against the profits central banks made before the rise in interest rates, but they may still be weighing on central banks' reputation and credibility.^[42] Even if losses do not impede central banks' ability to pursue their price stability mandate, in several countries they have led to enquiries,

warnings and calls for more transparency and research by legislators and other public authorities regarding the future use of asset purchases.^[43]

Long periods of QE may adversely affect market functioning

Second, while asset purchases can improve market functioning in periods of turmoil, sustained periods of QE can contribute to a scarcity of government bonds, which may adversely affect financial market conditions.^[44]

In the euro area, these effects became particularly concerning in 2022, when a significant share of repo transactions using German government bonds as collateral traded more than 40 basis points below the euro short-term rate (ESTR), despite the expansion of Eurosystem facilities that lend securities back to the market (Slide 9).

More generally, recent research shows that purchases of 1% of an outstanding bond are associated with a decline of 0.78 basis points in its repo rate.^[45] Asset scarcity can thus hamper market functioning and impair the steering of short-term interest rates.^[46]

QE poses financial stability risks and may exacerbate inequality

Third, portfolio rebalancing effects may result in excessive risk-taking and increasing inequality.

Price-earnings ratios in stock markets across advanced economies surged to record highs as major global central banks conducted QE before and after the pandemic (Slide 10, left-hand side). In 2021, before policy rates started to rise, spreads in many fixed income markets, including in the euro area, reached their lowest level since the global financial crisis (Slide 10, right-hand side).

While these developments are likely to be the outcome of a combination of factors, including the structural decline in short- and long-term interest rates, it can be expected that QE has contributed to the rise in asset valuations – after all, this is one of its key objectives.

Portfolio rebalancing also extends to real assets, including residential and commercial real estate.

Although house prices reflect the interaction of many factors driving demand and supply, research by the International Monetary Fund has found that falling yields may have played a non-negligible role in pushing up real estate prices across advanced economies, especially in major cities.^[47]

In the euro area, residential property prices increased by nearly 50% from the start of QE in 2015 to their peak in 2022 (Slide 11, left-hand side).

Surging asset prices do not only pose risks to financial stability but may also exacerbate wealth inequality.

^[48] While monetary policy always has distributional effects, portfolio rebalancing as part of QE may amplify these effects.

In the euro area, for example, less than 0.1% of households in the bottom net wealth quintile hold bonds, compared with more than 10% of the top decile (Slide 11, right-hand side). And only around 1 to 2% of

low-wealth households hold shares in mutual funds and stocks, compared with more than 35% of households in the top net wealth decile.

Therefore, central banks purchasing longer-dated assets disproportionately benefits wealthier households, whose assets tend to have longer durations than their liabilities.^[49] At the same time, these effects need to be weighed against the impact of asset purchases on income inequality, where the evidence generally suggests that low-income households benefit more strongly from the boost to growth provided by monetary policy.^[50]

Reversing the effects of QE may take a long time

Lastly, the experience over the past two years suggests that portfolio rebalancing effects might be highly persistent. Despite the sharp rise in interest rates, stock market valuations remain high, especially in the United States.^[51] And house prices have corrected somewhat in some countries but not in others.

In Germany, for example, despite residential real estate prices declining by nearly 13% since mid-2022, prices in metropolitan areas remained some 15% to 20% higher than the values implied by economic fundamentals in 2023.^[52]

Several factors, including supply constraints and strong demand in housing markets as well as declining volatility in financial markets, may have contributed to the broad resilience of asset prices.

However, another factor may be the pace with which central banks unwind the stock of purchased assets.^[53] Central banks typically take a cautious and gradual approach when reducing the size of their balance sheets, as too fast a decline in bond holdings could cause congestion effects in financial markets and as banks need time to adjust to the fall in excess liquidity.^[54]

This gradualism is probably one reason why quantitative tightening (QT) announcements are often found to have smaller effects on bond prices than QE announcements.^[55] That is, the stock effect matters also when monetary policy portfolios are reduced. Since bonds held by the central bank mature only gradually, investors may heavily discount redemptions that are due far out in the future.

This is consistent with three pieces of evidence.

First, using micro data on the interest rate and balance sheet expectations of market participants, ECB staff estimate that the unitary effect of QT on term premia is not significantly different from QE (Slide 12, left-hand side).

Second, today, despite the start of QT and the significant increase in public debt in the aftermath of the pandemic, the bond free float in the euro area is not expected to reach the pre-APP level anytime soon (Slide 12, right-hand side).

Third, new empirical evidence suggests that the effects of changes in the expected path of government debt on interest rates are materially lower – possibly by as much as half of the estimated impact under

perfect foresight – when investors have limited foresight for changes that may occur in the distant future.

