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Navigating Trade-Offs between Price and Financial Stability in Times of High Inflation

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Authorized for distribution by Tobias Adrian and Pierre-Olivier Gourinchas
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ABSTRACT: Trade-offs between price and financial stability can occur when inflation is above target and financial stress is rising. Use of central bank liquidity tools and other financial stability policies may, under some circumstances, allow central banks to maintain their inflation fighting stance, while addressing financial stress. However, challenges in deploying these tools and specific country characteristics may hinder central banks' ability to achieve both price and financial stability. In such circumstances, central banks should account for financial stress increasing downside risks to activity, allow for slower disinflation using monetary policy flexibility, and communicate that deviations from the medium-term inflation target are temporary. Countries with weak central bank credibility, high exposure to exchange rate movements, and limited fiscal space face extra challenges in managing these trade-offs and might have to rely on foreign exchange interventions, macroprudential policies, capital flow measures, and international liquidity tools.

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Acronyms/Glossary

BoE	Bank of England
CCyB	countercyclical capital buffer
CD	certificate of deposit
CFM	capital flow management measure
ECB	European Central Bank
ELA	emergency liquidity assistance
FDIC	Federal Deposit Insurance Corporation
FOMC	Federal Open Market Committee
FRB	Federal Reserve Board
FSB	Financial Stability Board
FXI	foreign exchange intervention
GFC	global financial crisis
IPF	Integrated Policy Framework
LCR	Liquidity Coverage Ratio
LDI	liability-driven investment
LTCM	Long-Term Capital Management
NBFI	nonbank financial intermediation
QT	quantitative tightening
SVB	Silicon Valley Bank

Executive Summary

Central banks may face a trade-off between price and financial stability when they tighten monetary policy to fight inflation. Interest rate hikes may weaken financial intermediaries and generate or exacerbate financial stress with adverse effects on output. This Staff Discussion Note (SDN) focuses on how central banks should react to financial stress episodes in the context of high inflation, when trade-offs between price and financial stability emerge.

When stress is modest, central banks may avoid trade-offs. As tighter financial conditions would imply a more restrictive environment if the policy rate path remained unchanged, the central bank may recalibrate its stance to keep inflation and output on the same path as before financial conditions tightened. Repos and the use of standing facilities can address liquidity-related stress.

In more severe cases of stress, trade-offs will emerge; achieving separation between price and financial stability objectives (that is, tackling stress without compromising price stability) will likely require additional tools. Central banks may need to deploy other measures such as long-term liquidity support and asset purchases to buttress financial stability while allowing monetary policy to focus on price stability.

When stress is high and illiquidity and insolvency become intertwined, fiscal support on top of liquidity support becomes critical. For instance, central bank emergency lending should be accompanied with a government indemnity if the solvency of the counterparty is uncertain to protect the central bank's balance sheet. Direct fiscal interventions may be necessary during episodes of acute stress.

But separation of price and financial stability objectives may prove elusive when the use of non-interest central bank tools and other policies involve sizable costs and challenges. Calibrating, implementing, and unwinding central bank policy interventions may be difficult in certain circumstances, exposing the central bank to political pressures that could undermine its independence should it incur large financial losses. Use of non-interest rate tools and other policies can also have costs such as weakening market discipline, encouraging excessive risk-taking, and impairing market development.

Strong prudential and fiscal frameworks reduce the risk of facing trade-offs and facilitate achieving separation of price and financial stability goals. Strong prudential policy and supervisory frameworks with adequate capital and liquidity buffers limit the financial risks associated with monetary tightening and help contain moral hazard concerns associated with a "central bank put." Appropriate regulatory and supervisory frameworks for nonbanks are a precondition for central banks to expand their toolkits to be able to provide collateralized lending to such institutions. Robust frameworks for resolution and financial safety nets backed by adequate fiscal buffers are critical to ensure that the authorities have the capacity to act when needed.

When separation is not possible, central banks should allow for more gradual disinflation while clearly communicating to keep inflation expectations anchored. Less aggressive tightening is consistent with de jure or de facto flexible inflation targeting for central banks with dual price and output stability objectives. To avoid losing credibility and keep inflation expectations anchored, central banks should emphasize their commitment to price stability and the temporary nature of deviations.

Navigating trade-offs between price and financial stability may be more challenging for economies with low central bank credibility, large exposures to exchange rate risk, and limited fiscal space. Pursuing a tight monetary policy stance could not only exacerbate financial stress but also trigger capital flight if investors anticipate a financial crisis. Conversely, a less aggressive policy stance could further undermine central bank credibility, leading to capital outflows and exchange rate depreciations that would worsen stress. These economies thus might have to use foreign exchange interventions (FXIs), macroprudential measures (MPMs), and capital flow management measures (CFMs), guided by the Integrated Policy Framework. Trade-offs faced by these economies can also be mitigated through liquidity support from multilateral institutions such as the IMF.

Introduction

1. In the low inflation environment following the global financial crisis (GFC), price and financial stability objectives were well aligned. Policy easing supported aggregate demand, kept inflation from dropping further below target, and reduced financial stability risks by strengthening financial intermediaries' balance sheets. Policymakers recognized intertemporal trade-offs, particularly the concerns about risk shifting associated with search for yield.[1] However, addressing these risks was considered a task for prudential policy, and changes to interest rate policy to "lean against the wind" and reduce the buildup of financial vulnerabilities were generally deemed not advisable (IMF 2015). At the same time, the argument was put forward that monetary policy in a low inflation environment should consider future macrofinancial stability when prudential policies are imperfect (Adrian 2020).

2. The global rise in inflation in the post-pandemic period highlighted potential trade-offs between price and financial stability. Although financial conditions remained surprisingly easy during much of the recent policy tightening cycle, there were notable episodes in which monetary policy tightening led to significant financial stress (for example, Korea in 2022 and the United States in 2023) and a case where financial stress driven by an unexpected fiscal policy announcement (that is, the "mini-budget" in the United Kingdom in 2022) complicated the central bank's task of bringing down inflation.[2]

3. In recent episodes of stress, central banks avoided having to compromise their price stability objective by using asset purchases and other non-interest-rate tools to safeguard financial stability. These actions allowed central banks to keep policy rates elevated in the face of high inflation and achieve anchoring of inflation expectations while also easing financial conditions in support of financial stability. For instance, during March–April 2023 depositor runs on Silicon Valley Bank (SVB) and other US regional banks, the Federal Reserve did not reverse policy rate hikes but introduced the Bank Term Funding Program to provide liquidity to banks at favorable conditions (in terms of haircuts, interest rates, and collateral valuations) and the Federal Deposit Insurance Corporation (FDIC) extended insurance coverage to uninsured depositors of certain institutions while the troubled banks were resolved using standard tools (see Annex 1). Similarly, during the September 2022 UK liability-driven investment (LDI) crisis, following the announcement of the mini-budget, the Bank of England (BoE) undertook temporary gilt purchases to restore orderly market conditions and did not lower the monetary policy rate.

4. However, policymakers may experience difficult trade-offs between safeguarding price and financial stability when battling high inflation, and identifying appropriate approaches to navigating these trade-offs is a critical but overlooked subject.[3] Only a few recent papers (Boissay and others 2023a, 2023b; Chavleishvili, Kremer, and Lund-Thomsen 2023) and speeches by central bankers (Barr 2023, Schnabel 2023) have examined the implications of monetary policy tightening for financial stability, potential trade-offs, and the possibility of achieving separation.[4]

[1] Boyarchenko, Favara, and Schularick (2022) and Grimm and others (2023) explore the link between monetary policy easing and financial vulnerabilities.

[2] A recent Bank of England (BoE) working paper (Bandera and Stevens 2024) offers this characterization of the UK liability-driven investment crisis in 2022.

[3] In contrast, an extensive literature following the global financial crisis (GFC) explored the question of whether monetary policy needed to curb the rise of financial vulnerabilities resulting from a low-interest-rate environment or whether separation between price and financial stability objectives was possible in that context (for example, Smets 2014, Stein 2014, Svensson 2015).

[4] See also IMF (2012c) for an earlier treatment of the interactions between monetary and macroprudential policies. In general, a systematic review of the more recent role of macroprudential in mitigating trade-offs is not possible because few incidents of financial stress have occurred during the recent inflationary post-pandemic period.

5. This Staff Discussion Note (SDN) aims to complement the IMF Board Paper (IMF 2015), which focused on the extent to which monetary policy (rather than other tools) should be adjusted to avoid the buildup of financial vulnerabilities when inflation is low, by exploring the following key questions related to the conduct of monetary policy when financial stress emerges and inflation is high:

- How does monetary policy tightening affect financial stress?
- How should central banks navigate potential trade-offs between price stability and financial stability in an environment of elevated inflation?
- What are the challenges associated with deploying central bank liquidity tools and other policies that can help mitigate stress and improve trade-offs?
- How do features typical of many emerging markets and small open economies complicate central banks' ability to navigate the trade-offs?

6. Although some of these questions were explored in an earlier IMF Blog (Adrian, Gopinath, and Gourinchas 2023), this SDN provides more theoretically grounded and granular policy considerations. It digs deeper into how monetary policy tightening affects the financial system and which financial vulnerabilities and macroconditions might trigger or amplify financial stress. The SDN then presents different scenarios of financial stress under high inflation and discusses how central banks should navigate trade-offs between price and financial stability based on insights from a micro-founded theoretical model. It offers a discussion of the challenges associated with central bank liquidity tools and other non-interest-rate policies, respectively. It explores how specific country characteristics, typically found in many emerging market and small open economies, might complicate managing the trade-offs and discusses potential policy options. Annex 1 provides short case studies of historical episodes of tensions between price and financial stability. Finally, Annex 2 offers details on the model underlying the analysis in the SDN.

How Does Monetary Policy Tightening Affect Financial Stress?

7. Although monetary policy tightening does not typically generate high financial stress, it may pose significant financial stability risks under certain conditions. In a sample of 170 monetary policy tightening episodes across 36 advanced and emerging market economies between 1971 and 2017, 20 episodes were followed by a banking crisis, with the onset of the crisis typically occurring 18–24 months after the start of the tightening cycle (Figure 1, panel 1). These crises were associated with a generalized drop in equity markets as well as a marked deterioration in bank equity valuations (Figure 1, panels 2 and 3). This section describes the channels through which monetary policy tightening affects the financial system and considers factors that could amplify financial stress.[5]

A. Transmission Channels

8. Monetary policy affects financial institutions via its effects on asset prices, financial conditions, and asset quality. Higher policy rates tend to reduce the valuation of assets and liabilities on intermediaries' balance sheets by affecting cash flows and the yield curve used to discount these flows.

[5] Inflation itself could affect bank profitability and the stability of the financial system (that is, even if monetary policy didn't react). Empirical studies, however, find that inflation has weak to no direct effect on bank profitability (Demirgüç-Kunt and Huizinga 1999, Bergant and others forthcoming).

They can tighten financial conditions, affecting the profitability of financial institutions by impacting term and risk premiums and altering the spread between the return on new assets and the costs from servicing, refinancing, or issuing new debt, including deposits. Additionally, monetary policy tightening can deteriorate financial institutions' asset quality, if borrowers find it more difficult to repay their loans following the increase in the policy rate, leading to credit losses for financial institutions. Elaboration on these channels is provided below.

9. Higher policy rates can adversely affect intermediaries' balance sheet through exposing them to valuation losses on long-term bonds and by raising the cost of funding. Financial intermediaries' assets have often longer duration than their liabilities, exposing them to valuation losses when long-term rates rise. These effects are somewhat dampened by banks' market power, which limits rate increases on insured deposits, and their ability to hedge interest rate risk (Bergant and others forthcoming). However, as evident during the SVB episode in the US, valuation effects associated with duration mismatches can undermine confidence in solvency and prove highly disruptive to the financial system.[6]

10. Higher policy rates tend to reduce asset quality as lower aggregate demand weakens firm and household cashflows and causes defaults to rise. Higher real interest rates and constrained bank credit reduce consumption and investment.[7] The drop in aggregate demand has a negative effect on households' and firms' incomes. Tighter financial conditions reduce the cashflow of households and firms by increasing their interest payments when debt is contracted at a floating rate. Lower asset prices reduce borrowers' wealth, creditworthiness, and ability to borrow.

11. Monetary policy tightening also increases liquidity risks for financial intermediaries. Higher policy rates may lead short-term liability holders to withdraw their funds for better returns in money market funds (IMF 2023b). Some intermediaries may face redemptions or runs as losses on their fixed-income portfolios raise concerns about their profitability and solvency. Lower asset prices can prompt brokers to require more funds or collateral in financial intermediaries' accounts to keep lending to them, draining liquidity, and worsening financial conditions through margin calls.

B. Amplification Factors

12. Certain vulnerabilities raise the likelihood and severity of financial stress episodes stemming from monetary policy tightening. These include high nonfinancial sector debt, loose credit standards, financial sector leverage, and liquidity and duration mismatches. Structural characteristics such as the presence of systemically important institutions and interconnectedness can also amplify stress.

13. High nonfinancial sector debt increases the likelihood of financial stress. When debt is at floating rates or requires frequent refinancing, interest expenditures can surge, raising default risks. Higher leverage makes it more likely for borrowers to fall into negative equity if asset prices drop, which can force deleveraging (for example, in case of refinancing needs) and create a feedback loop that further depresses asset prices and increases the loss given default of lenders. Higher public debt can also trigger

[6] Accounting and regulatory standards also influence how monetary tightening affects financial institutions' reported solvency. Trading book losses impact regulatory capital, while unrealized losses are not included in regulatory capital in the case of held-to-maturity securities recorded at book value—the value at which they were originally purchased—and only show up when such securities are sold prior to maturity. Banks may act strategically and change the accounting classification of securities (for example, from fair value to amortized cost) to reduce reported losses. However, under certain accounting standards such as International Financial Reporting Standards, such manipulation would likely be ineffective because banks are required to disclose the fair value gain or loss that would have been recognized if the financial asset had not been reclassified.

[7] Monetary tightening also causes the exchange rate to appreciate. This appreciation dampens economic activity through a decline in exports demand and lower import prices that induce higher spending on imports relative to domestic goods.

financial stress, especially if domestic banks are highly exposed to domestic sovereign debt, leading to a harmful cycle between public sector and banking sector instability. For example, if a government is burdened with high debt levels or significant fiscal risks, this may erode confidence in domestic banks that hold government bonds. Overall, monetary tightening is more likely to generate financial stress when debt-to-GDP and debt service ratios are high at the time of the tightening (Figure 1, panels 4 and 5).

14. Higher leverage among financial intermediaries can exacerbate asset repricing. Highly leveraged financial firms may be forced to deleverage due to difficulties in raising equity, refinancing debt, or meeting margin calls, leading to fire sales and further asset price declines. This deleveraging can spread to other institutions holding similar assets, affecting a wide range of assets and intermediaries (Brunnermeier and Pedersen 2009). The risks to financial stability are greater when asset price valuations, such as housing prices, experience a boom and grow faster prior to the tightening episode (Figure 1, panel 6).

