Chapter 2
Central Banks: Gatekeepers of Monetary Stability and Guardians of Public Interest

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Abstract This chapter presents the main elements of central banks' traditional functions as gatekeepers of monetary and broader financial and economic stability and outlines some emerging considerations relating to central banks' enhanced role as guardians of public interest. With regard to the central banks' emerging enhanced role, the analysis focuses on their (1) heightened policy coordination need with fiscal, regulatory, and debt management authorities to increase the efficiency of the monetary policy transmission mechanism and the overall efficacy of economic policy making, (2) principal role in the establishment of a sovereign asset and liability management framework to identify, monitor, and manage sovereign balance sheet risks on a consolidated basis, which also helps monetary policy through a more accurate estimation of sovereign risks and consequently a more appropriate interest rate setting, (3) active role in the development of domestic capital markets to enhance the country's funding sources and reduce its foreign exchange risk exposure, as well as to help the effectiveness of open market operations in targeting interest rates and in turn affecting the real economy, and (4) envisaged implicit role as protectors against emergent financial disruptions.

2.1 Introduction

As economies become more complex and less predictable, central banks are increasingly required to oversee the stability of domestic financial systems and to prevent economic downturns, in addition to maintaining inflation in line with set targets (Evanoff et al. 2013; IMF 2015; Lombardi and Schembri 2016). Especially after the global financial crisis of 2007–2009, central banks have been called to play a crucial

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role in ensuring a sustainable domestic economic growth rate and an acceptable level of prosperity (Asmussen 2012). Similarly, when domestic political and/or economic circumstances change drastically, central banks of countries or regions are expected to assume a crisis management role, such as the European Central Bank did during the European Sovereign debt crisis and the Bank of England after the Brexit vote. Further, central banks are customarily entrusted with safeguarding the integrity of their domestic financial systems from continually emerging financial challenges and innovations, e.g., shadow-banking, interconnectedness, distributed ledger technologies. In such a changing world, novel means of central bank monitoring, assessing, and managing financial conditions and risks, e.g., through a consolidated public balance sheet, instituted coordination of policies, and development of domestic capital markets, would be essential to avert unwarranted developments and ensure financial stability.

Conventionally, central banks' inflation and overall financial stability objectives have been attained by appropriate changes in their monetary policy instruments, e.g., short-term interest rates and exchange rates. The added explicit or implicit objective of ensuring robust economic growth, in particular after the recent economic and financial crises, may require implementation of unconventional monetary measures, e.g., quantitative easing (QE), in addition to applying central banks' traditional policy instruments. Addressing this additional objective through conventional monetary policy instruments could also create a determination issue in assigning the same instruments as before to achieve the old objectives plus an additional objective/target, as well as it may alter the monetary transmission mechanism (these important questions will not be analyzed here).

We present in this chapter some of the main elements of the traditional functions of central banks as gatekeepers of monetary and broader financial and economic stability and outline some emerging considerations relating to central banks' enhanced role as guardians of public interest, including (1) a heightened policy coordination role with fiscal, regulatory, and debt management authorities to increase the efficiency of the monetary policy transmission mechanism and the overall efficacy of economic policy making, (2) a principal role in the establishment of a sovereign asset and liability management framework to identify, monitor, and manage sovereign balance sheet risks on a consolidated basis, which will also help monetary policy through a more accurate estimation of sovereign risks and consequently a more appropriate interest rate setting, (3) an active role in the development of domestic capital markets to enhance the country's funding sources and reduce its foreign exchange risk exposure, as well as to help the effectiveness of open market operations in targeting interest rates and in turn affecting the real economy, and (4) an envisaged implicit role of protecting the financial and economic system from various emergent challenges, including the advent of crypto-assets, cybersecurity attacks, and other financial innovations.

This chapter is organized as follows: Sect. 2.2 outlines some of the main elements of ensuring central bank efficiency in its role as the gatekeeper of monetary stability, including a clear mandate, independence, well-defined policies and operations, and cooperation and coordination with foreign central banks in attaining global financial stability; Sect. 2.3 discusses additional functions that central banks

are expected to perform in their expanded role as guardians as public interest, including greater instituted coordination with other domestic economic policy entities, development of a comprehensive sovereign balance sheet, provision of an enabling environment for the establishment of domestic capital markets, and protection of the financial and economic system from potential financial disruptions; and Sect. 2.4 offers some concluding remarks regarding the design and focus of central banks.

2.2 Central Banks: Gatekeepers of Monetary Stability

2.2.1 Mandates of Central Banks

Central banks conduct their countries' monetary policies by controlling/managing the supply of money (often targeting a nominal interest rate) to promote economic growth and financial stability. Most developed economies' central banks, e.g., European Central Bank, Bank of England, Bank of Japan, have price stability, around a set inflation target, as their sole main mandate. However, other central banks, e.g., U.S. Federal Reserve System, have price stability and maximum employment as their dual main statutory mandates. Other traditional mandates of central banks include the maintenance of financial system stability, setting of short-term interest rates to manage the cost of credit, management of foreign exchange reserves, provision of lender-of-last-resort funds to financial institutions, and issuance of national currency (Bordo et al. 2014; Archer 2009).

By ensuring monetary stability, central banks help preserve the domestic (current and future) value of money, which in turn assures the external value of the currency. While central banks have to keep inflation, and inflation expectations, reasonably low and sensibly stable, they have also to maintain the safety and soundness of the banking system so that bank deposits' worth is ensured. In 2007, although central banks were successful in keeping inflation low, they had not apparently paid adequate attention to the resilience of the banking system. However, safeguarding the banking system does not imply that individual banks cannot fail, but that the whole system is not susceptible to a collapse. Further, the central banks' reactions to the global financial crisis, e.g., quantitative easing programs, had their own costs. While they rendered support to the recovery of the real sectors of their domestic economies and boosted asset prices, they adversely affected interest incomes of bank deposits.