[56]

As a result, risk premia may remain compressed in many market segments, making financial conditions more accommodative than they otherwise would be. This may have weakened the transmission of monetary policy during the recent tightening cycle.

Conclusion

All in all, these considerations suggest that asset purchases should remain part of central banks' toolkit. They have played an important role in stabilising financial markets at times of stress and in helping central banks preserve price stability during periods of low inflation.

The experience over the past 15 years suggests, however, that the effectiveness of QE in stimulating aggregate demand is state dependent and that QE can come with costs that might be higher than those of other policy instruments.

Two broad lessons can be drawn at this stage.

First, central banks may face shocks in the future where the optimal policy response requires a more patient approach to reaching their inflation aim in the vicinity of the effective lower bound, especially after balance sheet crises. Further research is needed to better understand how sensitive inflation expectations are to perceptions of policy constraints.

Second, central banks can reduce the costs of asset purchases by using them in a more targeted and parsimonious manner, intervening forcefully when needed but stopping them faster. Examples are the commercial paper purchases by the ECB in 2020 and the interventions by the Bank of England during the LDI crisis.

In a bank-based economy like the euro area, the experience also suggests that other measures, such as targeted longer-term refinancing operations, can provide substantial support to the economy in the face of disinflationary shocks and instability, while leaving a smaller and less persistent footprint, as they can be reversed more quickly if conditions change.

As in the past, all policy measures will need to pass the test of our proportionality assessment. The experience gained will help central banks to carefully weigh the benefits and side effects of different policy instruments in order to conduct policy appropriately, given the broader state of the economy.

Thank you.

Annexes

28 May 2024

[Slides](#)

1.

Purchases under QE1 were initially restricted to mortgage-backed securities.

2.

ECB (2009), “[Introductory statement with Q&A](#)”, 7 May; ECB (2009), “[Purchase programme for covered bonds](#)”, press release, 4 June; and ECB (2011), “[ECB announces details of its new covered bond purchase programme \(CBPP2\)](#)”, 3 November.

3.

ECB (2010), “[ECB decides on measures to address severe tensions in financial markets](#)”, 10 May; and Eser, F. and Schwaab, B. (2016), “Evaluating the impact of unconventional monetary policy measures: Empirical evidence from the ECB’s Securities Markets Programme”, *Journal of Financial Economics*, Vol. 119(1), pp. 147-167.

4.

Bailey, A. (2022), “Monetary policy and financial stability interventions in difficult times”, speech given at G30 37th Annual International Banking Seminar, Washington, D.C, 15 October.

5.

Schnabel, I. (2024), “[R\(ising\) star?](#)”, speech at The ECB and its Watchers XXIV Conference session on “Geopolitics and Structural Change: Implications for Real Activity, Inflation and Monetary Policy”, Frankfurt, 20 March; Platzer, J. et al. (2023), “[Low for \(Very\) Long? A Long-Run Perspective on r* across Advanced Economies](#)”, *IMF Working Papers*, No 2023/085, International Monetary Fund, April; and Cesa-Bianchi, A., Harrison, R. and Sajedi, R. (2022), “[Global R*](#)”, *Staff Working Papers*, No 990, Bank of England, July.

6.

It is worth noting that the Federal Reserve already conducted QE during the 1930s. See Anderson, R.G. (2010), “[The First U.S. Quantitative Easing: The 1930s](#)”, *Economic Synopses*, No 17, Federal Reserve Bank of St. Louis.

7.

ECB (2015), “[Introductory statement to the press conference](#)”, 22 January.

8.

Schnabel, I. (2020), “[The ECB’s response to the COVID-19 pandemic](#)”, remarks at a 24-Hour Global Webinar co-organised by the SAFE Policy Center on “The COVID-19 Crisis and Its Aftermath: Corporate Governance Implications and Policy Challenges”, Frankfurt am Main, 16 April.

9.

ECB (2020), “[ECB announces €750 billion Pandemic Emergency Purchase Programme \(PEPP\)](#)”, 18 March.

10.

Bernanke, B. (2014), “A Conversation: The Fed Yesterday, Today and Tomorrow”, Brookings Institution, 16 January.

11.

Wallace, N. (1981), “A Modigliani-Miller Theorem for Open-Market Operations”, *American Economic Review*, Vol. 71, No 3, pp. 267-274.

12.