15. Duration and liquidity mismatches in intermediaries' balance sheets increase the chances of financial stress. Lending at long maturities with short-term funding can expose intermediaries to losses as interest rates rise. Liquidity mismatches can amplify the fall in asset prices by forcing intermediaries to sell illiquid assets at a discount when facing redemptions or debt rollover problems. Past examples of financial stress caused by the interaction of monetary tightening with maturity and liquidity mismatches include the US Savings and Loan crisis in the 1980s and the 2023 regional bank crisis (Annex 1).

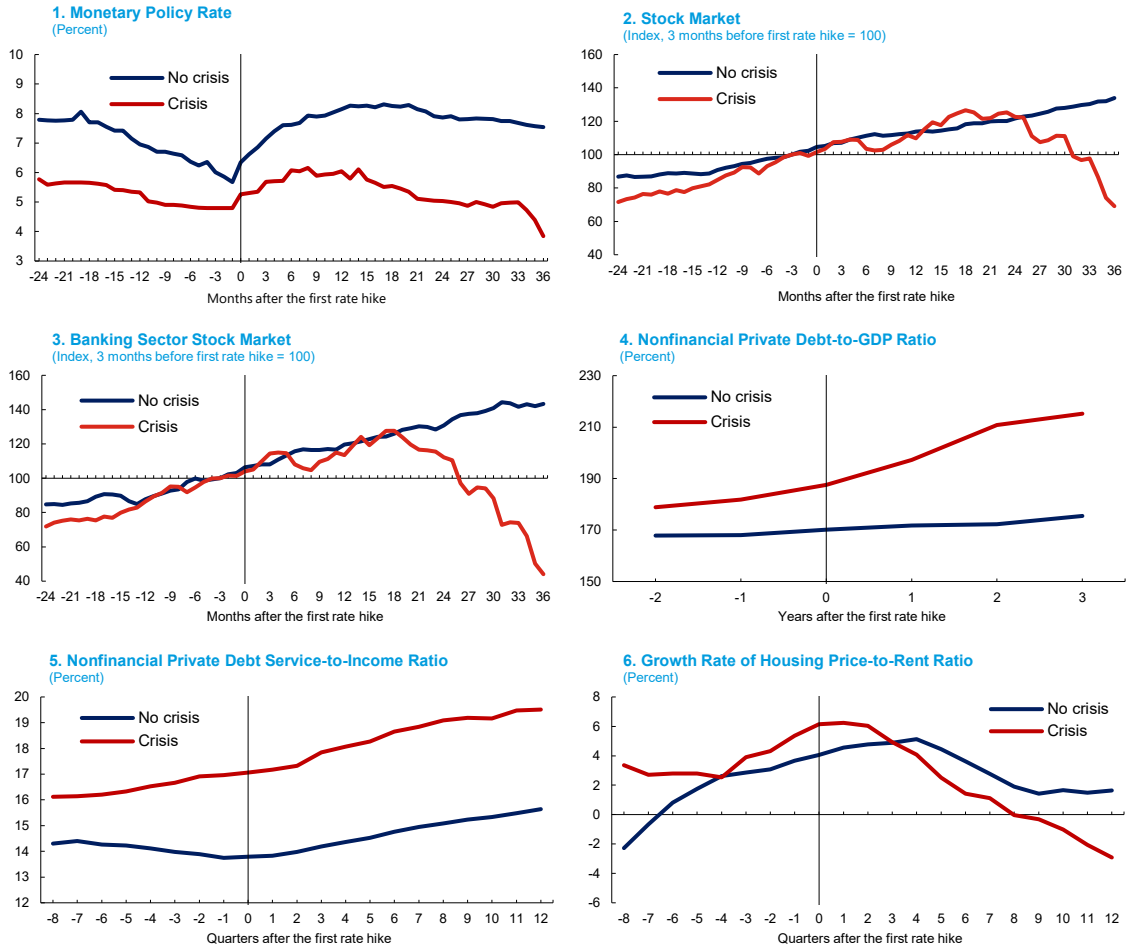
16. The systemic importance and interconnectedness of financial institutions most affected by policy rate hikes play a role in the propagation of financial stress. The failure of a large institution is expected to have system-wide repercussions on financial stress, but even small financial institutions can impact the financial system through direct balance sheet exposures, or common asset holdings, as seen in the 1998 Long-Term Capital Management crisis (Annex 1).

17. Higher policy rates are more likely to cause financial stress when inflation is driven by supply rather than demand shocks. In response to adverse supply shocks, the central bank may have to push output and employment significantly below potential to bring inflation to target, which tends to reduce borrowers' cash flows and increase credit default risk. In contrast, demand-driven inflation boosts borrowers' incomes along with prices, acting as natural buffer against the impact of monetary tightening and allowing borrowers to deleverage more smoothly. This deleveraging further contributes to reducing financial vulnerabilities and financial stress over the medium term (Boissay and others 2023b).

18. Financial stress is more likely when monetary tightening follows a period of persistently loose monetary policy. Low policy rates push up asset prices and foster risk-taking by financial institutions and search for yield by the financial and the nonfinancial sector. Moreover, the response of bond prices to interest rates is nonlinear, being much larger when rates increase from low levels. Monetary policy tightening is hence more likely to trigger financial stress following prolonged periods of low rates (Jiménez and others 2022, Grimm and others 2023). Historically, banking crises observed in the wake of monetary tightening episodes were more likely to occur after periods when rates were on average lower (Figure 1, panel 1).

19. Financial instability is also more likely to materialize if policy rates rise sharply and stay high for long. A sharp increase in policy rates may destabilize financial markets and institutions owing to a surprise effect and insufficient hedging. Liquidity stress can be exacerbated for those institutions heavily reliant on short-term funding. Prolonged high rates may also reveal vulnerabilities as loans are renegotiated at higher rates and borrowers face refinancing challenges when income and balance sheets deteriorate. If rates are high for long, banks also see their retail deposit funding costs and loan loss provisions increase.

Figure 1. Monetary Tightening and Macrofinancial Developments for Crisis and Non-Crisis Episodes



Sources: Bank for International Settlements; IMF, Global Debt Database; IMF, *World Economic Outlook*; and IMF staff calculations.

Note: The figure is based on a sample of 170 monetary policy tightening episodes (defined as tightening periods with at least four consecutive rate hikes) in response to an inflation surge between January 1970 and December 2017 in 21 advanced economies and 15 emerging market economies. Each panel shows the average values of the indicator for a crisis and a non-crisis subsample. Crises are defined using the Laeven and Valencia (2020) database. A tightening episode belongs to the crisis subsample if a banking crisis started in the three-year window following the first interest rate hike.

How Should Monetary Policy Respond to Financial Stress When Inflation Is High?

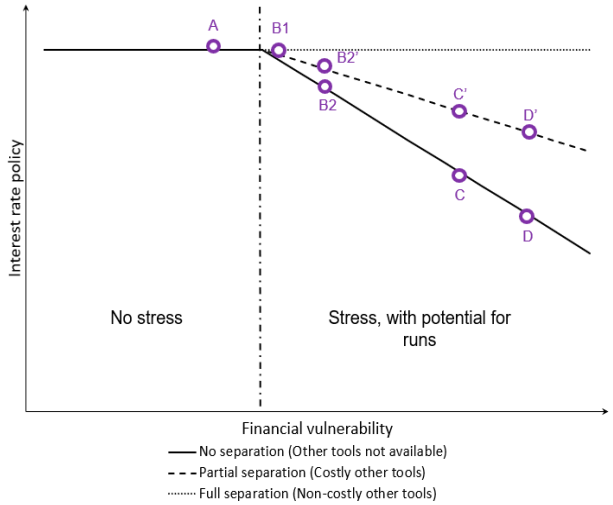
20. This section develops a framework for analyzing appropriate policy responses across scenarios of varying financial stress, drawing on Capelle and Teoh (2025) (see Annex 2 for a

summary) and the broader literature. The focus is on an economy with a de jure or de facto flexible inflation targeting monetary policy framework.[8]

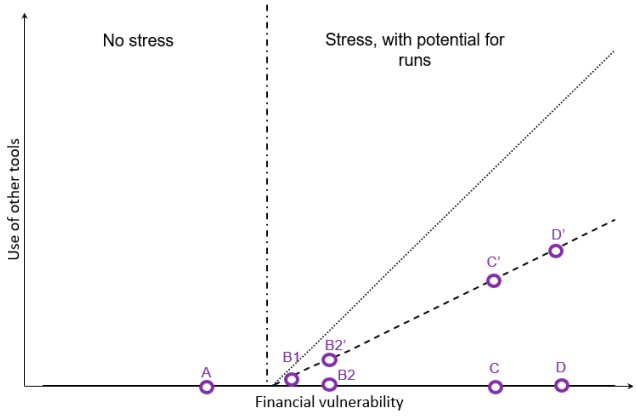
21. The appropriate policy response to financial stress when inflation is high should strive to achieve separation between price and financial stability objectives if the costs of using non-interest-rate tools are low, but when these costs are higher, separation may not be fully optimal. When financial stability tools (see Box 1)[9] are not costly, they should be used to the extent necessary to resolve financial stresses. This is shown in Figure 2, where the dotted line in panel 2 shows the optimal setting of the non-interest-rate tool—say "liquidity support"—in the model for different levels of financial stress or vulnerability, keeping price pressures constant. Interest rate policy can then focus on inflation stabilization, and keeping the policy rate unchanged at its pre-shock level (dotted line in panel 1) also suffices to keep inflation unchanged (dotted line in panel 3). In this case, full separation is optimal. The solid lines in Figure 2 consider a polar alternative in which these tools are prohibitively costly or not available. Here, interest rates need to be reduced relative to baseline—so policy is less aggressive—to accommodate financial stress (panel 1), with the consequence that inflation considerably overshoots its target (panel 3). Reality is somewhere in between: these tools entail costs and present implementation challenges, discussed later in this SDN, but these impediments are generally not prohibitive.

Figure 2. Optimal Combination of Interest Rate and Other Tools, and Deviations from Medium-Run Inflation Target

1. Optimal Interest Rate



2. Optimal Use of Other Tools



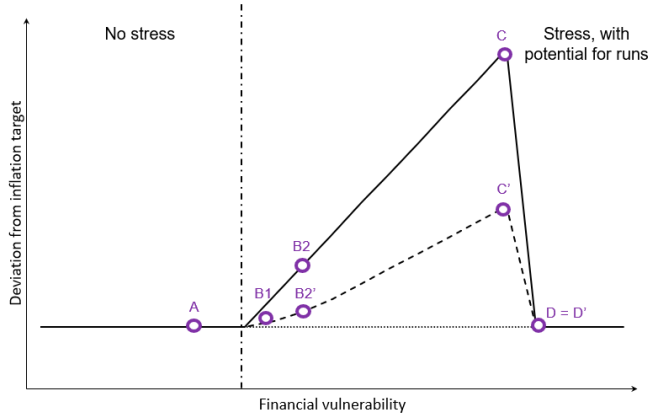
[8] A flexible inflation-targeting central bank primarily aims to achieve a specific inflation target over the medium term while also considering other economic objectives, such as stabilizing output, employment, or financial markets. In the model (Annex 2), this arises from the central bank choosing policy to maximize households' welfare. Nonetheless, the policy recommendations outlined in this section are qualitatively similar for central banks with strict inflation targeting or dual mandates. In addition, this Staff Discussion Note (SDN) does not consider fiscal policy as an instrument to stabilize inflation.

[9] This SDN abstracts from a discussion of quantitative tightening, wherein central banks shrink their balance sheets by unwinding their asset holdings. Although central banks have embarked on quantitative tightening in recent years as they normalize monetary policy, these events have had limited impact on asset pricing and market liquidity at the time of writing (Du, Forbes, Luzzetti 2024).

In this case, policymakers should trade off their benefits (that is, they target the source of financial stress and allow interest rate policy to focus on inflation) and their costs (for example, moral hazard, fiscal risks). The combination of interest rate policy and other tools that balances trade-offs is shown by the dashed line in Figure 2, panels 1 and 2. Interest rates decline enough that inflation overshoots its target, and separation may nearly be attained if stress is modest and the costs of using tools low. As financial vulnerabilities rise (right part of each panel), the use of other tools should be expanded both in size and scope.[10] Interest rate policy should also become less aggressive to avoid worsening these vulnerabilities and to account for the increasingly costly use of other tools.

Figure 2. Optimal Combination of Interest Rate and Other Tools, and Deviations from Medium-Run Inflation Target (concluded)

3. Deviations from Medium-Run Inflation Target



Source: IMF staff.
Note: The figure panels illustrate the appropriate policy mix and deviations from medium-run inflation target under different assumptions about the severity of financial stress and the availability and cost of non-interest-rate tools. Each point in the figures refers to a specific scenario discussed in the main text: (1) no stress (point A), (2) modest stress (point B1) and moderate stress (point B2 and B2'), (3) heightened stress (point C and C'), and (4) full-fledged crisis (point D and D'). Letter A refers to the case of no trade-off, letters without prime notation (B1, B2, C, D) indicate situations in which there is no separation; letters with prime notation (B2', C', D') indicate situations in which there is partial separation.

Four Scenarios

22. The remainder of this section explores the optimal use of interest rate policy and other tools under different stress scenarios. A clear upshot of the conceptual model is that separation becomes more difficult as financial stress intensifies, especially if the costs of using additional tools beyond the interest rate is high. But to tease out the practical implications, the analysis is next applied to a range of stress scenarios that draw on country experiences. Four scenarios of financial stress of increasing intensity are considered: (1) no stress, where financial markets are functioning normally and the financial system is solvent; (2) modest (for example, 2000 dot-com bubble burst) to moderate (for example, 1980s US Savings and Loan crisis) stress, where the financial sector is constrained in its capacity to intermediate capital and provide other financial services due to vulnerabilities (for example, low capital and/or liquidity levels), but risks of systemic panics are contained; (3) heightened risk of panic and contagion, where shifts in investor sentiment due to vulnerabilities could trigger a systemic run and collapse (for example, the 2023 US regional bank crisis); and (4) full-fledged financial crisis that results in severe disruptions in financial intermediation and output contracts (for example, the GFC). In practice, financial stress episodes are often fluid, requiring policy actions under uncertainty about the extent of financial fragilities and the potential sources. A real-time and accurate measure of financial stress is crucial, particularly for distinguishing between moderate and heightened stress scenarios, given the differences in appropriate policy responses.

[10] In practice, some tools are costlier to use than others, so navigating the trade-offs will require assessing both the appropriateness and relative cost of these tools given the nature of the financial stress.

Box 1. Tools for Navigating the Price and Financial Stability Trade-offs

This box describes several classes of tools that policymakers could potentially use to achieve separation of price and financial stability objectives in times of high inflation and financial stress.