2.2.2 Independence of Central Banks

Central banks' independence ascertains that they do not seek nor accept the intervention of respective governments in the exercise of their policies to achieve their mandates, including their monetary policy objective of inflation and broader financial and economic stability (IMF 2018a; Taylor 2016). In this context, there may be

explicit guarantees, e.g., for Eurozone central banks' independence from government interventions, the European Central Bank is mandated by EU treaties to take appropriate action in the EU Court in case of violation of a national central bank's independence and separation of powers. Further, to keep governments at arm's length, central banks' mandates are typically prohibiting the monetary financing of government's fiscal deficits. However, central banks can undertake macro-fiscal actions on their own initiative. This was the case during the recent global financial crisis where monetary authorities decided to get involved after realizing that the crisis could have detrimental effects on domestic economic activity and in turn the global economy. As a result, many central banks have now *de facto* expanded their traditional mandate to also include strengthening of economic activity and preservation of sustainable growth for their domestic economies.

2.2.3 Central Bank Policies and Operations

2.2.3.1 Monetary Policy: Interest Rate Setting

Until the 2007–2009 global financial crisis, the conventional rationale for most central banks' conduct of monetary policy was preservation of inflation stability, presuming that markets would be sufficiently self-regulating. However, the crisis helped monetary authorities to become aware of the need to expand the boundaries of their responsibility outside the traditional monetary policy objectives and include explicitly broader financial and production and employment considerations. In effect, this expansion/development may also reflect the realization of the crucial role of monetary transmission mechanism, as manifested by the increasing interconnections between the central bank monetary policy, financial markets, and the real economy (aggregate demand). As a consequence, central banks advocated interventions through purchases of sovereign and private sector bonds, "quantitative easing" and "credit easing," respectively, that would put an upper limit to interest rates (often targeting long-term rates) and in turn would help strengthen economic activity (Georgsson et al. 2015).

In conducting monetary policy through setting/targeting short-term nominal interest rates, along with deciding on their target range, central banks often set implicit or explicit inflation targets and assess regularly the outlook of the economy to form expectations about the underlying inflation (Friedman and Kuttner 2010; IMF 2018). Economic variables that are typically reviewed include the country's expected economic growth, fiscal situation/accounts, the state of the labor market, external trade conditions, and the stock-markets performance. If these variables indicate a building up of upward price pressures that could possibly push inflation above a set target, then rate rises are decided. Typically, interest rate policy is determined by future inflation, as implied in market prices, rather than current inflation.[1]

[1] Central banks may track the overall inflation or core inflation measure, which excludes food and energy from personal consumption expenditures.

Policy decisions on interest rate targets, e.g., the overnight interbank lending rate, serve as benchmarks for market interest rates paid by consumers and businesses. This has significant real economy implications as central bank changes of interest rates affect the flow of money into the financial system (i.e., the cost of credit) and the price of liquidity in the economy (via the deposits channel).

During normal times, central banks use four main conventional monetary policy instruments to implement monetary policy, i.e., effectively control the money supply (the total amount of money circulating in the country's economy) and interest rates: (1) open market operations (OMOs), i.e., purchases and sales of government securities in the open market, (2) the reserve requirement, i.e., a regulation that sets the minimum fraction of deposits that banks need to hold as reserves at the central bank, (3) discount lending/window that allows banks to borrow money from the central bank so that they can meet depositors' demand or reserve requirements, and (4) interest paid on reserves. Among the four instruments, OMOs are more widely used by central banks to affect the money supply and interest rates (with purchases of government securities intending to expand the money supply/lower interest rates and sales to contract it/prop up interest rates) and in turn inflation and the real economy.

2.2.3.2 Foreign Exchange Rate Policy: Adequacy of Reserves and Exchange Rate Market Interventions

A crucial function of a central bank is the explicit or implicit setting of the external value of its domestic currency, i.e., the exchange rate, along with a disclosed or undisclosed fluctuation range that is consistent with the country's prevailing and prospective economic fundamentals and interest rate policy. If the exchange rate is pushed outside such a fluctuation range, the central bank will typically defend it through foreign exchange market interventions. In this context, a central bank needs to determine an adequate level of foreign exchange reserves that can be used for monetary and exchange rate policy purposes (IMF 2013).[2] This part of the country's total reserves should exhibit ample liquidity characteristics and thus be able to swiftly be used in case of an intervention need (i.e., this constitutes the liquid part of the country's foreign exchange reserves). Any reserves above the liquid part (or excess reserves) could be managed/invested with an income objective (i.e., this constitutes the investment tranche of foreign exchange reserves).

Under a fixed exchange rate regime, central banks tend especially to hold adequate foreign currency reserves for intervention purposes in secure, high liquid, and short-term maturity foreign currency assets.[3] Thus, in such a pegged system, a central bank is obliged to preserve its currency's exchange rate by, e.g., conducting

[2] See also Chap. 14.

[3] Most central bank official reserves consist of foreign currency assets, gold, and Special Drawing Rights (SDRs) and claims against the IMF.

foreign exchange sales whenever its currency depreciates against the numeraire currency (typically the U.S. dollar, Euro, or Yen), or foreign exchange purchases whenever its currency appreciates against the numeraire currency. In recent years, multilateral foreign exchange swap lines among major central banks have also been contracted to enhance their capacity of foreign exchange liquidity and availability of funds for interventions in case of foreign exchange distress. This contingent source of foreign exchange availability for central banks helps diminish abrupt exchange rate fluctuations and consequent tensions in the financial system.

2.2.3.3 Management of Investment Tranche of Foreign Exchange Reserves[4]

By holding foreign exchange reserves in excess of the amount needed to defend their currency's exchange rate, central banks usually try to enhance market confidence in the stability of their currency, i.e., use of excess reserves as precautionary holdings (IMF 2013; Al-Hassan et al. 2015). As such, this part of reserves is invested with a longer-time investment horizon, i.e., differently than the short-term horizon of reserves intended for foreign exchange intervention purposes. For the portion of reserves with longer-investment horizons, many central bank reserve managers have recently explored alternative instruments and currencies, adding, e.g., non-traditional currency-denominated assets to their reserves, in an effort to enhance returns of their foreign exchange asset portfolios.