Jeanne, O. and Svensson, L.E.O. (2007), “Credible Commitment to Optimal Escape from a Liquidity Trap: The Role of the Balance Sheet of an Independent Central Bank”, *American Economic Review*, Vol. 97, No 1, pp. 474-490; and Bhattachari, S., Eggertsson, G.B. and Gafarov, B. (2015), “[Time Consistency and the Duration of Government Debt: A Signalling Theory of Quantitative Easing](#)”, *NBER Working Paper Series*, No 21336, National Bureau of Economic Research, July.

13.

Christensen, J. and Rudebusch, G. (2012), “The Response of Interest Rates to US and UK Quantitative Easing”, *The Economic Journal*, Vol. 122, No 564, pp. F385-F414; Bauer, M.D. and Rudebusch, G. (2014), “The Signaling Channel for Federal Reserve Bond Purchases”, *International Journal of Central Banking*, Vol. 10, No 3, September, pp. 233-289; Altavilla, C. et al. (2021), “Asset Purchase Programs and Financial Markets: Lessons from the Euro Area”, *International Journal of Central Banking*, Vol. 17, No 4, October, pp. 1-48; and Andrade, P. et al. (2016), “[The ECB's asset purchase programme: an early assessment](#)”, *Working Paper Series*, No 1956, ECB, September.

14.

Campbell, J.R. et al. (2012), “Macroeconomic Effects of Federal Reserve Forward Guidance”, *Brookings Papers on Economic Activity*, Brookings Institution, pp. 1-54.

15.

Tobin, J. (1958), “Liquidity Preference as Behavior Towards Risk”, *The Review of Economic Studies*, Vol. 25, No 2, February pp. 65-86; and Tobin, J. (1969), “A General Equilibrium Approach To Monetary Theory”, *Journal of Money, Credit and Banking*, Vol. 1, No 1, February, pp. 15-29.

16.

Krishnamurthy, A. and Vissing-Jorgensen, A. (2012), “The Aggregate Demand for Treasury Debt”, *Journal of Political Economy*, Vol. 120, No 2, April, pp. 233-267.

17.

Cúrdia, V. and Woodford, M. (2011), “The central bank balance sheet as an instrument of monetary policy”, *Journal of Monetary Economics*, Vol. 58, No 1, January, pp. 54-79; and Vayanos, D. and Vila, J.-L. (2021), “A Preferred-Habitat Model of the Term Structure of Interest Rates”, *Econometrica*, Vol. 89, No 1, January, pp. 77-112.

18.

See, for example, Krishnamurthy, A. and Vissing-Jorgensen, A. (2011), “[The Effects of Quantitative Easing on Interest Rates: Channels and Implications for Policy](#)”, *NBER Working Paper Series*, No 17555, National Bureau of Economic Research, October; and Schnabel, I. (2021), “[Asset purchases: from crisis to recovery](#)”, speech at the Annual Conference of Latvijas Banka on “Sustainable Economy in Times of Change”, Frankfurt am Main, 20 September.

19.

See also BIS (2022), “Market dysfunction and central bank tools”, Markets Committee, 11 May.

20.

See also Duffie, D. (2023), “Resilience redux in the US Treasury market”, paper presented at the 2023 Jackson Hole Economic Policy Symposium.

21.

Vissing-Jorgensen, A. (2021), “The Treasury Market in Spring 2020 and the Response of the Federal Reserve”, *Journal of Monetary Economics*, Vol. 124, November, pp. 19-47.

22.

Lorenzoni, G. and Werning, I. (2019), “Slow Moving Debt Crises”, *American Economic Review*, Vol. 109, No 9, September, pp. 3229-3263; and Cole, H.L. and Kehoe, T. (2000), “Self-Fulfilling Debt Crises”, *Review of Economic Studies*, Vol. 67, No 1, pp. 91-116.

23.

Schnabel, I. (2020), “[The shadow of fiscal dominance: Misconceptions, perceptions and perspectives](#)”, speech at the Centre for European Reform and the Eurofi Financial Forum on “Is the current ECB monetary policy doing more harm than good and what are the alternatives?”, Berlin, 11 September.

24.

Dominguez, K.M.E. and Foschi, A. (2024), “Whatever-it-takes policymaking during the pandemic”, *Journal of International Economics*, available online 13 March.

25.