- **Central bank liquidity tools.** These tools fall into two categories:
  - **Lending operations.** Central banks can provide short-term funding at the initiative of eligible financial institutions through standing facilities in unlimited amount as long as the appropriate collateral is provided. The cost of the facility and the haircut applied to the collateral are key factors driving the demand from eligible counterparties. They can also address systemwide funding liquidity issues via discretionary lending operations (typically repos) available to existing counterparties or to a temporarily extended set of counterparties. Temporary facilities can be designed for liquidity support to a specific market or type of financial intermediary. Lending operations also include emergency liquidity assistance directed at specific individual institutions. Under emergency liquidity assistance, conditions are attached to central bank lending as compensation for increased risk exposures. Finally, many central banks have bilateral swap lines arrangements with other central banks to access foreign currency liquidity in times of stress, which can then be on-lent to domestic financial institutions.
  - **Asset purchases.** Central banks can also act as market makers of last resort by purchasing assets in the secondary market (Buiter and others 2023). These operations generally address market liquidity issues rather than funding liquidity issues, even if the two can be related (Brunnermeier and Pedersen 2009).[1]

- **Prudential tools.** Macroprudential instruments include capital-related measures (such as the countercyclical capital buffer), liquidity-related measures (such as reserve requirements), and borrower-based tools (such as ceilings on debt-service-to-income ratios), with the stressed debt-service-to-income ratio being particularly important in countries where loans are mainly at flexible rates.[2] The microprudential requirements on capital and liquidity have been strengthened significantly globally after the global financial crisis, and arguably have made banks substantially more resilient. Moreover, certain jurisdictions have introduced a macroprudential component on top of minimum binding prudential requirements (for example, risk weights above minimum levels, higher requirements for large exposures). The calibration of these macroprudential tools may be adjusted when systemic risks materialize. Some liquidity-related prudential tools, such as the liquidity coverage ratio, aim to ensure that banks maintain a liquidity buffer that is meant to be used during a stress period (without any supervisory intervention). Using a combination of these tools can help reduce financial stress. IMF (2014b) provides a fuller description of the various tools.

- **Fiscal tools.** These tools include the following:
  - **Financial support tools.** Governments can provide loans or guarantees to alleviate liquidity constraints of financial institutions as well as equity to provide them with solvency support. They can also purchase illiquid or impaired assets to help financial institutions clean up their balance sheets (Battersby and others 2022). Governments can also provide fiscal backstops to central banks' liquidity provision.
  - **Deposit insurance and government guarantees**. By protecting small depositors, a well-designed deposit insurance system seeks to enhance confidence and reduce the risk of deposit runs, thereby contributing to financial stability. Under highly stressed conditions, however, temporary government guarantees on a wider set of liabilities (excluding capital, subordinated debt, and other loss-absorbing liabilities) may be needed to ensure that creditors continue to provide financing as broader crisis management actions are implemented.

- **Resolution tools.** A comprehensive "toolkit" of resolution powers for national authorities includes the ability to (1) assume control of a financial institution from existing managers and owners; (2) enforce the resolution through the sale or merger of the entity, the transfer of assets and liabilities of the institution to third parties; (3) implement loss absorption by creditors (via conversion of creditor debt into equity or a write-down of creditor claims), either on a "stand-alone" basis or used in combination with another resolution power, that is "bail-in"; (4) acquire temporary ownership of failed systemically important institutions, or "bail-out"; and (5) support the resolution through a temporary stay on the execution of early termination rights under financial contracts (IMF 2012a, FSB 2024c).

[1] Market liquidity refers to the ease with which an asset is traded while funding liquidity refers to the ease with which traders can obtain funding for their transactions.

[2] See Miettinen and Nier (forthcoming) for a discussion of positive neutral countercyclical capital buffer rates.

A. No Stress

23. When the financial system is well-capitalized, liquid, and hedged against interest rate changes, central banks can focus solely on price stability and macroeconomic objectives when setting interest rate policy. Raising interest rates to address inflation is unlikely to cause significant financial stability concerns because existing buffers are large enough that the financial sector's liquidity and solvency risks are minimal. The appropriate interest rate policy in this context depends on policymakers' mandates, their assessment of the monetary policy stance relative to the neutral interest rate, and the trade-offs they face between price stability and output stability, which hinge on the sources of shocks hitting the economy. Demand shocks that move inflation and output in the same direction do not pose a trade-off between price and output stability, while supply shocks that move them in opposite directions do imply trade-offs. Interest rate tightening should be calibrated to the severity of inflationary pressures as well as the risk of inflation expectations becoming unanchored and, in the case of supply shocks, to the policymakers' tolerance for temporary deviations of inflation from target.

24. In this scenario, there is clearly no need to provide any broad-based liquidity or solvency support to achieve separation. Nonetheless, policymakers should remain vigilant to the potential buildup of financial risk that could lead to financial stress down the road. In that regard, a robust macroprudential policy framework is essential for building resilience in the financial sector. Additionally, strong supervision and resolution frameworks are key to manage idiosyncratic pockets of financial vulnerabilities that may arise.

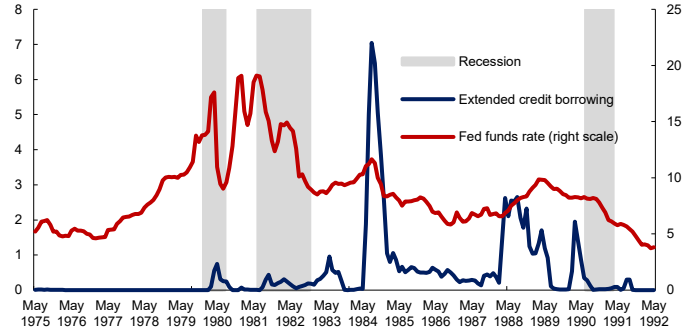
B. Modest to Moderate Stress: Constrained Intermediation Capacity

25. When financial stress is modest and a tightening of financial conditions compresses aggregate demand, policymakers can achieve price and financial stability with a less aggressive rate hike and possibly deploying standard liquidity tools. Interest rate policy can be less forceful given the dampening effect of tighter financial conditions on aggregate demand. A small recalibration of the policy stance (including through forward guidance) can keep inflation and output on essentially the same path as before financial conditions tightened. In this situation, there is no trade-off between price and financial stability. However, this comes with challenges due to the costs associated with communicating a change in the policy stance and the less predictable transmission of policy (FRB 2023b). Accordingly, policymakers can minimize interest rate recalibrations by using standard liquidity-management tools, such as standing facilities and repo operations to address any emerging systemwide liquidity tensions, assuming the cost of using these tools is low (Figure 2 panels 1 and 2, point B1).

26. However, if financial stress has adverse implications for the supply of credit (in addition to demand-side effects), interest rate policy faces a trade-off between price and financial stability. While a tightening reduces inflation, it could negatively affect future productive capacity by restricting credit and increasing risk premia. If non-interest-rate tools (Box 1) were not costly, policymakers could fully rely on them to resolve financial stress and keep monetary policy as tight as before financial conditions tightened as required to stabilize inflation. However, because non-interest-rate tools entail costs, as discussed later in this SDN, policymakers should combine their use with a less aggressive monetary policy stance to account for the supply-side effects of financial stress (Figure 2 panel 1, point B2'). Nonetheless, policymakers can come close to separation in this scenario given that stress, deployment of other tools, and associated costs are assumed to be contained.

27. The additional tools deployed should be targeted at the source of financial stress. Liquidity issues may be addressed using both standard and emergency liquidity facilities.[11] For example, the Federal Reserve expanded lending assistance during the wave of bank failures in the early phase of the 1980s US Savings and Loan crisis (Figure 3). This action was crucial to ensure viable banks continued to operate during periods of temporary illiquidity (Clouse 1994). For solvency-related stresses, undercapitalized institutions should first come under early intervention and intensive supervision. In the case of capital shortfalls, where private solutions cannot be found, resolution tools, including liquidation of insolvent banks, deposit transfers, and use of bail-in powers should be prioritized. Relaxing macroprudential policies can help loosen intermediaries' balance sheet constraints and support lending to the real economy (in addition to avoiding fire sales) by limiting pressures on deleveraging.

Figure 3. United States: Credit of Depository Institutions from the Federal Reserve
(Billions of US dollars, left scale; percent, right scale)



Sources: Federal Reserve Board; and IMF staff calculations.

C. Heightened Stress: Risk of Financial Panics

28. When widespread vulnerabilities can trigger nonlinear feedback loops and a panic-induced financial crisis, achieving separation may prove even more elusive. Feedback loops arise when strains on intermediaries' balance sheets lead to a vicious circle of deleveraging and liquidity drying up. Panic and runs may emerge when depositors lose confidence in the ability of intermediaries to repay their short-term debt and are usually triggered by concerns about the solvency of intermediaries. When the risk that these situations materialize is high, achieving separation is more challenging. One reason for this challenge: it is difficult to predict whether or when a panic will develop into a full-fledged systemic crisis, and the degree to which an aggressive tightening could exacerbate this downside risk. Although a very aggressive rate hike could keep inflation close to target should the panic remain contained, it also increases the likelihood that the systemic crisis materializes, in which case inflation (and output) would fall significantly below target. At the other extreme, a lower policy rate may rule out the run, but allow for higher inflation. Another reason why achieving separation may become more challenging: relative to the previous scenarios, the severity of the stress is larger, and more costly tools are required, as explained below. As such, relying on other tools to manage financial stress while keeping interest rates on the same path is suboptimal.

29. In these situations, monetary policy should take financial stability risks into greater account and allow for a more gradual disinflation path (Figure 2, point C'). The more cautious approach is consistent with de jure or de facto flexible inflation targeting regimes with dual price and output stability objectives. In addition, it reduces the possibility of perverse feedback loops between liquidity drying up and deleveraging and systemwide run by alleviating the strain on intermediaries' balance sheets. The extent to which central banks make full use of such flexibility should depend on the financial system's

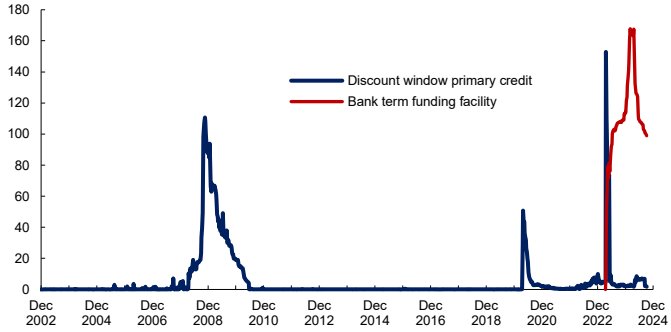
[11] This should be accompanied by heightened supervision for institutions that do not meet the prudential liquidity requirements.

vulnerabilities, the likelihood that a tighter policy stance would trigger a crisis, and the availability and costs of using other tools.

30. Clearly communicating how monetary policy actions fit with the flexible inflation targeting regime is critical to keep medium-term inflation expectations well-anchored and successfully safeguard financial stability. Policymakers should clearly state that short-term recalibrations of the interest rate do not undermine their ability and commitment to achieve the inflation target in the medium term. They should also articulate the rationale for their more cautious approach, which is that tighter policy could trigger a financial crisis and explain that any deviations are temporary and due to exceptional financial vulnerabilities and the large associated downside risks to growth. Even so, the flexibility should be used cautiously to avoid damaging the central bank's credibility, which would complicate its ability to rein in inflation. Moreover, unanchored expectations could jeopardize the central bank's effort to safeguard financial stability by leading to higher premiums and long-term interest rates.

31. In this situation, more forceful interventions and a broader and potentially costlier set of tools may need to be deployed to mitigate the trade-offs faced by interest rate policy. These tools may include long-term liquidity support and central bank asset purchases. Asset purchases support asset prices, shore up intermediaries' balance sheets, and hence reduce financial stress. During the 2022 UK LDI crisis, the BoE used a temporary and targeted backstop purchase facility to stem fire-sale dynamics in the gilt market and allow LDI funds to deleverage (Hauser 2023). During the failure of Continental Illinois National Bank and Trust Company in 1984, the Federal Reserve activated emergency lending programs to prevent contagion to otherwise solvent banks (Annex 1). Under exceptional circumstances, emergency lending and expanded protection of depositors may be needed to mitigate heightened contagion risks. For example, during the 2023 US regional bank crisis, the FDIC invoked the systemic risk exception under the Federal Deposit Insurance Act, which effectively allowed it to depart from the least-cost principle and protect both insured and uninsured deposits of SVB and Signature Bank.[12] In addition, fiscal backstops are important to ensure the credibility of deposit insurance and to protect the central bank balance sheet in case of losses associated with asset purchases and lending operations. During the recent US regional bank crisis, the US Treasury earmarked $25 billion to backstop the Federal Reserve's newly introduced lending facility (Figure 4).

Figure 4. United States: Liquidity from the Discount Window and Bank Term Funding, 2002m12–2024m8
(Billions of US Dollars)



Sources: Federal Reserve Board; and IMF staff calculations.

32. Resolution tools and fiscal support are also crucial, particularly when heightened stresses are driven by solvency issues. Private solutions should, where possible, play a role in the orderly restructuring of undercapitalized intermediaries to prevent a freeze up of market liquidity and contagion. For instance, in 1998 the Federal Reserve organized a consortium of financial institutions to provide equity for the orderly unwinding of US hedge fund Long-Term Capital Management after its failure in 1998 (Annex 1).

[12] As required by law, the costs to the deposit insurance fund arising from the protection of uninsured deposits, pursuant to the systemic risk exception, will be recovered by the Federal Deposit Insurance Corporation from the industry via a special assessment.

Where private solutions cannot be found, resolution powers should be applied to ensure losses are absorbed by the shareholders and creditors of the failed bank. Only in exceptional circumstances, when the failure of undercapitalized institutions poses an acute systemic threat, the government may need to consider providing public support to failing institutions, which ultimately should be recouped from the industry.[13]

D. Full-Fledged Financial Crisis

33. The final scenario considers a case wherein a severe financial crisis (for example, the Nordic banking crises in the early 1990s or the GFC) unfolds in a context of inflationary pressures.[14] In this situation, the financial intermediaries deleverage due to tighter financial constraints, impaired balance sheets, market illiquidity, and higher risk premiums. The resulting credit crunch leads to a sharp contraction in output, amplified by precautionary saving and expectations of poor economic performance.

34. The downturn can be large enough to offset the initial inflationary pressures, causing inflation to fall despite the underlying inflation shock. The demand contraction is amplified by the severe disruption in financial intermediation and the adverse feedback loop between the financial sector and the real economy. This dynamic was evident during the GFC, as inflation and aggregate demand collapsed.

35. In this scenario, policymakers may need to aggressively deploy a wide range of other tools to address financial stability concerns (Figure 2, panel 2, point D'). Liquidity-related tools alleviate disruptions in intermediation capacity and allow credit to continue to flow to the real economy while solvency-related tools, including restructuring, resolution and in acute systemic risk fiscal interventions, may be required to address undercapitalized and insolvent institutions and prevent markets from freezing up.

36. The appropriate policy also calls for interest rate cuts to avoid deflation and further tackle financial stress (Figure 2 panel 1, point D'). In this case, price and financial stability objectives are aligned. Lower interest rates support aggregate demand and help prevent inflation from undershooting the inflation target in the medium term. Lower rates also help stabilize the financial sector by reducing debt service burdens, supporting asset prices, and improving credit worthiness. For instance, at the onset of the GFC, the Federal Reserve acted by cutting interest rates to zero and expanding the use of non-interest rate interventions, including extending credit directly to nonbanks and issuing loans to banks with asset-backed securities as collateral through the Term Asset-Backed Securities Loan facility.