Globally, central bank foreign exchange reserves, after declining gradually since 2014, started recovering in 2017, at a pace of 8%, with this trend being relatively broad-based (IMF 2018b). While reserves are growing, central banks' strategic asset allocations and strategies for managing them are reported to have remained broadly conservative. For the liquid part of reserves, security and liquidity continue to be important criteria for defining their allocation strategies. The investment tranches of some central bank reserves are reported to have increased and to be managed less conservatively. In particular, these parts of reserve assets are diversified away from traditional allocation strategies focused on low-yielding, sovereign fixed-income instruments and expand into a wider range of riskier assets, including equities, real estate, and infrastructure assets. As the low bond-yield environment gradually vanishes, central banks are expected to pursue less-risky investment tranche asset management strategies.

2.2.3.4 Commercial Bank Regulatory Functions

In countries where there are no separate banking regulators, central banks also assume the role of regulator and supervisor of commercial banks. This role entails effective monitoring of the soundness (i.e., adequate capitalization) and well-functioning (i.e., transparency and accountability of transactions) of the domestic banking

[4] See also Chapters in Part II and III.

system so that the occurrence of banking crises is minimized and bank bailouts, which trigger rises of sovereign credit risk, are avoided. In this capacity, central banks have also to institute prudential policy measures to ensure the integrity of the operations and activities of commercial banks, as well as the efficiency of the utilized payment and settlement systems (IMF 2015).

For enhancing the stability and resilience (safety and soundness) of the banking sector, central banks often need to have in place regulatory systems in line with Basle III that (1) adequately prevent collapses of individual banks by requiring the strengthening of their capital adequacy (by imposing/instituting minimum capital requirements that ensure solvency) and the reduction of their vulnerability to liquidity shocks (by necessitating banks to hold more and higher quality capital through increased asset-risk weights, higher total loss-absorbing capital, lower leverage ratios—to reduce exposures, and larger liquidity requirements—sufficient buffers to protect against domestic and/or external shocks and ensure adequate liquidity), as well as by the heightening of prudential supervision, including the implementation of stress tests; (2) eliminate or limit contagion and negative spillovers to the rest of the financial system; and (3) enable the authorities to deal with a bank insolvency without endangering the financial system, e.g., taking appropriate measures to prevent a financial panic that could halt domestic credit markets and cause a financial crisis.[5]

2.2.3.5 Overall Domestic Financial Stability

In addition to the inflation-stability mandate and commercial bank regulatory function, central banks may also be entrusted with a wider role of safeguarding the country's overall financial stability. Such a role could include responsibilities for ensuring the stability of the domestic bond market and other capital markets, including that of derivatives markets. Admittedly, however, these responsibilities tend to be extensive and central banks do not, in principle, undertake them (Evanoff et al. 2013).

2.2.4 Cooperation and Coordination with Foreign Central Banks in Attaining Global Financial Stability

Central banks are engaged in different international and regional policy fora, including the Financial Stability Board, the BIS, the IMF, and the Executives Meeting of East Asia and Pacific Central Banks (EMEAP), in an effort to ensure that inflation stability in their domestic economies, as well as the global economy in general, is preserved (Cunningham and Friedrich 2016; IMF 2015). Such engagements have also been extended to include domestic, regional, and global financial market

[5] See also Ingves (2018).

stability initiatives, such as macroprudential policies, to contain capital markets' volatility. Further, global financial crises may prompt central banks to undertake unconventional monetary policy measures to ensure that their domestic economies and the global economy do not drift to recession.

Following the 2007–2009 global financial crisis, the instituted extensive central bank asset-purchasing programs were intended to alleviate the negative market impact of the crisis and its resulting deflationary pressures on domestic economies. In general, when domestic nominal interest rates get close to zero, central banks may resort to monetary policy easing by directly increasing the quantity of money. Most post-financial crisis programs primarily purchased government bonds, but some also purchased a wider range of assets, e.g., the U.S. Federal Reserve also purchased government-backed securities, while the European Central Bank's programs included corporate and asset-backed bonds and that of the Bank of Japan included corporate bonds, equities, and property funds. These quantitative easing programs, i.e., direct interventions by monetary authorities, have proved to be useful policy instruments in preserving low interest rates. When economic conditions normalize, especially when economic activity goals have been attained, central banks have to unwind their asset-purchasing programs and reduce their balance sheets by gradually selling/divesting their accumulated assets so that market volatility is limited.

In the USA, when inflation starts rising and the labor market tightens putting upward pressure on wage growth, the Federal Reserve is expected to proceed with its long-term plan to reduce its extraordinarily large balance sheet, along with increasing interest rates. After years of low interest rates and expansion of the Federal Reserve's balance sheet, both the former and current Federal Reserve chairs, Janet Yellen and Jerome Powell, have referred to the rise in inflation and tightening of the labor market as essential signs in the path towards policy normalization. At its quarterly meeting in September 2018, the Federal Reserve again raised the target range of the federal funds rate by a quarter point, to 2.0–2.25%.

The U.S. Federal Reserve's balance sheet started to grow in late 2008, following the decision for a quantitative easing program that entailed the acquisition of assets such as U.S. treasuries and government-backed securities on a large scale. This was initially undertaken to avoid a deepening of the financial disruption and default of illiquid but solvent financial institutions, as the U.S. housing (U.S. subprime) crisis was rapidly transforming into a U.S. and global financial crisis. Subsequently, this policy was continued to preserve easy monetary conditions and fight economic sluggishness and deflation risks as the private sector deleveraged markedly. On the liabilities side, bank reserves grew to exceed regulatory minimum requirements. In October 2014, then Federal Reserve chair Janet Yellen announced the conclusion of this program, while the Federal Reserve balance sheet had increased to around USD 4.3 trillion (around USD 2.5 trillion in U.S. treasuries and USD 1.8 trillion in mortgage-backed securities) from less than USD 900 billion before the financial crisis.

In October 2017, the Federal Reserve started a gradual contraction of its balance sheet by stopping the reinvestment of all proceeds received from maturing assets.