- Blotevogel, R. et al. (2024), "Asset purchases and sovereign bond spreads in the euro area during the pandemic", *Journal of International Money and Finance*, Vol. 140, February.
- 26.
- Alcaraz et al. (2019), "Whatever it takes: what's the impact of a major nonconventional monetary policy intervention?", Working Paper Series, No 2249, ECB; and Altavilla et al. (2016), "The financial and macroeconomic effects of the OMT announcements", *International Journal of Central Banking*, September.
- 27.
- ECB (2022), "[The Transmission Protection Instrument](#)", 21 July.
- 28.
- Camous, A. and Cooper, R. (2019), "'Whatever It Takes' Is All You Need: Monetary Policy and Debt Fragility", *American Economic Journal: Macroeconomics*, Vol. 11, No 4, October, pp. 38-81.
- 29.
- Duffie, D. and Keane, F.M. (2023), "[Market-Function Asset Purchases](#)", *Federal Reserve Bank of New York Staff Reports*, No 1054, Federal Reserve Bank of New York, February.
- 30.
- In the euro area, several safeguards in the design of asset purchases ensure that they comply with the Treaty prohibition of monetary financing, as confirmed by the Court of Justice of the European Union. Research shows that monetary financing as a means of avoiding self-fulfilling debt crises may come at considerable costs. See Bacchetta, P. et al. (2018), "Self-fulfilling debt crises: What can monetary policy do?", *Journal of International Economics*, Vol. 110, January, pp. 119-134.
- 31.
- For recent empirical evidence on this channel, see Breckenfelder, J. and De Falco, V. (2024), "[Investor heterogeneity and large-scale asset purchases](#)", *Working Paper Series*, No 2938, ECB.
- 32.
- Altavilla, C. et al. (2021), op. cit.; Gagnon et al. (2011), "The Financial Market Effects of the Federal Reserve's Large-Scale Asset Purchases", *International Journal of Central Banking*, Vol. 7, No 1, March, pp. 3-43; Krishnamurthy, A. and Vissing-Jorgensen, A. (2011), "The Effects of Quantitative Easing on Interest Rates: Channels and Implications for Policy", *Brookings Papers on Economic Activity*, Vol. 42, No 2, pp. 215-287; Joyce, M.A.S. et al. (2011), "The Financial Market Impact of Quantitative Easing in the United Kingdom", *International Journal of Central Banking*, Vol. 7, No 3, pp. 113-161.
- 33.

Gertler, M. and Karadi, P. (2013), „QE 1 vs. 2 vs. 3...: A Framework for Analyzing Large-Scale Asset Purchases as a Monetary Policy Tool”, *International Journal of Central Banking*, January; Fratzscher et al. (2018), “On the International Spillovers of US Quantitative Easing”, *The Economic Journal*, Vol. 128(608), pp. 330-377; and Gagnon et al. (2011), “The Financial Market Effects of the Federal Reserve’s Large-Scale Asset Purchases”, *International Journal of Central Banking*, 7 (1), pp. 3–43.

34.

See, for example, Weale, M. and Wieladek, T. (2016), “What are the macroeconomic effects of asset purchases?”, *Journal of Monetary Economics*, Vol. 79, May, pp. 81-93; Hohberger, S., Priftis, R. and Vogel, L. (2019), “The macroeconomic effects of quantitative easing in the euro area: Evidence from an estimated DSGE model”, *Journal of Economic Dynamics and Control*, Vol. 108, November; Mouabbi, S. and Sahuc, J.-G. (2019), “Evaluating the macroeconomic effects of the ECB’s unconventional monetary policies”, *Journal of Money, Credit and Banking*, Vol. 51, No 4, June, pp. 831-858; and Gertler, M. and Karadi, P. (2013, *ibid.*).

35.

Schnabel, I. (2023), “[Money and inflation](#)”, Thünen Lecture at the annual conference of the Verein für Socialpolitik, Regensburg, 25 September.

36.

For an earlier discussion, see Schnabel, I., (2020), “[Monetary policy in changing conditions](#)”, speech at the second EBI Policy Conference on “Europe and the Covid-19 Crisis – Looking back and looking forward”, Frankfurt, 4 November.

37.

Ahmed, R. et al. (2024), “Losing traction? The real effects of monetary policy when interest rates are low”, *Journal of International Money and Finance*, Vol. 141, March; and van den End, J.W. et al. (2020), “[Macroeconomic reversal rate: evidence from a nonlinear IS-curve](#)”, *DNB Working Paper Series*, No 684, De Nederlandsche Bank, May.

38.

Related, there could be a “reversal interest rate” at which accommodative monetary policy becomes contractionary. See Brunnermeier, M.K. and Koby, Y. (2018), “[The Reversal Interest Rate](#)”, *NBER Working Paper Series*, No 25406, National Bureau of Economic Research, December.

39.

Berger, D. et al. (2021), “Mortgage Prepayment and Path-Dependent Effects of Monetary Policy”, *American Economic Review*, Vol. 111, No 9, September, pp. 2829-2878; and Eichenbaum, M., Rebelo, S.

and Wong, A. (2018), “[State Dependent Effects of Monetary Policy: the Refinancing Channel](#)”, *NBER Working Paper Series*, No 25152, National Bureau of Economic Research, October.