Central Bank Liquidity Tools: Principles and Challenges for Their Deployment

37. The deployment of central bank liquidity tools to help achieve separation, described earlier, should follow well-accepted principles and needs to deal with several challenges. Central bank lending to relevant entities in the nonbank financial intermediation (NBFI) ecosystem presents a set of specific challenges, which are receiving renewed attention by policymakers and are also highlighted, at a very high level, below. Efforts to reduce the cost of using these tools play a major role in helping central banks come closer to achieving separation.

[13] In accordance with the Financial Stability Board's Key Attribute 6 of Effective Resolution Regimes (FSB 2024c).

[14] This scenario is less likely to be observed in economies with low central bank credibility, exposure to foreign exchange risk, and/or limited fiscal space, where a financial crisis is often accompanied by a large devaluation, which keeps inflationary pressures high (see the discussion later in this SDN).

A. Principles for the Deployment of Central Bank Liquidity Tools

38. Central banks should build on Bagehot's long-standing principles when conducting lending operations. They should lend early and without limit to illiquid but solvent firms, against good collateral, and at high rates (Bagehot 1873, Tucker 2009).[15] Lending operations should support only well-regulated entities in a targeted and temporary manner. In cases of uncertain solvency or significant credit risk, a fiscal backstop is necessary to reduce risks to the central bank balance sheet (IMF 2023a).[16]

39. Asset purchases should also follow sound principles to be effective. They should be initiated by the central bank rather than by the Treasury or other branches of government. They should be made in the secondary market, ensure market neutrality (to reduce the risk of price distortions), and be accompanied by clear communication about their objectives and rationale. A fiscal backstop is also needed because purchasing risky assets could generate losses and compromise central bank solvency (Adrian and others 2021).

40. Market-wide lending to financial institutions generally presents several advantages over asset purchases. First, secured lending for financial stability purposes is a common central bank tool, reducing the risk of misperception about the monetary policy stance when deployed. Second, lending operations have fewer balance sheet implications as central banks do not have to bear the market risk of holding assets and can apply haircuts to limit counterparty risk. Finally, as lending operations can be directed to particular market segments experiencing stress, they can be more targeted than asset purchases in relieving these stresses, while also reducing moral hazard (Hauser 2023, IMF 2023a).

41. Some central bank liquidity tools are more likely than others to allow for separation of price stability and financial stability objectives depending on their impact on aggregate liquidity conditions. The assurance that liquidity will be supplied elastically—through overnight facilities and long-term lending—may be enough to assuage market pressures without the need for large-scale liquidity injections. Frameworks that allow for contingent targeted asset purchases (for example, the European Central Bank's Outright Monetary Transactions and Transmission Protection Instrument) can work in a similar way: the implicit liquidity insurance may reduce or obviate the need for actual purchases, so that these frameworks do not affect the monetary policy stance (Annex 1). In contrast, unsterilized operations such as large-scale asset purchases and broad liquidity injections through repos could significantly impact the yield curve, jeopardizing separation. These operations need to be swiftly unwound, with clear ex ante communication, to limit their effects on inflation and inflation expectations.[17] In fact, large-scale asset purchases have been used by major central banks in the post-GFC era to ease the stance of monetary policy with the explicit goal of bringing inflation back to target. In contrast, asset purchases for financial stability goals should be limited in time and explicitly distinguish these goals from price stability goals (Adrian and others 2024).

[15] The pricing should be high enough to discourage borrowing from central banks in normal times but not high enough to deter its use during periods of stress.

[16] Fiscal backstops are also instrumental to achieve separation as inflation expectations might rise following risky central bank lending operations in their absence.

[17] In this respect, the BoE's commitment to a temporary intervention during the 2022 UK liability-driven investment crisis (the gilt purchases were fully unwound only three months after the end of the intervention), and the targeted nature of the intervention were critical to successfully manage the price stability-financial stability trade-off (BoE 2023; Bandera and Stevens 2024).

B. Challenges and Costs Associated with Central Bank Liquidity Tools

42. Lending operations and asset purchases come with short-term costs and challenges. Even when following the above-mentioned principles, some immediate practical issues may arise, especially when financial stress is heightened, and liquidity provision is not standard:

- **Determination of solvency.** Central banks should lend only to institutions that are financially sound, but policymakers may struggle to establish compliance with prudential requirements (notably solvency requirements) in times of heightened financial stress. In the context of ELA, an additional difficulty is that solvency should be assessed on a forward-looking basis.[18]
- **Collateral availability.** The central bank may find itself unable to extend sufficient funding due to the inadequacy of eligible collateral held by potential beneficiaries.[19]
- **Stigma.** Although borrowing from standing facilities is an integral part of central banks' monetary policy operational framework in many jurisdictions, discount window borrowing can carry a stigma because of associated perceived financial weakness (Aramonte, Schrimpf, and Shin 2022). For example, US market rates rose well above the Federal Reserve facilities' interest rates during 2007–08, indicating reluctance to access these facilities (Cecchetti and Disyatat 2010). Emergency Liquidity Assistance can entail stigma because it comes with conditions, enhanced supervision, and additional scrutiny.
- **Calibration and targeting**. High uncertainty during stress periods can complicate the choice of tools and the right amount of liquidity provision, especially in case of persistent inflationary pressures.

43. Medium-term costs or adverse side effects may also discourage large central bank interventions:

- **Moral hazard**. The expectation of generous central bank liquidity provision during stress episodes can incentivize risk-taking, a key concern for policymakers (Goodhart 2007, Schwartz 1992); even if lending at a penalty rate, coupled with liquidity requirements that imposes a degree of self-insurance should encourage financial institutions to maintain enough liquidity (Mishkin 2007).[20]
- **Risks to central banks' balance sheets.** Lending against lower-quality collateral or purchases of risky assets exposes central banks to financial losses while lending to less well-supervised entities increases counterparty risk, requiring relatively more conservative haircuts.
- **Lower market liquidity and asset prices distortion.** Large-scale asset purchases by central banks can reduce market liquidity by removing assets from the market (Aldridge, Cimon, and Vala 2023; Boneva, Islami, and Schlepper 2021) and persistently distort risk premiums (Steeley 2015, Barbon and Gianinazzi 2019).

[18] Doubts about a bank's solvency and viability should not preclude the provision of Emergency Liquidity Assistance by the central bank. Countries' Emergency Liquidity Assistance frameworks should, however, outline the specific circumstances in which indemnification by the Treasury may be needed and ensure that the process for obtaining such indemnification is formally established.

[19] To mitigate this issue, the central bank should assess potential liquidity demand and scrutinize the assets present on the balance sheets of eligible institutions. Pre-positioning of collateral could facilitate the mobilization of illiquid assets and enable precise calibration of haircuts. A pivotal consideration remains whether pre-positioning ought to be compulsory during normal times to circumvent underinsurance, alongside its harmonization with other prudential regulations, including the Liquidity Coverage Ratio. The central bank could also expand the scope of eligible collateral (as done, for example, during the GFC), although this may entail some risks for its balance sheet.

[20] In addition, beyond a specified threshold of reliance on central bank lending, beneficiary institutions ought to adhere to a funding plan incorporating conditions that directly govern their risk policy and bolster the repayment of loans received from the central bank.

- **Difficulty ending and unwinding interventions.** Ending an intervention may raise concerns about "cliff edge" effects and too fast or premature unwinding could lead to a resumption of stress.[21] Central banks may face political pressures to continue support despite lacking a good financial stability reason to do so. Well-designed liquidity programs should therefore be "self-liquidating" as stress abates.

C. Challenges Specific to Lending to NBFI Entities[22]

44. The NBFI sector is comprised of a diverse universe of institutions of growing importance globally with a heterogenous regulatory framework across different types of entities. The NBFI share of global financial assets was about 49 percent at the end of 2023 (FSB 2024a). A distinguishing feature of NBFI entities is the absence of deposit contracts, which is why they generally do not have access to liquidity backstops by the central bank or deposit insurer. Entities in the NBFI ecosystem include insurance companies, pension funds, open-ended investment funds, private equity funds, and hedge funds, as well as intermediaries performing more bank-like functions such as private credit firms, finance companies, and some financial technology firms. There are also key capital market intermediaries such as nonbank broker dealers and financial market infrastructures, including clearing and settlement corporations, and payment systems. The regulatory framework for NBFI entities is highly heterogenous across entities and countries. Insurance companies have strong prudential frameworks in most jurisdictions, are subject to consolidated supervision, and have extensive disclosure requirements. Capital market institutions are generally subject to investor protection rules, prudential rules, and disclosure requirements.[23]

45. Where segments of the NBFI sector are systemic, central banks may be confronted with the need to consider providing liquidity to them in case of heightened stress. NBFI can be a source of or an amplifier of financial stress with broader consequences to the economy (IMF 2023a). For example, the demand for liquidity by various types of UK NBFI entities, including insurance companies, pension funds, and open-ended funds, surged and destabilized markets during the March 2020 "dash for cash" and the September 2022 LDI crisis (Czech and others 2021, Hauser 2023). In both situations, central bank tools for lending to banks were insufficient to stabilize the financial system because banks did not (or could not) on-lend to NBFI relevant entities in sufficient amounts, requiring the BoE to improve liquidity in the gilt market

[21] For example, markets became increasingly anxious about the possibility of a major sell-off ahead of the end date of the BoE's gilts purchase program in late 2022 (Chen and Kemp 2023).

[22] This section does not aim to be a comprehensive analysis of the nonbank financial intermediation (NBFI) ecosystem and acknowledges the fact that risks from NBFI can vary widely and have different implications for financial stability; therefore, the regulatory and supervisory approaches to these are often necessarily different than that of banks. This section only intends to highlight some issues that could be relevant when considering whether and how central banks should lend beyond the banking system.

[23] NBFI entities should not be confused with the off-balance sheet entities of banks that were set up in the run-up to the GFC—generally referred to as "shadow banks"—which were oftentimes explicitly motivated by regulatory arbitrage activities by banks. Banking regulation, banking resolution regimes, and accounting rule changes have generally prohibited such bank regulatory arbitrage activities, though banking regulators globally continue to monitor banking activities in nonbank financial intermediation closely.

through asset purchases. This suggests that, in some jurisdictions, being able to target some NBFI segments could be considered to address system-wide liquidity needs.[24]

46. However, additional specific challenges arise when trying lending to relevant NBFI entities. These challenges include the following:

- **Large number and heterogeneity**. A range of entities is carrying out activities in the NBFI ecosystem with very different business models compared to banks; the way in which risks from NBFI can impact the broader financial system are also very different across business models and often the risk stems from activities and their interconnectedness with the broader financial system and not from individual entities. This makes liquidity provision to NBFI entities much more daunting.
- **Generally, less intrusive prudential regulation and supervision** particularly in light of their rapid growth and systemic importance. Work is ongoing to enhance their resilience (FSB 2022).
- **Data gaps.** Despite priority given by global regulatory bodies to data collection about NBFI activities and improvements in this area, significant data gaps remain that hinder the assessment and monitoring of their vulnerabilities (IMF 2023a). Direct measures of interconnectedness among NBFI entities are difficult to collect while indirect measures (such as common exposures) are seldom available.
- **Greater difficulty in determining solvency.** Some types of entities in the NBFI ecosystem hold illiquid and hard-to-value assets (ranging from loans to small and medium-sized enterprises to crypto assets). This can blur the distinction between liquidity and solvency during period of stress.
- **Greater risk of moral hazard.** Some nonbanks' business models (for example, hedge funds) involve a high degree of risk taking. Central bank liquidity support could weaken market discipline, encourage greater risk taking due to explicit or implicit guarantees of support and incentivize regulatory arbitrage.

47. As challenges in lending to relevant entities within the NBFI ecosystem can intensify the financial stability risks associated with monetary tightening and make separation more difficult to achieve in practice, policy attention is needed in the following areas:

- **Closing data gaps while enhancing monitoring, supervision, and regulation**. Developing best practices on the collection, use, and sharing of data on nonbanks can improve the effectiveness of their supervision (FSB 2024b).[25] Adequate data coverage would help financial supervisors mitigate NBFI vulnerabilities and would enable central banks to maximize the effectiveness of their policy support.
- **Close coordination among regulatory and supervisory bodies.** As in the case of banks, clear division of labor and cooperation between the central bank, relevant regulatory and supervisory bodies,

[24] Entities carrying out activities in the NBFI ecosystem do not typically have accounts with the central banks. For example, many countries have a financing wall between broker-dealer subsidiaries and commercial bank subsidiaries prohibiting the broker-dealer from accessing central bank backstop liquidity. More fundamentally, central banks' legal authority to provide liquidity support to NBFI entities is uneven across jurisdictions. At the same time, frameworks for direct lending to some entities have started to evolve as central banks recognize NBFIs' important role in systemwide liquidity transformation. Chile passed a law in 2023 to allow provision of emergency liquidity to central counterparties (BCC 2023). In January 2025, the BoE opened the Contingent Non-Bank Financial Institution Repo Facility for applications. This new facility, which will be activated only during episodes of severe gilt market dysfunction, will lend to participating insurance companies, pension schemes, and liability-driven investment funds (BoE 2025). The South African Reserve Bank is considering introducing an NBFI repo facility during times of stress or market dysfunction (SARB 2024). The European Central Bank is exploring the potential benefits of offering liquidity to some nonbanks such as life insurers and pension funds (Wilkes 2024). Lending facilities allow the Federal Reserve to lend to nonbank financial institutions provided that the lending facilities are market wide arrangements, and do not specifically target individual financial institutions (Section 13(3) in the Federal Reserve Act).

[25] IMF (2017) and IMF (2019) provide guidance on best practices for collection, compilation, and dissemination of NBFIs' data.

and the treasury is essential for swift and effective policy intervention. This approach can also protect the central bank from political pressure (Dobler and others 2016) while improving the preemptive identification of risks (IMF 2023a). Cross-border cooperation is also needed given NBFI global interconnectedness.

- **Strengthening or developing the operational framework for lending to well-regulated and systemic NBFI segments.** Central banks should work on their operational readiness to lend to these intermediaries once pre-conditions for such lending operations, including adequate data and a comprehensive supervisory and regulatory framework, are met. This includes assessment of the availability of highly liquid collateral.

Challenges in Deploying Other Policy Tools

48. Given that the scope of the central bank toolkit is limited, other tools can play a crucial role in reducing financial stress; however, there can be significant challenges in deploying them.[26]

A. Prudential Policy

49. A strong prudential policy framework can lower the risk that monetary policy tightening results in significant financial stress, and thus improve the trade-offs facing policymakers. These tools can help reduce vulnerabilities and increase resilience to shocks (IMF 2014a, 2015). Indeed, the progressive strengthening of prudential frameworks following the GFC helped financial systems in both advanced economies and emerging market economies better withstand the effects of sharp policy hikes during 2021–23, and helped account for why emerging market economies did not experience the capital outflows that were widely feared.