Further, as announced in June 2017, the initial monthly portfolio reduction of USD 10 billion is expected to reach USD 50 billion in October 2018, with no outright sales of assets being envisaged. Bank reserves have diminished accordingly.[6] The impact of the balance sheet unwinding, especially the release of U.S. treasuries, on short-term interest rates will depend on the pace of reduction of the level of banks' reserve balances on the Federal Reserve's liabilities, i.e., banks' deposits at the Federal Reserve. If the Federal Reserve has accumulated assets (U.S. treasuries) in its balance sheet that are more than the amount that markets, mainly banks, want to hold, then the Federal Reserve's unwinding will not induce massive reductions in banks' reserves at the Federal Reserve and consequent U.S. treasuries' purchases, and therefore will not have any significant impact on short-term interest rates.

Decisions with regards to central banks' exiting from asset-purchasing programs, e.g., quantitative easing, and reducing their bank balance sheets should ideally be taken in a cooperative and coordinated manner to maximize policy efficacy and minimize adverse exchange rate movements and capital market volatility. However, in such an international policy endeavor, the decision-making structures and dynamics among central banks and international financial policy entities need to be taken into consideration. For example, in setting U.S. monetary policy, the U.S. Federal Open Market Committee (FOMC), which consists of 12 members, often takes time to reach an understanding and vote on setting monetary policy and interest rates. Further, international financial entities, e.g., the Financial Stability Board (established in 2009 under the auspices of G20), that are delegated to examine from a global perspective monetary and financial policy issues, such as systemic risk and "too big to fail" strategies, may require considerable time for deliberations and recommendations.

2.3 Central Banks: Guardians of Public Interest

2.3.1 Role in Coordination with Fiscal, Regulatory, and Debt Management Policies

To attain macroeconomic policy objectives effectively, consistency of designed and instituted monetary, fiscal, regulatory and debt management policies must be ensured through enhanced coordination among corresponding policy entities (IMF

[6] If the non-bank private sector repays, at redemption, bonds held by the Federal Reserve using its bank deposits, then those deposits (and in turn, commercial bank reserves) fall and money balances are eliminated. Also, bank reserves may be reduced if the Federal Reserve sells bonds that it holds to Primary Dealers (PDs) the day before they mature and PDs pay the Federal Reserve with their reserves at the Federal Reserve. In this case, the Federal Reserve's liabilities (commercial bank reserves) are reduced in tandem with its assets (sold bonds). In this process, central banks engaged in QE need to ensure that the pace of their QE exiting guarantees a steady growth in the supply of money that is consistent with both low inflation and wider macroeconomic stability.

2018a). Coordination entails good communication channels and adoption of a well-thought out program of collaboration, while taking into consideration prevailing practices, idiosyncrasies, and constraints. In this context, communication among monetary, fiscal, debt management, and financial sector regulatory authorities needs to be established, with each authority retaining its independence and accountabilities. Close consultation and interaction among these policymakers could help in exchanging information and providing each other with valuable inputs on individual entities' policy perspectives and overall efficacy of economic policy. Nevertheless, policy-making coordination is often a major challenge, especially during periods of economic and/or financial distress.

In this context, the monetary authorities' role in a country's economic policy coordination should be part of their broad functions and responsibilities as guardians of public interest. Especially, information sharing and coordination meetings between monetary and fiscal policy authorities should take place on a regular basis, including for debt sustainability analysis (DSA) purposes where interest rate and exchange rate assumptions are paramount for growth and fiscal balance baseline projections and scenario analysis. As mentioned in Jonasson and Papaioannou (2018), such collaboration with debt managers is also crucial when monetary policy includes so-called non-standard measures, some of which are carried out directly in government bond markets. In regulating and supervising financial markets and institutions, it may happen that certain measures may unintentionally hamper the functioning of the primary and secondary markets. Consultations among monetary, debt management, fiscal, and financial regulatory authorities can promote solutions that facilitate proper functioning of public debt markets, while also meeting monetary and financial policy objectives (IMF and World Bank 2014).

The monetary policy regime, the instruments used for monetary policy operations, and the institutional setting have important implications for the extent and frequency of needed policy coordination. As the core objective of the monetary authority is price stability, the appropriate monetary-fiscal mix is one of the most crucial factors in the attainment of this objective. Targets for inflation, interest rates, monetary aggregates, or the exchange rate, which are managed through open market operations or through non-market controls, such as setting reserve requirements, have to also be discussed and coordinated with fiscal policy authorities for increasing their chance of successful realization. A monetary policy will be credible and more effective in taming inflationary expectations only if it has been deliberated and determined in an integrated monetary-fiscal policy framework. Under these circumstances future uncertainty will likely be contained and, in turn, the risk premium on domestic currency debt will be lowered.

Further, the central bank tends to be prohibited to lend money to (buy bonds from) the government, or, when the objective is to finance the government, the scope of this financing tends to be limited for inflation to be controlled. Under these conditions, any liability management operations between the central bank and the government should be transparent and cleared at market prices. For example, this may include implementation of transactions where the central government exchanges short-maturity bills and notes issued by the central bank for longer-maturity bonds

issued by the central government. In these cases, the central bank transfers cash (reserves) to the government (equal to the nominal value multiplied by the market price of the transaction). From the central bank's perspective, the transaction is equivalent to a buyback (with reserves), while from the government's perspective the transaction is a plain primary market issuance. If the central bank needs to issue its own bills for open market operations, the market should know the sections of the treasury-bill yield curve that are reserved for central bank-bills and government treasury-bills. This is important for the market to be able to distinguish between fiscal and monetary operations (see Jonasson and Papaioannou 2018).

Coordination of monetary and fiscal policies does not, however, diminish the need for clear and transparent monetary and fiscal policy objectives, mandates, and frameworks. Decision-making in a well-coordinated manner ensures that inconsistencies between these two policies are minimized and thus the effectiveness of each policy is improved. Further, the interplay between monetary and debt management policies should be recognized and accounted for possible unintended consequences. For example, Jonasson and Papaioannou (2018) state that the unconventional monetary policy instituted by some central banks in recent years, i.e., purchasing of long-term government bonds, has been pointed out to have important implications for public debt management.