40.

Bundick, B., Hotz, L. and Lee Smith, A. (2023), “How Optimal Was U.S. Monetary Policy at the Zero Lower Bound?”, *Research Working Paper Series*, No 23-14, Federal Reserve Bank of Kansas City, December.

41.

Gorodnichenko, Y. and Sergeyev, D. (2021), “Zero Lower Bound on Inflation Expectations”, NBER Working Paper No 29496. Similarly, there is evidence that the effect of persistent deviations of inflation from target on long-term inflation expectations is not stronger at the effective lower bound. See Moessner, R. and Takáts, E. (2020), “How well-anchored are long-term inflation expectations?”, BIS Working Papers No 869.

42.

See, for example, Gros, D. and Shamsfakhr, F. (2022), “[The real fiscal cost of central bank bond buying](#)”, *CEPS Explainer*, No 2022-04, November.

43.

See, for example, Swedish National Audit Office (2023), *The Riksbank’s asset purchases – a costly experience*, December; and House of Lords Economic Affairs Committee (2021), “[Quantitative easing: a dangerous addiction?](#)”, July; and Treasury Committee (2023), *Call for Evidence – Quantitative tightening*.

44.

Corradin, S. and Maddaloni, A. (2020), “The importance of being special: Repo markets during the crisis”, *Journal of Financial Economics*, Vol. 137(2), pp. 392-429; and Weigerding, M. (2023), “Long-term liquidity effects of large-scale asset purchase programs: Evidence from the euro covered bond market”, *International Review of Economics & Finance*, Vol. 87, pp. 244-264. For Japan, see Han, F. and Seneviratne, D. (2018), “[Scarcity Effects of Quantitative Easing on Market Liquidity: Evidence from the Japanese Government Bond Market](#)”, *IMF Working Papers*, No 18/96, International Monetary Fund, May.

45.

Arrata, W. et al. (2020), “The scarcity effect of QE on repo rates: Evidence from the euro area”, *Journal of Financial Economics*, Vol. 137, No 3, pp. 837-856.

46.

Nguyen, B., Tomio, D. and Vari, M. (2023), “[Safe Asset Scarcity and Monetary Policy Transmission](#)”, *Working Paper Series*, No 934, Banque de France; and Schnabel, I. (2024), “[The Eurosystem’s](#)

[operational framework](#)”, speech at the Money Market Contact Group meeting, Frankfurt am Main, 14 March.

47.

International Monetary Fund (2018), “[House Price Synchronization: What Role for Financial Factors?](#)”, *Global Financial Stability Report*, April, pp. 90-133.

48.

Schnabel, I. (2021), “[Monetary policy and inequality](#)”, speech at a virtual conference on “Diversity and Inclusion in Economics, Finance, and Central Banking”, Frankfurt am Main, 9 November; and Andersen, A. et al. (2020), “Monetary policy and inequality” *Journal of Finance*, Vol. 78, No 5, pp. 2945-2989.

49.

At the same time, middle-wealth households often benefit from rising house prices as a result of QE. This can offset the impact of higher financial asset prices on the wealth distribution. See Lenza, M. and Slacalek, J. (2024), “How does monetary policy affect income and wealth inequality? Evidence from quantitative easing in the euro area”, *Journal of Applied Econometrics*, pp. 1-20.

50.

Lenza, M. and Slacalek, J. (2024, *ibid*).

51.

ECB (2024), [Financial Stability Review](#), May.

52.

Deutsche Bundesbank (2024), [Monthly Report](#), February. In the United States, a recent report suggests that homes were overvalued by 11% at the end of 2023. See FitchRatings (2024), *U.S. RMBS Sustainable Home Price Report — 2Q24*, 13 May.

53.

Karadi, P. and Nakov, A. (2021), “Effectiveness and addictiveness of quantitative easing”, *Journal of Monetary Economics*, Vol. 117, pp. 1096-1117.

54.

Acharya, V.V. et al. (2023), “[Liquidity Dependence and the Waxing and Waning of Central Bank Balance Sheets](#)”, *NBER Working Paper Series*, No 31050, National Bureau of Economic Research, March.

55.

Du, W., Forbes, K. and Luzzetti, M.N. (2024), “[Quantitative Tightening Around the Globe: What Have We Learned?](#)”, *NBER Working Paper Series*, No 32321, National Bureau of Economic Research, April.

56.

Gust, C. and Skaperdas, A. (2024), “[Government Debt, Limited Foresight, and Longer-term Interest Rates](#)”, *Finance and Economics Discussion Series*, No 2024-027, Board of Governors of the Federal Reserve System.