50. In the event that financial conditions tighten markedly, using prudential tools, including macroprudential measures, can help reduce financial stress at the margin by limiting deleveraging pressures. Moreover, such relaxation can lower the risk of an adverse feedback loop between financial intermediaries' balance sheets, credit availability, and asset prices from fire sales.[27] The principles for and effectiveness of use will in general differ depending on the type of tool:

- **Capital-related tools:** Releasable capital tools, such as broad-based countercyclical capital buffers, systemic risk buffers, and sectoral buffers, can be used in periods of stress to increase capital headroom above minimum requirements and support the continued provision of credit to the economy.
- **Liquidity-related measures:** Liquidity-related tools, such as releasable reserves requirements, can be relaxed to relieve liquidity stress, avoid fire sales, and help meet systemwide redemption pressures. Also, consistent with international standards, banks may use their liquidity buffers in times of stress.

51. Yet macroprudential policy faces several challenges that may hinder their contribution to a full separation of price and financial stability objectives. Beyond inherent difficulties in calibrating policy, these challenges include:

[26] Stress tests can also play a useful role as a crisis management tool. For instance, the 2009 Supervisory Capital Assessment Program in the United States helped reduce informational asymmetries and restore public confidence in the financial system. They also helped calibrate the capital injections needed to ensure capital adequacy in 19 large bank-holding companies.

[27] At the same time, the relaxation of macroprudential measures needs to maintain confidence by ensuring resilience against future shocks. This intertemporal trade-off can depend on the size of available buffers (IMF 2014a).

- **Regulatory gap, leakages, and asset substitution:** An incomplete regulatory perimeter, leakages, and asset substitution can reduce the effectiveness of macroprudential measures. Leakages can occur through credit supply by domestic NBFI entities or cross-border entities not subject to the policy measures (IMF 2014a). Asset substitution (risk-shifting effects) can also happen when banks try to maintain the same level of risk exposure as before measures were introduced (Biljanovska and others 2023).
- **Fear of market stigma.** When buffers are not explicitly released, stigma can make banks reluctant to use them (Saporta 2022).

52. To address these challenges and make macroprudential policy more effective, a strong policy framework is essential. First, the macroprudential authority should have the willingness and ability to act, while ensuring good coordination between macroprudential and monetary policy (IMF 2014a). Second, the macroprudential policy perimeter should be expanded to include areas of the NBFI ecosystem that could have a systemic impact. Third, cross-border regulatory arbitrage should be addressed through enhanced international cooperation across standard setting bodies to develop comprehensive and globally consistent measures (IMF 2023a).

B. Resolution Framework

53. An effective resolution regime is critical for reducing the risk that institution-specific liquidity or solvency problems morph into systemic problems that threaten the financial system, and hence helps improve the trade-offs associated with tightening monetary policy. Strong resolution frameworks reduce contagion risks and help maintain confidence in the payments and financial systems.

54. Although progress has been achieved since the GFC, resolution authorities still face several challenges. The international resolution framework established following the GFC aims to ensure financial stability while minimizing the costs to taxpayers, so that shareholders and unsecured and uninsured creditors absorb losses (or are "bailed-in") in a manner respecting the hierarchy of claims in liquidation without undermining financial stability or exposing taxpayers to loss (Dobler, Moretti, and Piris Chavarri 2020, FSB 2024c).[28] This process presents complexities that are recognized by international policymakers and need to be carefully addressed.

- **Resolution of systemic institutions.** The US 2023 regional bank crisis showed that it is not always feasible to gauge in advance which financial institutions can turn systemic at times of stress. Therefore, crisis preparedness needs to target the entire banking sector, on a proportional basis, to ensure that any bank that may turn systemic has adequate recovery and resolution planning (Adrian 2024).
- **Fiscal support in exceptional circumstances.** When faced with a crisis, policymakers may need to balance acute risks to financial stability—including from adverse spillovers from bail-ins—against the moral hazard and fiscal costs of bailouts, and fiscal support may be needed in some circumstances (Dell'Ariccia and others 2018, Adrian and Dobler 2023). The recent experience of bank failures has shown that post-GFC reforms have improved the terms of this tension but have not eliminated them. Fiscal resources may be needed to address systemic risks when imposing extensive losses on private stakeholders would cause severe spillovers, as seen when US authorities invoked the statutory systemic risk exception to protect uninsured depositors of two regional banks to avert contagion in March 2023. However, the use of public funds should be the exception not the rule—justified as a last

[28] For an in-depth analysis and discussion of resolution, see Dell'Ariccia and others (2018) and Dobler, Moretti, and Piris Chavarri (2020).

resort, exclusively when financial stability is gravely threatened, and structured to mitigate the associated costs. They should occur only alongside loss sharing with private stakeholders of the troubled bank and time-bound restructuring plans that address the underlying weaknesses and help restore the bank's long-term viability.

- **Full operationalization of the resolution toolkit.** FSB (2023) underscored the need to operationalize a range of resolution options, including the transfer and sale of business tools alone or combined with bail-in. It also stressed the importance of establishing public sector (backstop) funding mechanisms to support bank resolution; building banks' capital buffers in resolution, on its own, may not restore creditors' confidence.
- **NBFI resolution.** Resolution regimes for some relevant entities within the NBFI ecosystem are inexistent or underdeveloped (compared to banks) in many jurisdictions (IMF 2023a).
- **Cross-border issues.** Resolving multinational financial institutions can be more complicated due to gaps in information sharing among financial authorities in different jurisdictions and additional legal complexity.

55. Continuing to address these challenges will help further strengthen resolution frameworks. Adrian (2024) and Adrian and Dobler (2024) discuss how to set course for the remaining ground to be covered.

C. Fiscal Policy

56. Despite strong regulation, supervision, and resolution frameworks, fiscal interventions may still be necessary during acute financial stress episodes.[29] Fiscal support may be needed for direct interventions (including to support systemic NBFI segments under some circumstances), to backstop unconventional policy actions by central banks, and to help avoid systemic financial crises.

57. Fiscal space is critical to conduct these actions and to bolster market confidence. Purchasing troubled assets, injecting equity, and providing loans or subordinated debt often require issuing new public debt, putting government solvency at risk if fiscal space is limited, adding a new source of financial instability. These operations also expose governments to valuation risk and credit risk. Government guarantees can be costly if called (Battersby and others 2022).[30]

58. In evaluating whether to provide fiscal support, the authorities must weigh how their actions erode fiscal space—and hence their future capacity to act—as well as take account of other risks of using fiscal tools. These risks include the following:

- **Long-lasting effects and footprint.** Larger government interventions can distort private sector decision-making in the long term, for example by affecting asset prices. Divesting financial sector holdings acquired during a crisis can take years (Dell'Ariccia and others 2022)

[29] To ensure operational preparedness, the principles and procedures for responding to financial stress should be agreed among all relevant authorities—including the fiscal authority, the central bank, financial sector supervisors, and the resolution authorities—in normal times. Such arrangements, typically formalized through memoranda of understanding, facilitate coordination, delineate responsibilities, and promote the sharing of confidential information (Dobler and others 2016; Dobler, Moretti, and Piris Chavarri 2020).

[30] The sizeable guarantees (about 25 percent of GDP) provided by the Swiss government during the acquisition of Credit Suisse by UBS illustrates how significant contingent liabilities can be (Adrian and Dobler 2024).

- **Public ownership and oversight issues.** The ownership and the oversight of financial institutions present governance and risk management challenges for which the government may be ill equipped.
- **Deployment complexity.** Defining eligibility criteria and financial terms for these tools may be difficult if governments lack adequate financial sector expertise.

59. These challenges necessitate adherence to sound principles when deploying fiscal tools. Fiscal tools should only be deployed to provide backstop to central bank liquidity provision (as discussed in earlier) or to avert a systemic financial crisis. If fiscal support is provided, the associated fiscal costs and contingent liabilities should be costed, monitored, and recorded in fiscal accounts. Furthermore, countries should regularly publish a statement of fiscal risks that includes updates of government interventions to ensure transparency (Everaert and others 2009, IMF 2009).[31] Sound fiscal policies are also essential to build buffers in normal times.

Additional Challenges for Some Emerging Market and Small Open Economies

60. Some country characteristics, more prevalent in emerging market and small open economies, can intensify the trade-offs between price and financial stability. These include the following:

- **Low central bank credibility.** This characteristic often stems from a lack of monetary policy independence, which increases the likelihood of government debt monetization. It results in poorly anchored inflation expectations, fueling inflation and weakening the transmission of monetary policy to inflation. Central bank liquidity interventions can also worsen inflationary pressures if market participants perceive that these actions are taken under pressure from the government (Bianchi and Melosi 2022).
- **Exposure to exchange rate risk.** High foreign currency debt on borrowers' balance sheets, exacerbated by currency mismatches on banks' balance sheets, can lead to increased default rates and losses for intermediaries after significant depreciation in the domestic currency. Such events can be triggered by a run on the currency, when elevated liquidity and solvency stresses are present in the local financial sector and investors lack confidence in policymakers' ability to contain these stresses.
- **Limited fiscal space**. Countries with inefficient spending or inadequate tax revenue collection have more limited fiscal space. Countries with such weak fiscal structures combined with fragile financial systems can suffer from debt intolerance (Reinhart and others 2003) further limiting their capacity to borrow to cope with shocks or provide fiscal backstops.

61. Central banks with low credibility have little room to alter the interest rate path to contain financial stress and may need to tighten more aggressively to address inflationary pressures and signal their commitment to price stability.[32] Although broad-based liquidity and solvency support could be deployed to address financial stress, their effectiveness may be limited by factors such as limited fiscal space. For instance, when liquidity provision tools are used without credible fiscal backstops or clear time bounds, they may lead to de-anchoring inflation expectations and worsen price and financial stability trade-

[31] Fiscal interventions also need to be adequately unwound. Battersby and others (2022) analyze the process and conditions of gradually unwinding fiscal interventions. Their analysis also describes the potential risks associated with the exit strategy, which, if mismanaged, could exacerbate the risks that the fiscal interventions were originally designed to mitigate.

[32] See Cole, Martinez-Garcia, and Sims (2023).

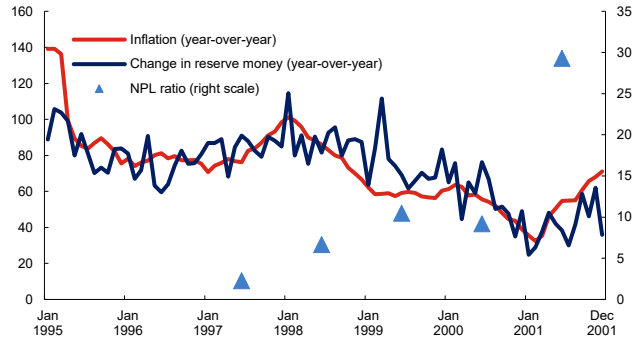
offs. A relevant example is the Colombian government's recapitalization of financial institutions in the 1980s. These largely unfunded liquidity injections contributed to high inflation during that period (see Annex 1).

62. In countries with significant exposure to exchange rate changes, central banks have less room to deviate from the price stability objective. Adopting a more accommodative policy stance during a global tightening cycle may lead to capital outflows, which could trigger a large depreciation if foreign exchange markets are shallow. This poses a significant risk for borrowers with large unhedged foreign currency liabilities, as a domestic currency depreciation increases their debt service burden.[33] The increased financial fragility can lead to lower investment and output (Kalemli-Özcan, Kamil, and Villegas-Sanchez 2016; Alfaro and others 2019). The depreciation also reduces collateral prices and tightens borrowing constraints, further exacerbating financial stress (Bianchi and Mendoza 2020). Hence, policymakers have a strong incentive to avoid a large depreciation by maintaining a monetary policy stance in line with hard currency economies.

63. In countries with limited fiscal space, some tools for containing financial stress may not be effective and could even exacerbate inflationary pressures. Policymakers with limited fiscal backstops may have to fund their lending operations, asset purchases, or expansion of deposit with monetary financing that could worsen inflationary pressures.[34] For example, during the 2000–01 financial crisis in Türkiye, the government recapitalized insolvent state-owned banks with debt securities purchased by the central bank (see Annex 1). The resulting monetary expansion, along with a sharp depreciation of the lira, led to a resurgence of inflation (Figure 5). Limited fiscal space makes separation less feasible.

64. In some emerging market and developing economies, all three challenges likely coexist, significantly curtailing central banks' ability to navigate price and financial stability trade-offs. On the one hand, pursuing a tight monetary policy stance to address inflationary pressures would exacerbate financial stress and potentially trigger capital flight if investors anticipate a large financial crisis. On the other hand, pursuing a less aggressive policy stance could potentially undermine central banks' credibility toward maintaining a nominal anchor. Maintaining a more accommodative policy stance relative to other hard currency economies could also lead to capital outflows and trigger a depreciation, worsening domestic financial conditions. Finally, the lack of fiscal space also limits the use of alternative policy tools to address financial stress. This dilemma was evident when Brazil embarked on the Real Plan in 1994, which successfully brought hyperinflation under control

Figure 5. Türkiye: Selected Macrofinancial Indicators, 1995m1–2001m12
(Percent)



Sources: Ari, Chen, and Ratnovski (2019); Bloomberg Finance L.P.; and Haver Analytics.
Note: NPL = nonperforming loan.

[33] This trade-off was at the center of the debate between Stanley Fischer and Joseph Stiglitz on the appropriate interest rate policy during the Indonesia crisis of 1997–98. Fischer advocated for raising interest rates to stabilize the exchange rate and restore investors' confidence, while Stiglitz criticized this approach, arguing that high interest rates would exacerbate economic instability, increase bankruptcies, and amplify financial stress (Fisher 1998, Stiglitz 1999).

[34] In addition, central banks could also be concerned about balance sheet losses and may not want to sterilize the increase in the money supply implied by liquidity operations through remunerated reserves because they have a quasi-fiscal cost. Although central banks could in principle increase unremunerated reserves requirements to sterilize the increase in the money supply, such unremunerated reserves could exacerbate financial stress by reducing bank profitability.

through sharp interest rate hikes and a tightening of reserve requirements. However, the rapid disinflation came at the cost of bank profitability and led to the liquidation of many institutions (Annex 1).

65. Given the additional challenges, tools such as FXIs, MPMs, and CFMs may be necessary to provide monetary policy with more scope to address inflationary pressures. These instruments have proven helpful in the context of external financial and real shocks, such as capital flow reversals, currency depreciation, and commodity price increases (IMF 2012b, 2017, 2020, 2022, 2023c) and their use can be guided by the Integrated Policy Framework and the following considerations:[35]

- **FXIs.** When financial stress is modest to moderate, FXIs can be deployed in shallow or temporarily illiquid FX markets to counteract cyclical depreciation pressures and alleviate the burden of unhedged FX liabilities. The use of FXIs during periods of heightened systemic stress or a full-fledged financial crisis is likely to be insufficient given the scale of intervention required.
- **MPMs.** During times of heightened stress when depreciation risks are high, releasing capital buffers can help absorb the losses and maintain banks' lending capacity. Relaxing reserve requirements on FX deposits can mitigate liquidity stresses arising in FX markets, but the effects of excess liquidity on money supply should be sterilized to avoid worsening inflation.
- **CFMs.** In crises or panics, tightening of outflow CFMs could be desirable. This is particularly true when the shocks provoking crises or panics are large and persistent, increasing the risk of depleting the country's international reserves (IMF 2012). For example, in the wake of the GFC, Iceland imposed restrictions on outflows of foreign currency that helped limit the extent of the financial panic. CFMs are less applicable when financial stress is modest to moderate, given their potential costs.