In particular, Blommestein and Turner (2012) show that the U.S. Federal Reserve's QE is identical in its macroeconomic effects to shortening the duration of the U.S. Treasury debt issuance. Also, Chadha et al. (2013) indicate that the reduced average maturity of U.S. Treasury issuance lowered the long-term interest rates, while Greenwood et al. (2014) document that the U.S. Federal Reserve's attempts to reduce the supply of long-term bonds held by private investors through its QE policy were partially offset by the Treasury's decision to lengthen the average maturity of the debt. Thus, the U.S. Federal Reserve policies under the special circumstances of the Zero Lower Bound have taken direct action to shorten the duration of the government debt held by the public. In this context, if a central bank acts as a major buyer of government debt, its decisions on where on the curve is buying and on what maturities have significant impacts on the debt management office's planning. Yet, a government's objective for financing cost minimization, subject to a prudent level of risk, should not be viewed as a mandate to reduce interest rates, or to influence domestic monetary conditions. Neither should the cost/risk objective be seen as a justification for the extension of low-cost central bank credit to the government.

Nevertheless, when the domestic central bank is seen as a major market participant, e.g., preferring specific bonds and yield curve segments, this could have significant implications for foreign exchange reserve managers. For example, if reserve managers are duration targeters and the domestic central bank or debt management operations intend to lower the overall duration of outstanding sovereign debt, then they will be "forced" to buy longer-dated bonds. This, however, exposes them to interest rate risks, as longer durations tend to be more interest rate sensitive. Also, international reserve managers will face similar pressures if the central bank decides to manipulate the discount window borrowing or use selectively open market operations to control credit conditions.

At the same time, Jonasson and Papaioannou (2018) argue that debt management operations should be consistent with monetary and exchange rate policy objectives, e.g., an external debt buyback should not antagonize possible exchange rate strengthening policies. As monetary operations are often conducted using government debt instruments and markets, the choice of monetary instruments and operating procedures needs to be coordinated with debt management policies for effective overall policy implementation and well-functioning of the government debt markets. In countries with developed financial markets, central bank interventions usually take place in secondary markets, reducing the need for coordination between fiscal and monetary authorities at the operational level (IMF 1994). In countries with less developed financial systems, central banks start issuing their own securities or use government securities as their intervention instrument for open market operations that are often implemented in the primary market, raising the need for effective coordination on issues such as the tender volume, so as to allow the central bank to issue more securities than is strictly necessary for debt management purposes and decide on mechanisms to bear the cost of overfunding the government's budget (Gray and Pongsaparn 2015).

In cases that central banks do not assume the role of financial market regulators, they need to actively engage in discussions and closely coordinate their policy actions with financial, especially bank, regulators as changes in monetary policy conditions directly (balance sheet effects) and indirectly (real economy effects) impact the health and viability of financial institutions. Monetary policy changes that are not coordinated with appropriate regulatory actions may adversely affect the health of financial institutions. Given the usually high level of interdependence of financial institutions, the effects can have potential systemic financial stability implications. Understanding the risks and the channels of their transmission to financial stability is an essential element of formulating appropriate policies for strengthening domestic (and international) financial stability. For example, not well-thought out or untimely monetary policies and/or regulatory actions can, first, negatively impact financial institutions' balance sheets, incomes, and capital reserves and, ultimately, the sovereign balance sheet, thereby raising sovereign risks. This situation may be aggravated if foreign investors maintain significant holdings in the domestic market and decide to unwind their positions in local markets as a consequence of a perception or actual sovereign risk deterioration that often implies an exchange rate depreciation.

Finally, there are likely benefits to the smooth implementation of monetary policy if Treasury Single Account (TSA) cash balances are held by the central bank and attainment of a cash balance target is closely monitored and coordinated between cash management and monetary authorities. In such a case, it is ensured that any withdrawals do not upend the implementation of monetary policy, while temporary cash surpluses are remunerated by the central bank or placed in financial market instruments. Further, the efficacy of monetary policy is enhanced when foreign exchange reserve management is well-coordinated with other policies and, in particular, takes place within a consistent monetary policy implementation framework (i.e., is compatible with the overall interest rate policy setting).

2.3.2 *Role in Development of a Sovereign Asset and Liability Management Framework*[7]

It is widely recognized that the development and management of an integrated sovereign asset and liability portfolio helps monitor and manage sovereign portfolio risks efficiently and in a least-cost manner (Das et al. 2012; Koc 2014; Jonasson and Papaioannou 2018; Amante et al. 2018). In this scheme, the central bank is called to have a central role in the identification of items to be included in the portfolio, in the measurement of associated risks, and in the hedging strategies to be followed/adopted. In particular, a "sovereign asset liability management (SALM)" framework aims to identify and manage effectively the sovereign's key financial exposures based on the sovereign's balance sheet.[8] Jonasson and Papaioannou (2018) observe that sovereigns are susceptible to various risks and uncertainties relating to their financial assets and liabilities, depending on the country's level of economic and financial development. These risks, if realized, could cause a significant fiscal and financial drain and a consequent fall in the country's domestic absorption and potential output, besides affecting the balance of payments.

As the SALM approach helps detect sovereign risk exposures from a consolidated public-sector portfolio perspective, it allows one to analyze the financial characteristics of the sovereign's balance sheet by identifying sources of costs and risks and quantifying the correlations among these sources. This approach involves monitoring and quantifying the impact of movements in economic and financial variables, including exchange rates, interest rates, inflation, and commodity prices, on sovereign assets and liabilities, and containing other debt-related vulnerabilities in a coordinated way. In managing sovereign risk exposures, ALM techniques applied to government operations can uncover interest rate and currency mismatches between assets and liabilities and make clear the "cost-of-carry" of debt-financed financial assets. More broadly, ALM can help policymakers identify net risk positions requiring management and highlight cash flows available to service net debt, thus providing input for the design of monetary policies. In cases where the match of financial characteristics of the assets and liabilities is only partial, risk management could focus on the unmatched portions, i.e., net financial positions. In a short- to medium-term perspective, a financial risk management strategy could then be developed to reduce such exposures (see Jonasson and Papaioannou 2018; Amante et al. 2018).

To indicate net liability exposures in light of the characteristics of sovereign assets and government revenues, an analysis of the composition of public debt on a

[7] See also Chap. 10.