66. However, the use of these tools requires careful calibration given their potential limitations and costs. If reserves are insufficient and the level of the exchange rate is deemed unsustainable, FXIs may amplify speculative attacks on the currency (IMF 2023c). Outflow CFMs may not be fully effective in stabilizing capital flows since some degree of circumvention can be expected. Their use also entails long-term economic and reputation costs (Chang, Fernandez, and Martinez 2024). As such, these tools should be used only when financial stress is systemic (and outflow CFMs only in crisis or near crisis). They should also be temporary and lifted once confidence in the country's macroeconomic and financial stability is restored. The use of these tools should be a part of a broader policy framework and should not prevent the warranted adjustment of macroeconomic policies to address the drivers of the systemic run on the currency.

67. A strong international safety net is also vital to addressing financial stability issues, particularly when domestic policy tools are constrained. Foreign currency swap lines and international lender of last resort facilities provide liquidity to domestic central banks, allowing them to lend to domestic financial intermediaries to meet their short-term foreign currency financial obligations. International swap lines can also help lower borrowing costs and alleviate financial stress (Bahaj and Reis 2022). Moreover, these tools can enhance the credibility of FXIs, reducing the risk of a run against the local currency.

[35] Although the vulnerabilities discussed here overlap with those considered in the Integrated Policy Framework, this Staff Discussion Note considers a scenario of rising inflation, which previous analyses have not addressed. Typically, high inflation entails a monetary policy tightening that is likely to lead to capital inflows and an appreciation of the currency. However, more extreme scenarios such as the heightened risk of systemic runs and financial crisis share elements of the external risk-off shock in the Integrated Policy Framework, such as outflow of capital and depreciation of the currency.

Conclusions

68. Trade-offs between price and financial stability can occur when inflation is above target and financial stress is rising. Although most episodes of monetary tightening in recent economic history have not led to financial stress, during future episodes, reining in inflation may require very tight monetary policy that could adversely affect financial markets and intermediaries and even run the risk of a full-fledged financial crisis. When financial stress is modest and not driven by solvency concerns, central banks can use their standard liquidity tools and lower their policy rate path without jeopardizing price stability in response to a tightening of financial conditions that puts downward pressure on aggregate demand. In this situation, there is no trade-off between price and financial stability. However, in case of more severe stress, allowing monetary policy to remain focused on its price stability objective requires deploying additional central bank tools such as long-term liquidity support and asset purchases.

69. Although central banks' liquidity tools can help alleviate financial stress, their scope is limited, and other policies may be necessary. These tools cannot address solvency issues. When private recapitalization options are unavailable or insufficient, other instruments in the resolution toolkit can be activated, and governments can provide needed solvency support in extreme cases. Moreover, macroprudential policy can be relaxed to help soften the impact of the stress on the economy.

70. However, challenges related to these tools can reduce the scope for separation between price and financial stability. These include difficulties in calibrating, implementing, and unwinding nonstandard central bank policy interventions. In addition, their interventions can have significant side effects over the medium term such as moral hazard and risks to central bank balance sheets. Lending to NBFI entities can represent a particularly formidable challenge. Despite progress since the GFC, resolution frameworks still have gaps and can face operational problems. Fiscal support implies an immediate increase in fiscal risks and public debt, which lack of fiscal space may not allow, and also raises concerns about moral hazard and governance issues over the medium term. Macroprudential policy may not be able to target all sources of systemic risk ex ante or may suffer from a lack of releasable buffers.

71. When these limitations are significant, monetary policymakers should consider financial stability risks and may allow for a more gradual disinflation path to avoid adverse events. This is consistent with de jure or de facto flexible inflation targeting regimes with dual price and output stability objectives. In times of financial stress, when downside risks to activity are significant, these risks should play a bigger role in the policy reaction function. The extent to which central banks make full use of such flexibility and therefore allow for a delayed return to the inflation target should depend on the financial system's vulnerabilities, the likelihood that a tighter policy stance would trigger a crisis and the cost of other tools.

72. This flexible approach makes clear communications critical to keep medium-term inflation expectations well anchored and allow for an effective defense of financial stability. When incorporating financial stability considerations in setting the policy rate, the central bank may risk being perceived as abandoning its medium-term price stability objective while inflation is still running high, leading to de-anchoring of inflation expectations. This would result in higher long-term rates and premiums, potentially jeopardizing the policy's beneficial effects on financial stability. To avoid this, policymakers should clearly state their commitment to price stability, explaining that any deviations are temporary and due to exceptional financial vulnerabilities and the large associated downside risks to growth.

73. Significant efforts should also be made to lower the barriers to achieving separation. A strong prudential policy and supervisory frameworks with adequate capital and liquidity buffers (ideally in place before stress emerges to reduce vulnerabilities and increase resilience) are critical for limiting the financial stability risks associated with monetary tightening, and hence for achieving separation (and for containing

potential moral hazard effects stemming from a perceived "central bank put").[36] In addition to robust frameworks for resolution and financial safety nets, sound fiscal policies are essential to build fiscal buffers in normal times and ensure that the authorities have the capacity to act when needed. Enhanced regulatory and supervisory frameworks for nonbanks are a precondition for central banks to be able and willing to provide liquidity support to such intermediaries in situations of heightened stress in a way that keeps the risks to central banks contained and minimizes political economy risks ("picking winners and losers"). Once this precondition is met, central banks should contemplate expanding their toolkit to be able to lend to these entities.

74. Countries with low central bank credibility, large exposures to exchange rate changes, and restricted fiscal space face additional challenges to navigate the trade-offs. Where financial stress could lead to capital outflows and a large currency depreciation, foreign exchange interventions, macroprudential policy measures, and capital flow management measures as well as international liquidity tools may improve trade-offs. Foreign exchange interventions and capital flow management measures require careful calibration given their potential limitations and costs.

[36] In particular, banks should hold capital against interest rate risk in the banking book.

Annex 1. Tensions between Price and Financial Stability: Some Historical Episodes

1. Since the early 1970s several episodes have highlighted how monetary tightening can interact with financial vulnerabilities, creating tensions between price stability and financial stability. A few notable examples from the United States and other economies are described below.

Examples from the United States

2. The Savings and Loan (S&L) crisis in the 1980s illustrates how banking sector financial vulnerabilities can be exacerbated by monetary tightening. The S&L associations, already weakened by their lack of diversification and large maturity gaps, faced severed challenges when monetary policy was tightened in 1979 and early 1980 in response to high inflation following the oil crisis of 1979. Higher interest rates caused major deposit outflows from S&Ls due to Regulation Q's ceiling on deposit rates. This action exacerbated the financial deterioration of S&Ls, reducing their market share in new mortgage loans from 50 percent during the 1970s to 26 percent during the first quarter of 1981 (Laughlin 1991). The US Congress phased out Regulation Q to help S&Ls compete with commercial banks for deposits. However, as S&Ls responded by increasing rates on deposits to attract new funds, their net interest margins were squeezed and 80 percent of them recorded losses in 1981 (Shoven, Smart, and Waldfogel 1992). Regulatory forbearance measures (such as the reduction in capital standards) did not suffice to shore up their profitability, given the Federal Reserve's protracted monetary policy tightening. The federal funds effective rate peaked in mid-1982 when inflation was firmly on a downward path. Price stability was restored, but the S&L industry was particularly affected with the sector recording negative equity by mid-1982. Extended forbearance measures combined with creative accounting techniques just delayed the resolution of the banks. The S&L crisis finally ended in the late 1980s through consolidation, restructuring, and liquidation (about 747 S&L banks were closed), costing $124 billion to taxpayers (Federal Reserve History 2023).

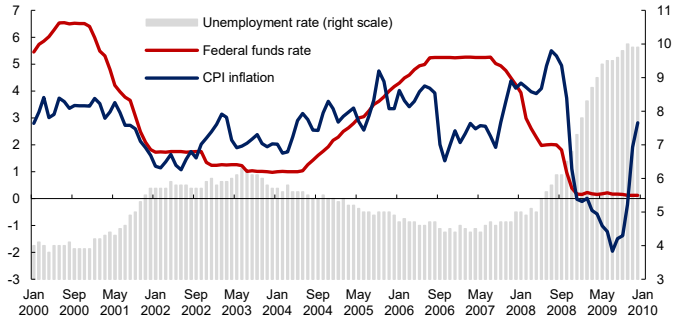
3. The bailout of Continental Illinois National Bank and Trust Company averted a systemic crisis during the monetary policy tightening cycle of 1983–84 and allowed the Federal Reserve to focus on its price stability objective. To cool down the economy, the federal funds rate was increased by 3 percentage points from mid-1983 and reached 11.5 percent in mid-1984. This aggressive tightening severely impacted Continental Illinois, the seventh-largest commercial bank as measured by deposits. The bank was heavily reliant on short-term wholesale funding and significantly exposed to the oil and gas industry, which was particularly affected by the 1983–84 tightening cycle. Insolvent by May 1984, the bank was bailed out to avoid a run on the entire banking system given its size and its strong interconnectedness with other banks. The Federal Deposit Insurance Corporation (FDIC) approved an injection of $1.5 billion in the form of subordinated debt. A group of 24 major US banks also provided a $5.5 billion line of credit, and the Federal Reserve committed to meeting any additional liquidity needs by the bank. Most importantly, the FDIC protected all depositors of the bank regardless of the $100,000 limit on deposit insurance prevailing at the time (FDIC 1997). These actions not only halted the run but also allowed the Federal Reserve to continue to increase interest rates—they peaked in September 1984—to contain inflationary pressures, enhancing the credibility of its commitment to low inflation (Ferguson 2023).

4. Preventing contagion from the failure of Long-Term Capital Management in 1998 required prioritizing financial stability over price stability temporarily. The Russian sovereign default in August 1998 triggered the collapse of the highly leveraged US hedge fund Long-Term Capital Management in

September 1998. To prevent a fire sale and major financial contagion, the Federal Reserve did not directly provide liquidity but organized a consortium of financial institutions that provided $3.6 billion in new equity to ensure an orderly unwinding of a major NBFI. In addition, it cut the federal funds rate from 5.5 percent to 5.3 percent in September 1998 in response to the event despite an economic boom (Mishkin and White 2014). Real GDP growth averaged 4.4 percent (year over year) during the first three-quarters of 1998 and 4.9 percent in 1998Q4. The Federal Reserve further cut the policy rate to 4.8 percent in November 1998 to ease financial conditions despite the still strong economy. The Federal Reserve did not quickly reverse the rate cuts even after global financial markets had stabilized. Consumer price index inflation rose from 1.5 percent in September 1998 to 2.3 percent in April 1999, and reached 3 percent in early 2000.

5. The Federal Reserve's aggressive easing cycle in the early stages of the GFC illustrates how central banks can deviate from their inflation fighting stance to cope with heightened financial stress and associated downside risks to growth. In one of its longest tightening cycles, the Federal Open Market Committee (FOMC) raised the federal funds rate from 1 percent in June 2004 to 5.3 percent in July 2007 in response to strong activity and rising inflation against the backdrop of a strong housing market (Annex Figure 1.1). FOMC statements and minutes suggest that inflationary pressures remained the FOMC's main concern until early August 2007. However, following French bank BNP Paribas's announcement on August 9 that it would stop redeeming shares in its three investment funds with exposures to the US asset-backed securities, global financial markets entered into a turmoil, which led the FOMC to hold an emergency meeting on August 10.[1] The Federal Reserve declared its willingness to provide liquidity to facilitate the orderly functioning of financial markets but kept the policy rate unchanged amid persistent concerns about elevated inflation. The series of protracted interest rate hikes had cooled down the US housing market and had particularly affected its subprime segment, with the number of foreclosures increasing by threefold compared to its precrisis level. The turn in house prices affected financial institutions' balance sheets—through the channels described in the main text—generating turmoil in the US housing and financial markets. Therefore, in its scheduled meeting on September 18, 2007, the FOMC started reversing course and lowered the federal funds rate by 50 basis points to 4¾ percent even though inflationary pressures remained a concern. It cut the policy rate by an additional 25 basis points in its subsequent meeting at the end of October and judged that "after this action, the upside risks to inflation roughly balance the downside risks to growth." However, given the continued deterioration of financial conditions and a weakening economic outlook, the FOMC kept easing monetary policy aggressively in December 2007 and early 2008 despite persistently elevated inflation. As financial stress kept intensifying with the failure of investment bank Bear Stearns in March 2008, the FOMC introduced the Primary Dealer Credit Facility to improve the ability of primary dealers to provide financing to participants in securitization markets and increased the maturity of discount window loans from 30 to 90 days.

Annex Figure 1.1. United States: Policy Rate, Inflation, and Unemployment, 2000m1–2009m12
(Percent)



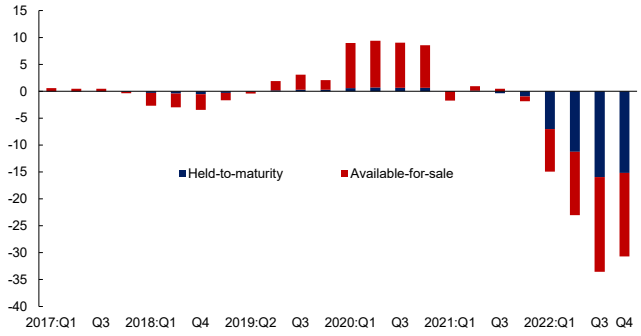
Sources: Federal Reserve Bank of St. Louis; and IMF staff calculations.
Note: CPI = Consumer Price Index.

[1] BNP Paribas's announcement is often considered to be the beginning of the GFC.

The continued deterioration in the economic outlook also prompted it to cut the federal funds rate target by a further 75 basis points to 2¼ percent in mid-March.[2]

6. The 2023 US regional bank crisis illustrates how rapid monetary tightening can expose banks with poor interest rate risk management and how central bank lending facilities and targeted deposit insurance measures can allow monetary policy to maintain its inflation fighting stance. From early 2022, the Federal Reserve embarked on a series of policy rate hikes to fight rising inflation due to the post-COVID-19 pandemic's supply-chain-related bottlenecks, the large fiscal stimulus, and higher global commodity prices. The federal funds rate increased by about 450 basis points by early March 2023. This series of fast and large rate hikes affected several US regional banks with fragile business models and significant shortcomings in interest rate risk and liquidity management (G30 Working Group on the 2023 Banking Crisis 2024). In particular, Silicon Valley Bank (SVB) was funded through large and uninsured deposits gathered during a period of low interest rates while investing in long-term securities. As the Federal Reserve tightened monetary policy, the bank experienced large losses in its long-dated investment securities portfolio when it was forced to sell part of it amidst large and fast deposit outflows (Annex Figure 1.2). SVB had not tested its capacity to borrow at the Federal Reserve's discount window and did not even have appropriate collateral arrangements (FRB 2023a). To avert massive contagion and halt the large outflows of deposits from many regional banks toward large banks (perceived as more stable) and money market mutual funds, SVB, and Signature Bank were placed under receivership, their deposits were fully guaranteed by the FDIC, the Federal Reserve created an emergency lending program for all US banks (the Bank Term Funding Program, backstopped by the US Treasury), and the Federal Home Loan Banks provided additional liquidity to banks. These interventions proved successful in preventing a general panic. As during the failure of the above-mentioned Continental Illinois, the Federal Reserve continued its policy tightening to contain inflationary pressures.

Annex Figure 1.2. SVB: Estimated Unrealized Gains/Losses on Securities Portfolio, 2017:Q1–2022:Q4
(Percent of total equity)



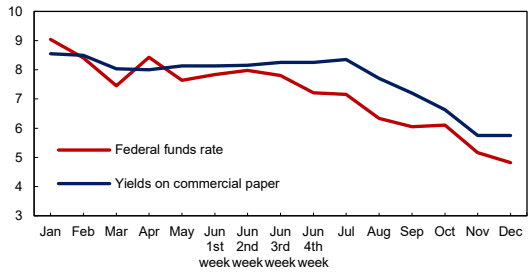
Sources: Federal Reserve Board; and IMF staff calculations.
Note: SVB = Silicon Valley Bank.

7. By contrast, the Penn Central bankruptcy in 1970 shows how price and financial stability objectives can align at times. Penn Central, a railroad company and major issuer of commercial paper with more than $84 million outstanding in debt, filed for bankruptcy on June 21, 1970. The failure led to a severe liquidity crisis in the commercial paper market. The total outstanding nonbank commercial paper fell by about 7 percent during the first week of the crisis. The expected increase in market interest rates because of flight to quality toward other money market investments could have aggravated the crisis (Brimmer 1989). To prevent the tightening of financial conditions amid a sharp recession and subdued inflation and to enable businesses to roll over their maturing commercial paper, the Federal Reserve decided to use its lender of last resort tools (Hayes 1971). Key measures included reducing nonpecuniary costs for borrowing from the discount window, removing Regulation Q ceiling on the interest rate of large-

[2] See Bernanke, Geithner, and Paulson (2020) for a comprehensive review of US policymakers' interventions during the GFC.

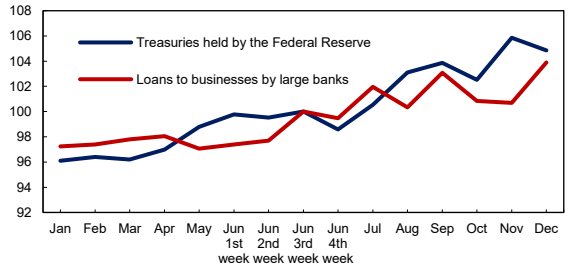
denominated certificates of deposits (CDs), and activating the use of the emergency lending under Section 13(3) of the Federal Reserve Act if needed. The liquidity provision worked well. Three weeks after this package of measures was announced, total borrowed reserves by commercial banks more than doubled given the extensive use of the discount window and large negotiable CDs at large commercial banks rose markedly given the relaxation of Regulation Q. These measures eased financial conditions and boosted loans to businesses (Annex Figures 1.3 and 1.4). The liquidity crisis was short-lived, and the Federal Reserve did not need to use Section 13(3).[3] However, the Federal Reserve's liquidity provision has been controversial. Schwartz (1992) argued that the discount window had been used as a scheme to bail-out insolvent institutions and should be closed. Others, however, have counterargued that problems arising from particular nonbank segments, such as the commercial paper freeze caused by the Penn Central failure, can justify the provision of liquidity through the discount window (Calomiris 1993).

Annex Figure 1.3 United States: Federal Funds Rate and Yields on Commercial Paper, 1970
(Percent)



Sources: Calomiris (1993); and IMF staff calculations.

Annex Figure 1.4 United States: Liquidity and Credit to the Economy, 1970
(Index, 3rd week of June = 100)



Sources: Calomiris (1993); and IMF staff calculations.

Examples from Other Economies

8. The early 1990s Nordic banking crises illustrate how monetary tightening to cool down an overheating economy can generate acute financial stress. These crises were preceded by monetary policy tightening as central banks in the region were fighting inflation (Blot and others 2023) amid overheating. Banks made huge losses at the peak of the crises. Loan losses—in percent of total loans—increased from 0.7 percent in 1987 to 6 percent in 1991 in Norway, from 0.5 percent in 1989 to 4.7 percent in 1992 in Finland, and from 0.3 percent in 1989 to 7 percent in 1992 in Sweden. Given the thin capitalization of banks at that time, such loan losses greatly impaired their financial positions (Drees and Pazarbasioglu 1998). A number of factors have been put forward to explain the banking crises. Among them, the economic boom in the run-up to the crises, financial deregulation that boosted domestic bank credit (Honkapohja 2009), the end of financial repression policies (Drees and Pazarbasioglu 1998), and restrictive monetary policy to defend the pegs to the European Currency Unit. The substantial monetary tightening—short term rates were far over double digits in early 1990s—negatively affected the banking system. In addition, the European Exchange Rate Mechanism currency crisis during end 1992 forced many countries, including Nordic ones, to hike their interest rates to mitigate large capital outflows. For example,

[3] Section 13(3) of the Federal Reserve Act gives the Federal Reserve the power to make emergency loans to financial institutions.

the Swedish central bank raised its interest rate aggressively from 12 percent in July 1992 to 500 percent in September 1992 to defend the krona. This further put considerable stress on the banking system and on the economy. In November 1992, Swedish policymakers let the krona float and embarked in a series of rate cuts. Overall, Nordic central banks provided emergency liquidity assistance to the banking system while their governments created resolution agencies to provide public support (including fiscal support in the form of capital injections) and to restructure weak banks (Honkapohja 2009).[4]

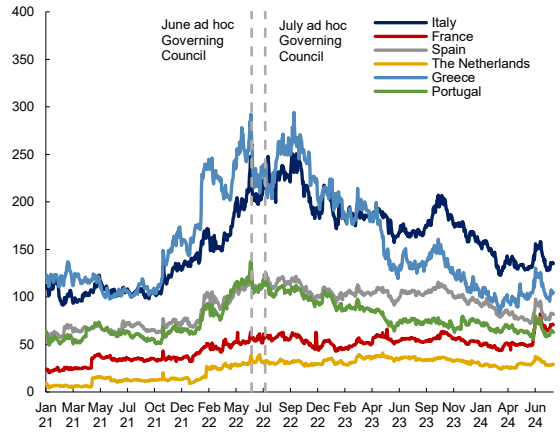
9. Stress in the Australian banking sector following monetary policy tightening at the turn of the 1990s and the authorities' response to that stress illustrate that direct liquidity injection is not always required to calm markets and depositors as regulatory measures, supervisory actions, and clear public communications were able to effectively maintain financial stability. From the mid-1980s, Australia experienced a credit boom secured against increasingly overvalued commercial property following deregulation that intensified competition and the desire by financial institutions to grow their balance sheets rapidly (Gizycki and Lowe 2000). In 1989, the combination of high interest rates, in response to inflationary pressures, and a softening of the commercial property market exposed the poor credit quality of some of the riskiest loans, and as the economy went into recession and the decline in property prices accelerated, more broadly based credit quality problems became evident. Banks' profitability and equity market valuations were significantly hit. In the face of large losses, public confidence became more fragile in 1990 and 1991, although this did not lead to widespread concerns about the stability of the financial system. Institutions that experienced the largest losses were either owned by state governments (guaranteeing the repayment of deposits) or by foreign banks (prepared to recapitalize their Australian subsidiaries) while the capital ratios of the major domestic banks remained above regulatory minima, and those whose capital ratios were below raised equity immediately after the announcement of losses. There were, however, several runs on relatively small institutions, including a couple of banks that were formerly building societies. In general, these runs were stopped by public sector intervention, such as the issuance by the Reserve Bank of Australia of press releases stating that the banks continued to meet prudential standards and were soundly managed. The Reserve Bank of Australia did not provide emergency liquidity support in any of these cases. However, it started cutting its policy rate from January 1990 in response to slowing economic growth. Runs also occurred on several trusts investing in either commercial property or commercial property mortgages. These runs were ended when, in the face of mounting liquidity problems, the National Companies and Securities Commission or the trusts themselves (in case unlisted) froze redemptions or extended redemption periods.

10. The case of the euro area in the post-COVID-19 high-inflation environment illustrates how the introduction of a new central bank liquidity instrument can help achieve separation between price and financial stability objectives. Following years of low inflation and low interest rates, the sharp increase in inflation in the wake of the COVID-19 crisis and Russia's invasion of Ukraine led the European Central Bank (ECB), along with other central banks around the world, to respond forcefully by raising rates sharply. After the ECB Governing Council announced in June 2022 its intention to start raising interest rates at its next monetary policy meeting, a positive inflation surprise in the United States triggered sharp rises in euro area sovereign bond yields (Annex Figure 1.5) and financial stress indicators (Annex Figure 1.6). The ECB responded by launching a new tool on July 21, 2022, the Transmission Protection Instrument (TPI), to prevent financial market fragmentation and ensure a smooth transmission of its monetary policy stance across the entire euro area during the forthcoming period of policy tightening. At the same time,

[4] The fiscal support was substantial: 10 percent of GDP in Finland, 2.6 percent of GDP in Norway, and 5.2 percent of GDP in Sweden (Drees and Pazarbasioglu 1998).

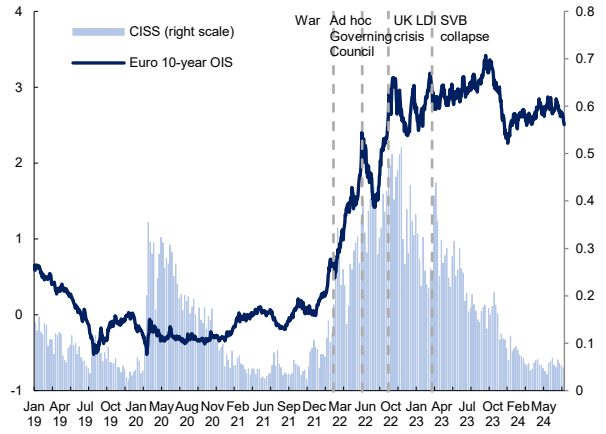
it explicitly sought to avoid any interference with the appropriate monetary policy stance. The new tool allowed for purchases of public sector securities, but only in jurisdictions that fulfilled a list of eligibility criteria ensuring sound and sustainable fiscal and macroeconomic policies. The TPI appears to have been effective without being used as the mere option of activating the tool appears to have helped to halt the disorderly rise in sovereign spreads. Following the announcement of the TPI, sovereign spreads indeed remained range-bound and rather insensitive to shifts in rate expectations (Schnabel 2023), despite repeated upward revisions of inflation forecasts and associated upward revisions of the policy rate paths in subsequent quarters.

Annex Figure 1.5. Selected Euro Area Countries: Sovereign Spread against Germany
(Basis points)



Sources: Refinitiv; and IMF staff calculations based on Schnabel (2023).

Annex Figure 1.6. Euro Area: Composite Indicator of Systemic Stress and 10-Year EA OIS
(Percent, left scale; right scale, 0 = no stress, 1 = high stress)



Sources: European Central Bank; Refinitiv; and IMF staff calculations based on Schnabel (2023).
Note: CISS = Composite Indicator of Systemic Stress; EA = euro area; LDI = liability-driven investment; OIS = overnight index swap; SVB = Silicon Valley Bank; UK = United Kingdom.

11. The 2000–01 financial crisis in Türkiye illustrates the challenging trade-offs faced by policymakers in emerging market economies. Prior to the crisis, Türkiye's economy was grappling with high inflation, political instability, and a fragile banking sector. This fragility stemmed from large unhedged foreign currency liabilities and a high share of nonperforming loans (Serdengeçti 2006). To address these issues, an exchange rate stabilization program was introduced in 1999, which featured a crawling peg exchange rate to anchor inflation expectations, fiscal austerity measures, tighter monetary policy, and various banking sector reforms (Özatay and Sak 2003). Despite these efforts, persistent vulnerabilities in the banking sector and anticipated future deficits due to bailout guarantees for failing banks raised serious concerns about the sustainability of the exchange rate peg. The situation worsened dramatically in February 2001 when a political crisis erupted, causing overnight interest rates to spike to 6,200 percent and leading to the collapse of the pegged exchange rate system. In response, the government injected substantial liquidity into the financial system, despite considerable inflationary risks. This involved issuing debt securities to recapitalize insolvent state-owned banks, which the central bank purchased, totaling to 21 quadrillion Turkish liras (approximately $21 billion) (Serdengeçti 2006). Inflation surged in the subsequent months, with the consumer price index reaching 68.5 percent by the end of 2001.

12. The Brazilian 1994 banking crisis illustrates how a commitment to price stability through a rapid disinflationary process can trigger financial distress. Following years of high inflation and failed stabilization plans, Brazil embarked on the so-called Real Plan in February 1994. A new currency called the real was introduced on July 1, 1994, as part of a broader plan to stabilize the Brazilian economy. This was preceded by series of contractionary fiscal and monetary actions. Interest rates rose from 5,572 percent at the end of 1993 to 15,406 percent at the time the new currency was introduced. Marginal reserve requirements climbed to 100 percent of demand deposits in July of 1994. Inflation came down sharply within the first year, dropping from a peak of 4,922 percent year over year in June 1994 to 33 percent only one year later. While the Plan successfully stabilized inflation, it had significant financial stability implications. As inflation dropped sharply following the Real Plan, banks that relied on "floats"—the difference between what banks paid depositors in real terms and what they received from investing in indexed government securities—as their main source of profits saw their profit margins collapse. Some banks attempted to increase their profits by lending to the private sector, but as real rates rose and the economy entered a recession, nonperforming loans climbed, and many banks failed. Some were either merged with other banks or taken over by foreign institutions that entered the Brazilian financial system. Several small banks were liquidated.

13. The 1982 banking crisis in Colombia highlights how the monetary authorities' response to a terms of trade shock which fueled inflation could contribute to financial sector stress. Colombia experienced an economic boom in the late 1970s, owing to a large increase in the price of coffee, one of its main exports. This boom contributed to the high inflation rates that the country experienced in the 1970s. Policymakers attempted to control inflation by raising reserve requirements, imposing interest rate controls on loans, limiting the increase in foreign debt, and introducing capital controls, which led to an increase in lending costs and reduced the profitability of banks (Hernandez, and Caballero-Argáez, and Tovar 2022). Between 1977 and 1981, the price of coffee fell dramatically. International interest rates also increased in response to a tightening of US monetary policy and defaults in other Latin American countries. These factors further exacerbated the financial stresses due to domestic policies to contain inflation and led to a significant increase in nonperforming loans. A banking crisis erupted in 1982, with two major banks forced into liquidation and taken over by the government. In 1986 and 1987, four more banks were bailed out by the government. Faced with rapidly deteriorating financial conditions, the authorities had to prioritize financial stability concerns over price stability objectives. By 1987, the government acquired almost a third of the banking system's assets, estimated to be between 3 to 6 percent of GDP (Hernandez, Caballero-Argáez, and Tovar 2022). The resulting increase in the government debt, mostly financed by direct loans from the central bank to the government, contributed to the high levels of inflation throughout the 1980s (Perez-Reyna and Osorio 2018).