[8] A stylized sovereign balance sheet typically includes in the asset side (1) international reserves, (2) net fiscal assets (present value of primary fiscal balances), (3) value of money issuance (seigniorage, or zero for countries using another country's currency as a legal tender), and (4) other assets, including net pension and wealth funds, state-owned enterprises, infrastructure, and real estate, less explicit and implicit contingent claims, including guarantees, and in the liability side (1) external debt, (2) domestic debt, and (3) base money (Das et al. 2012).

net basis is required. The effects of implementing an ALM strategy should be carefully analyzed. In any effort to develop a comprehensive and meaningful sovereign ALM framework, the potential implications on macroeconomic objectives and policies should be assessed in parallel with the potential benefits from a consolidated sovereign portfolio management. Especially, the impacts of adopting an ALM strategy on policies to support the reduction of inflation, maintain financial stability, and enhance the resilience of the economy to external shocks should be taken into consideration. In this regard, the role of an ALM framework in developing appropriate monetary, fiscal, and debt management policies, including the development of local-currency debt instruments, to mitigate sovereign balance sheet risks and macroeconomic vulnerabilities should be encouraged.

Jonasson and Papaioannou (2018) maintain that the SALM approach is also utilized to facilitate a country's long-term macroeconomic and developmental objectives such as economic diversification, broadening of the export market, or reducing the dependence on key import products. Further, the SALM approach can help identify long-term fiscal challenges, such as unfunded social security liabilities, implying a future claim on resources. In this context, the SALM framework forms an integral part of an overall macroeconomic management strategy. Especially for commodity-exporting countries, the SALM approach can clarify the potential asset management challenges that stem from a medium-term fiscal strategy. In such framework, however, the interaction between monetary policy and the SALM strategy should be clear. Maintaining a well-articulated monetary policy, which explains the analysis and rationale for the chosen policy, is essential for such purpose. A forum for an open dialogue, such a SALM framework, helps secure support for the policy, as part of the central bank's overall approach to macroeconomic management and financial stewardship.

To establish an SALM framework, certain preconditions should be fulfilled, including availability of relevant sovereign asset and liability data and presence of a political will to undertake such a coordination-intensive project. Typically, governments do not compile a full statement of financial position in assets and liabilities. Also, adding to the complexity, prevailing institutional arrangements, including constitutional or statutory independence of participating entities, may segment policy decision-making, e.g., foreign reserves are usually managed by the central bank, while sovereign debt portfolios are managed by ministries of finance and debt management offices, each with different objectives and time horizons. Based on the experiences of countries that apply a consolidated sovereign portfolio risk management, the establishment of an SALM framework constitutes an effective policy innovation, with the achievement of intended results (i.e., providing the authorities with better monitoring of risk exposures and vulnerabilities and managing them in the most cost-effective way) depending on the (1) availability of adequate data for preparing a consolidated sovereign balance sheet, (2) development of a well-designed SALM framework, and (3) enactment of a comprehensive arrangement, perhaps in the form of a separate entity/formal body, for policy coordination among participating policy entities and adherence to agreed principles.

According to countries that employ an SALM approach, the SALM framework may be complex to implement due to a number of policy and institutional factors[9]:

- Monetary policy objectives have an impact on SALM strategies, by affecting either market (interest rate and exchange rate) risk management or directly the size to be managed. On the liability side of the consolidated sovereign balance sheet, they affect debt management strategy, as it typically aims at minimizing debt service cost subject to a prudent level of risk. On the asset side, they affect strategic asset management, as it aims primarily at accumulating an adequate level of net foreign assets, including foreign exchange reserves, to be used for conducting effective monetary and foreign exchange policies and as a buffer against external shocks. The latter entails the management of possible "excess" foreign currency assets (e.g., reserves above the adequacy level), either through the design and management of investment reserve portfolios so that returns on (excess) international assets can be enhanced or through the creation of sovereign wealth funds (SWFs) that can help offset the impact of domestic and external shocks on the fiscal position and/or pass on wealth to future generations.
- Additional difficulties in the design and implementation of an SALM framework may stem from fiscal policy objectives that aim at limiting annual debt service costs. This may put constraints on the duration and currency composition of public debt, since a high share of short-term debt may be perceived to lead to greater volatility in debt service costs.
- The structure of international and domestic capital markets also shapes SALM's design and implementation. Some developing countries cannot issue domestic debt because of illiquid and/or shallow domestic debt capital markets and a lack of a reliable local investor base. Often, attempts to issue domestic currency external debt have not been well-received in international markets owing, in part, to their vulnerability to shocks, restrictions on foreign investors to buy local-currency debt (e.g., on type of instruments, minimum holding period), poor transparency, and/or a lack of interest rate and exchange rate hedging instruments.

In view of these difficulties/constraints, some countries apply SALM concepts, at least partially, by adopting strategies to reduce vulnerabilities of the sovereign assets and liabilities without necessarily having explicit SALM identified objectives. Nevertheless, active engagement of central banks in the design of the structure and in the implementation of this framework can diminish potential operational difficulties, and in this way, benefit not only the overall sovereign portfolio management but also the design and conduct of monetary policy. For example, central banks that may need to accumulate sizable volumes of liabilities on their balance sheets for sterilizing the build-up of foreign currency reserves during periods of strong capital inflows, which can create significant balance sheet mismatches that can undermine a central bank's capital, can address this challenge more effectively

[9] See Jonasson and Papaioannou (2018) and Togo (2007)—a discussion of the coordination challenges among sovereign participating entities is also presented in Section II. C.

in an SALM framework by undertaking coordinated debt buybacks or debt prepayments financed by reserves (e.g., Brazil, Mexico, and Russia).[10]

Finally, as Maziad and Skancke (2014) note, a flexible SALM framework that integrates various macroeconomic and financial trade-offs with the aim of containing financial risk to the sovereign balance sheet requires, at the very least, coordination of the reserve and debt management decisions in terms of currency mix and duration. This fundamental premise should apply to the central bank reserve management. To the extent that sovereign assets/reserves exceed levels needed for shorter-term liquidity purposes, this excess could be invested in less-liquid/higher yield instruments to preserve wealth for future generations (preferably through a dedicated savings fund subject to appropriate institutional safeguards), provided that such investments help reduce the overall sovereign balance sheet risks. To this end, the investment objectives and strategies of sovereign assets could be informed by the structure and nature of sovereign liabilities, including contingent claims. This will be reflected in the associated investment horizon, mandate, and risk profile and, in turn, in the type of savings fund.