Annex 2. A Simple Model with Trade-offs between Price and Financial Stability

1. **This annex introduces a stylized macroeconomic model with banks and banking panics, based on an IMF working paper (Capelle and Teoh 2025) and on earlier work by Gertler, Kiyotaki, and Prestipino (2020).** The model is used to derive conventional interest rate policy in times of high inflation and financial stresses and to think about how additional tools, such as asset purchases, credit facilities, macroprudential instruments and other policies, can be used to ease tensions between price and financial stability objectives.

2. **The model embeds a financial sector into an otherwise conventional New Keynesian framework.** It has two periods. In both periods, firms produce differentiated goods with two inputs, labor, and capital. For simplicity, the supply of capital is exogenous in both periods. Importantly, financial intermediaries are unique because they are more efficient than other agents in the economy at intermediating capital from households to firms. The more capital is directly operated by other agents (for example, households), the lower its efficiency. This implies that disruptions to capital intermediation have economic costs.

Model

3. **Households.** Households have log-linear preferences in consumption $U = \log C_1 - v(C_1) + \beta \log C_2 - v(l_2)$. They can save in three types of assets: bank deposits D_2 long-term government bonds L_{H2}, and capital K_{H2}. Households choose consumption (C_1, C_2), their allocation of savings across bank deposits D_2, government bonds, L_{H2}, and capital ("trees), K_{H2}, and labor (ℓ_1, ℓ_2), taking as given wages (W_1, W_2), prices (P_1, P_2), asset prices (Q_{L1}, Q_{K1}), and returns (R_2, r_{L2}, r_{K2}). Households are less efficient than financial intermediaries in handling investments, so they also pay management costs that increases quadratically in their holdings of L_{H2} and K_{H2}. Their period budget constraints are given by:

$$P_1 C_1 + D_2 + Q_{L1} L_{H2} + Q_{K1} K_{H2} = R_1 D_1 + \left(Q_{L1} + r_L\right) L_{H1} + \left(Q_{K1} + r_{k1}\right) K_{H1} + T_1 + W_1 \ell_1 + \Pi_1$$

$$P_2 C_2 = R_2 D_2 + \left(1 + r_L - \frac{\beta_L}{2} \frac{P_2 L_{H2}}{L}\right) L_{H2} + \left(1 + r_L - \frac{\beta_K}{2} \frac{P_2 K_{H2}}{K}\right) K_{H2} + T_2 + W_2 \ell_2 + \Pi_2$$

4. **Firms.** Final good producers operate in a competitive market. They purchase intermediate goods and combine them with CES technology to produce final goods sold to households. Intermediate good producers operate in a monopolistic competitive market. Each producer (indexed i) combines labor $l_t^d(i)$ and capital $K(i)$ to produce intermediate good $Y_t(i)$. When setting their prices $P_t(i)$, each producer also faces a quadratic adjustment cost in the first period, but not the second. The objective is to maximize:

$$\max_{P_t(i), l_t^d(i)} P_t(i) Y_t(i) - W_t l_t^d(i) - \frac{\theta_t}{2} \left(\frac{P_t(i)}{P_{t-1}(i)} - 1 \right)^2 P_t Y_t$$

subject to a technological constraint $Y_t(i) = l_t^d(i)^{\alpha} K_t(i)^{1-\alpha}$ and demand function $Y_t(i) = \left(\frac{P_t(i)}{P_t}\right)^{-\epsilon} Y_t$, with $\theta_1 > 0$ and $\theta_2 = 0$.

5. **Financial intermediaries.** Financial intermediaries collect deposits D_2 in period 1 and invest in capital K_{F2} and long-term government bonds L_{F2}. Intermediaries are subjected to two types of financial frictions. First, they face a leverage constraint, where assets on their balance sheet must be backed by sufficient net worth:

$$\phi_1 N_1 \geq Q_{L1} L_{F2} + Q_{K1} K_{F2}$$

where maximum leverage ϕ_1 is exogenous. This friction could arise from moral hazard as in Bernanke, Gertler, and Gilchrist (1999) or from regulatory constraints on banks' equity capital. Second, there is a risk of coordination failures among depositors leading to financial panics and self-fulfilling runs. The probability of a run $\xi(N_1^*)$ depends on the net worth of intermediaries under liquidation:

$$N_1^* = R_1 N_0 + N_G + (R_{K1}^* - R_1) Q_{K0} K_{F1} + (R_{L1}^* - R_1) Q_{L0} L_{F1}$$

where $\xi(N_1^*) > 0$ when $N_1^* \leq 0$ and zero otherwise. The run probability is the equilibrium outcome of a coordination game among depositors, which is based on a global game approach (Morris and Shin 1998). Importantly, the probability of a run increases with the degree of financial vulnerability $\xi'(N_1^*) \leq 0$. When a run occurs, banks are liquidated $K_{F2} = 0$, and all investments are transferred to households.

6. Central bank/government. The central bank's policy tools are the nominal interest rate R_2, asset purchases K_{G2} and equity injections N_G. The central bank is also more inefficient than private intermediaries at investing and face management costs quadratic in their holdings of K_{G2} and N_G. Fiscal policy is passive in the sense that lump-sum taxes T_1, T_2 are chosen each period to satisfy the period central bank-government budget constraint:

$$T_1 = r_L L + Q_{K1} K_{G2} + N_G$$
$$T_2 + \left(1 + r_{K2} - \frac{\beta_G}{2} \frac{P_2 K_{G2}}{K}\right) K_{G2} - \frac{\beta_N}{2} P_2 N_G^2 = (1 + r_L) L$$

7. Policy objectives. The central bank sets policies $\{R_2, K_{G2}, N_G\}$ to maximize the representative household's welfare:

$$W = \max_{R_2, K_{G2}, N_G} \log C_1 - v(C_1) + \beta \log C_2 - v(l_2)$$

subject to households' and firms' optimality conditions, and the government and financial intermediaries' constraints. These policies are chosen in period 1 after the inflation shock is realized, but before runs occur.

Equilibrium Conditions

8. Firms face nominal frictions in the first period, which gives rise to a Phillips curve, but prices are flexible in the second period. In the first period firms face adjustment costs if they choose to change their price. These nominal rigidities give rise to an upward-sloping relationship between the output gap and inflation—the Phillips curve—which in turn implies that interest rate policy shapes the path of aggregate demand and of inflation:

$$(\epsilon_1 - 1)\left(\frac{\epsilon_1}{\epsilon_1 - 1} \frac{W}{P_1 \alpha} \left(\frac{Y_1}{K}\right)^{\frac{1-\alpha}{\alpha}} - 1\right) = \theta\, \pi_1(\pi_1 + 1)$$

9. Households' intertemporal allocation of consumption gives rise to a Euler equation, whereas their portfolio allocation gives rise to a no-arbitrage condition. In the first period, households choose how much to consume and save in different assets (deposits and capital), as well as their supply of labor, taking wages and prices as given. Their optimal intertemporal allocation of consumption gives rise to a positive relationship between consumption in the first and in the second period (a "Euler equation")

$$C_2 = \beta R_2 C_1$$

Their optimal portfolio allocation gives rise to two no-arbitrage conditions which relate the price of capital, the returns on both capital and deposits, and the quantity of capital held by households. It depends on the quantity of capital because the efficiency of capital and the effective returns received by households are decreasing in the amount they hold.

$$R_2 = \frac{1 + r_L - \beta_L \frac{P_2 L_{H2}}{L}}{Q_{L1}} = \frac{1 + r_{K2} - \beta_K \frac{P_2 K_{H2}}{K}}{Q_{K1}}$$

Policy Implications

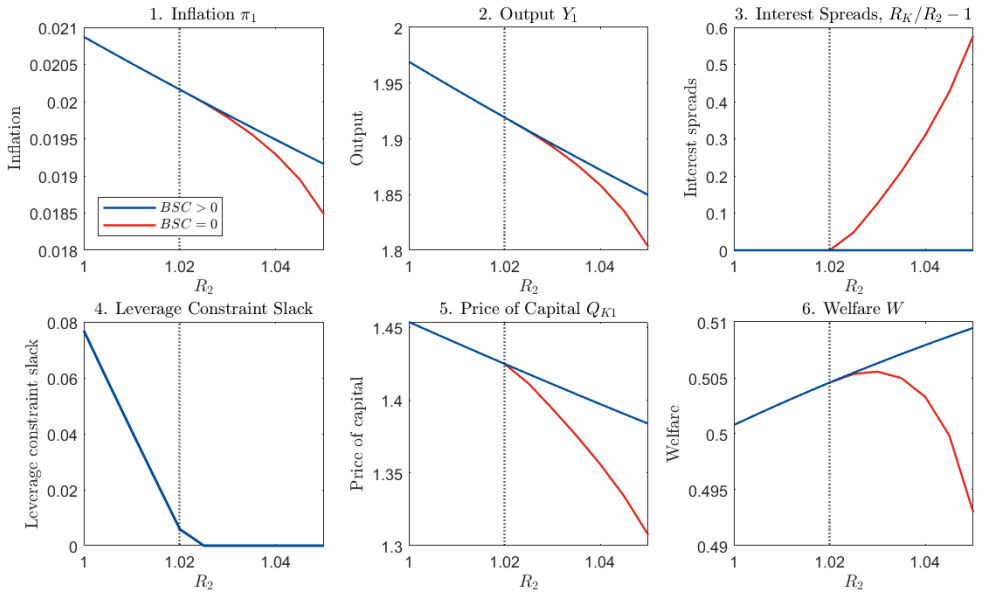
10. By weakening banks' balance sheet, interest rate hikes can lead to financial stress, namely a situation in which banks cannot fully intermediate capital in the economy. When the leverage constraint binds, aggregate shocks are amplified by the response of banks who are forced to liquidate part of their assets. This amplification is known as the *financial accelerator.* It leads to an increase in the cost of capital and generates output losses (Annex Figure 2.1). Policy rate hikes also increase the risk of a systemic run, which would totally disrupt financial intermediation and depresses aggregate demand to the extent that households and firms become pessimistic about the future. If a bank run materializes, banks are forced into full liquidation, which leads to a significant spike in risk premium and large economic losses (Annex Figure 2.2).

11. Optimal interest rate policy, in the absence of other central bank tools, calls for less aggressive rate hikes than in the no-stress scenario (Figure 2). The optimal interest rate balances the objective of stabilizing prices with the need to ensure financial stability by accounting for the adverse effects of tighter policy on banks' health and credit supply and on the risk of systemic runs. Less aggressive rate hikes mitigate these adverse effects by supporting asset prices, which alleviates strains on intermediaries through the mark-to-market and collateral channels, by maintaining borrowers' creditworthiness and banks' asset quality (asset quality channel), and by mitigating liquidity risks arising from the redemption and margin call channels. The extent to which optimal monetary policy deviates from the no-stress policy should be calibrated to the degree of vulnerabilities in the financial system.

12. Deploying other instruments, such as liquidity tools (asset purchases and ex post liquidity provision) or solvency tools (equity injection, resolution frameworks) to address financial stress, can help the central bank achieve "separation" and allow interest rate policy to focus on price stabilization (Figure 2). The degree to which separation is feasible and to which central bank should consider financial stress when conducting interest rate policy crucially depends on the effectiveness and the costs of these other tools in addressing the sources of financial stress (β_L, β_K). When they are effective and not costly $(\beta_L = \beta_K = 0)$., full separation can be achieved, and conventional monetary policy can ignore distortions stemming from financial frictions. But in general, when there are costs associated with using these tools, separation remains partial and monetary policy should incorporate financial stability concerns.

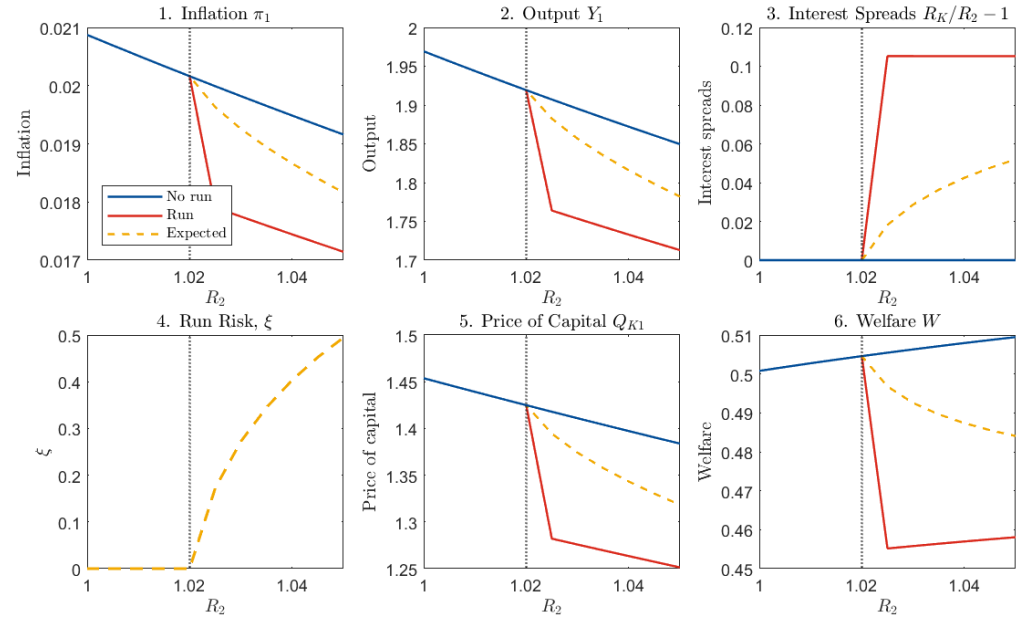
13. This framework and the trade-offs between price and financial stability it gives rise to are related to a broader academic literature studying the interaction between monetary policy and financial stability. The notion that financial intermediation may amplify aggregate shocks and interest rate hikes through their balance sheet is shared by many papers in the macrofinancial literature, for example Bernanke, Gertler, and Gilchrist (1999), Adrian and Shin (2009), Adrian and Duerte (2020), Gertler and Karadi (2011), Brunnermeier and Sannikov (2014), Gertler and Kiyotaki (2015) and Boissay, Collard, and Smets (2016). The idea that a weakening of the financial intermediaries' balance sheets increases the likelihood of panic-based runs goes back to Diamond and Dybvig (1983), Goldstein and Pauzner (2005) and have been incorporated into a macroeconomic model by Gertler, Kiyotaki, and Prestipino (2016, 2020).

Annex Figure 2.1. Financial Stress Due to Binding Leverage Constraint



Source: Capelle and Teoh (2025).
Note: BSC=0 refers to a situation in which the Balance Sheet Constraint (BSC) binds and BSC>0 to a situation in which it doesn't.

Annex Figure 2.2. Financial Stress Due to Systemic Bank Runs



Source: Capelle and Teoh (2025).

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