2.3.3 Role in Development of Domestic Capital Markets[11]

The development of domestic government bond markets has recently become a matter of growing policy interest in many countries, independently of the stage of their capital markets advancement. The benefits of a deep and liquid domestic debt market go beyond providing a reliable source of financing for fiscal deficits. They include diversification of funding sources, avoidance of the limitations of banking sector financing and inadequate availability of foreign aid and concessional foreign loans from the official sector (i.e., foreign governments and multilateral institutions), enhanced ability to respond to volatile capital flows and commodity prices, and reduction of the risks associated with borrowing in foreign currencies (Jonasson and Papaioannou 2018). Experience of advanced and emerging market economies has shown that well-regulated, predictable, stable, and liquid domestic debt markets can play a critical role in supporting economic growth and in helping the development of the financial sector, especially its efficacy and flexibility with regards to monetary policy conduct and resilience to financial shocks.

In particular, well-developed government bond markets could help finance budgetary deficits through the issuance of longer-term treasury bonds. In comparison with treasury bills or shorter-term treasury bonds, long-term bonds minimize refinancing risk in the government debt portfolio and, by lengthening the average time to interest rate resetting, its exposure to interest rate risk. Investors are willing to buy longer maturities only if they are confident in their ability to sell these securities if

[10] For a discussion of Mexico's case, see Ortiz (2007).

[11] See also Chap. 8.

they need to liquidate them. Also, they are willing to pay a higher price for a security with this advantage, which implies a lower yield and consequently a lower cost of funding for the government. As the secondary market develops, market prices of longer-term bonds are the basis of the yield curve, against which corporate bonds can be priced and market risk be hedged.

Establishing and developing domestic debt markets is a long and complex process that requires certain key preconditions to be in place (IMF et al. 2013; Amstad et al. 2016; IMF and the World Bank 2016; BOJ–BIS 2012). Many issues can inhibit the development of the market, such as macroeconomic or political instability; financial controls; low domestic savings rate; paucity of institutional investors; proliferation of government agencies issuing securities causing market fragmentation; unpredictable issuance policy; and absence of the required market infrastructure. Potential obstacles to the development of a domestic bond market depend, therefore, on a country's overall degree and stage of development. Accordingly, in building a deep and liquid bond market, countries typically develop their own reform plans suited to their conditions.

In particular, the credibility of the government as an issuer of securities and rational policymaker is an essential precondition in the development of an efficient domestic bond market. Government credibility implies that the size of the public debt allows investors to be confident about the government's ability to meet its financial commitments (i.e., to service and repay its borrowings). A prudent fiscal policy will typically mitigate concerns about debt sustainability. Another significant condition is the commitment of the government to pay market interest rates, i.e., not to enact regulations to create a captive investor base by compelling some institutions to buy debt instruments (i.e., by obliging banks to invest in instruments a certain percentage of their deposits), thereby enabling the government to issue at artificially low rates. Further, predictability and transparency of the government's annual issuance plan to meet its gross borrowing requirement is essential in enabling investors to plan their own portfolios and building the government's credibility.

Further, the establishment of a well-functioning primary domestic government bond market depends critically on developing sufficient secondary market liquidity, with a high turnover and great price transparency. This helps create a liquid yield curve, which is critical for an efficient bond pricing and market risk hedging. To enhance secondary market liquidity, governments issue benchmark securities of chosen tenors, including through liability management operations, e.g., bond buybacks or exchanges. Additionally, a well-functioning money market is crucial for the development of an efficient domestic bond market to ensure a competitive and efficient system of market-based financial intermediation and support an active secondly bond market by reducing liquidity risk. Besides, it facilitates monetary policy operations, with market-based instruments anchoring the short end of the yield curve and promoting the development of the foreign exchange market.

A sound banking system is similarly vital for the development of a domestic bond market, as it provides adequate appetite to invest in securities and thus helps

increase secondary market liquidity.[12] Moreover, a large and heterogeneous investor base with different risk preferences, investment maturity horizons, and trading motives ensures a strong and stable demand for government debt securities in a range of market conditions. Another precondition is the existence of appropriate technical and regulatory infrastructure, which is also of relevance to foreign exchange reserve managers of central banks. In general, there is no need for a sophisticated, high-capacity infrastructure in the initial phase, but as the market develops and the number of participants increases and diversifies, a more efficient system for the registration, custody, clearance, settlement of, and payment for debt instruments should be put in place.

The responsibility for ensuring that these preconditions for a macroeconomic and generally conducive environment are met should be shared among fiscal, monetary, and debt management authorities. In particular, an inter-agency consultative process would be required for establishing the preconditions within the scope of a plan for overall macroeconomic prudency and reforms. Experience has shown that policy interventions are effective and reforms are best-enacted in countries where an empowering institutional framework exists (i.e., suitable legal, tax, and governance structures are in place) and commitment begins with the heads of the institutions and is conveyed to the principals of the agencies that participate in this endeavor.

Central banks could first and foremost help in the development of the domestic government bond market, as well as of equity markets, by maintaining a stable macroeconomic environment and well-regulated financial system. Central banks could also help in such development by coordinating with fiscal and debt management authorities the issuance of possible central-bank bonds and government bonds, especially with regard to maturities, so as (1) a liquid yield curve is established (which in turn will assist in the development of the country's money markets and derivatives instruments for interest rate and exchange rate hedging operations by domestic and foreign market participants and will serve as a benchmark for private sector, banks and corporates, borrowing), and (2) amble liquid bond instruments are generated, which could facilitate in the efficient exercise of monetary policy operations.

In this regard, uncertainty about future macroeconomic conditions, particularly about the course of inflation, will prevent the government from extending the yield curve beyond very short-term securities. If inflation is rapidly increasing and interest rates are high and volatile, investors will at best buy only very short-term securities with maturities no longer than a few weeks. High inflation and high interest rates are perceived as indicators of economic and/or political instability. Extension of the yield curve under persistent inflationary conditions may require issuance of inflation-indexed bonds or variable-rate bonds in the initial stage. Though a domestic government bond market can begin with a relatively high inflation rate, it needs government commitment to contain inflation in order to develop.

[12] See also Chap. 8.

2.3.4 Facing Other Emerging Challenges

2.3.4.1 Central Bank Digital Currencies, Cryptocurrencies and Distributed Ledger Technologies (e.g., Blockchain)

Central bank digital currencies (CBDCs), Cryptocurrencies, such as Bitcoin and Ethereum, and distributed ledger (DL) technologies, in particular Blockchain, are among the latest innovations in the financial system (Jagtiani et al. 2018). Cryptocurrencies, as digital currencies with an open, distributed ledger, could alter the structure of global transactions and offer significant efficiencies in global markets. The public's long-standing efforts to avoid registration and scrutiny of ensuing transactions are cited as principal reasons for the creation and proliferation of these private currencies. However, the use of cryptocurrencies has raised a number of concerns, including high price volatility and safety of corresponding assets, money laundering and terrorist financing risks, financing illicit activities, promoting tax evasion, and financial stability considerations. The main advantages of the DL technology relate to the ensured higher designed decentralization and extend to the broader financial system. Advances in the DL technology, especially with regards to digital identities and "smart" contracts, are expected to help in the wider spread of digital currencies as efficient means of transactions, such as payments, transfers, investment, trading, peer-to-peer lending, and crowdfunding.

As cryptocurrencies can offer an alternative to national currencies as a medium of exchange for transactions and store of value, irrespective of any regulations that may be imposed, their existence will be determined by their functionality and the efficiency of the technology that will support them.[13] Although the current small use of cryptocurrencies is not envisaged to pose any monetary policy transmission or financial stability concerns, central banks and regulators need to remain vigilant about the resultant risks from their evolving uses and be ready to introduce regulation to curb hazards stemming from possible payment and clearing system disruptions and from transactions of questionable integrity. At the same time, monetary authorities should usefully take advantage of any new DL technologies that could improve the efficiency of the existing payment and clearing systems, as well as of the overall financial apparatus. The short- and medium-term benefits and associated risks to their users, central bank managers of foreign reserves, and the financial system as a whole are widely debated among policy makers, international financial institutions, and markets, with various proposals being currently deliberated on how to move forward both in local monetary systems and the global economy.

2.3.4.2 Cybersecurity Attacks

Given the increasing cybersecurity risks for financial institutions, central banks have recently been proactive in implementing measures to prevent or minimize cyberattacks. For example, the European Central Bank (ECB) has designed a

[13] Some analysts argue against the store-of-value function of cryptocurrencies, e.g., Shin (2018).

simulation test for cyberattacks on banks, stock exchanges, and other critical entities for the functioning of the financial system. This action is the result of a series of cyberattacks on financial institutions and central banks during the past few years, including those on the three biggest Dutch banks earlier in 2018. The ECB initiative aims at creating an integrated framework for the tests that assess the resilience of the European Union financial entities against cyberattacks. The European framework "Threat Intelligence-based Ethical Red Teaming" (TIBER-EU) is intended to function as a roadmap for such tests in financial institutions.

2.3.4.3 Environmental, Social, and Corporate Governance (ESG) Responsible Investments[14]

In its effort to help create an economically efficient, sustainable global financial system for long-term value creation, the UN-supported Principles for Responsible Investment (PRI) group developed six voluntary environmental, social, and corporate governance (ESG) principles for long-term institutional investors (PRI 2016, 2018). As many investors have already subscribed to the PRI principles, central banks, as managers of the investment tranche of their foreign exchange reserves, need also to commit to them as part of their fiduciary duty to act in the best long-term interests of their beneficiaries, i.e., the citizens of their countries. By adopting the principles, investors recognize that ESG issues can affect the performance of investment portfolios (to varying degrees across companies, sectors, regions, asset classes and through time) and their application may better align them with broader objectives of society. These principles, provided that they are consistent with the respective investors' fiduciary responsibilities, require that investors (1) incorporate ESG issues into investment analysis and decision-making processes; (2) will be active owners and incorporate ESG issues into their ownership policies and practices; (3) seek appropriate disclosure on ESG issues by the entities in which they invest; (4) promote acceptance and implementation of the principles within the investment industry; (5) work together to enhance their effectiveness in implementing the principles; and (6) report on their activities and progress towards implementing the principles (PRI 2015). By adopting such principles and helping in their implementation, central banks can contribute to the development of a financial system that will reward long-term, responsible investment and also benefit the environment and society as a whole.

2.4 Concluding Remarks

In modern times, central banks are called to play multiple roles, including the traditional one of monetary and financial stability and the more contemporary ones such as ensuring overall financial stability and adequate and sustainable economic

[14] See also Chap. 26.

growth, i.e., safeguarding employment and prosperity. The wider role of central banks in their respective economies is now more generally accepted, primarily as a result of the global authorities' successful reaction to the recent financial crisis and aversion of a global depression. Such reaction followed the timely realization of central bankers that monetary policy cannot stay in the traditional confines of ensuring inflation stability and not pay due attention to the general state of the economy. This expanded role of central banks is likely to last far beyond the period that economic activity and labor market conditions have returned to normalcy (proxied by respective levels observed before the financial crisis). The adaptive stance of major central banks and maintenance of quantitative easing measures, as needed, is another indication that they are serious about their guardian role of the public interest.

Further, with the advent of new domestic or international macro-financial challenges, central banks need to (1) strengthen their coordination role with other policy-making institutions to enhance the overall efficacy of domestic economic policy making, (2) develop a consolidated sovereign balance sheet to monitor and manage better sovereign portfolio risks, and (3) promote the establishment of domestic capital markets, including local-currency bond markets, to increase the availability of financing sources and reduce foreign exchange exposures, thus serving as a diversifier for foreign reserves. In addition, central banks should be prepared to face technological innovations, as well as novel domestic or international financial developments and risks, including the current spread of CBDCs, cryptocurrencies and distributed ledger technologies in the financial system, cybersecurity-attack concerns, and environmental, social, and corporate governance considerations in their reserve-investment decisions.

In this context, central banks' communication strategies need careful attention. Especially, as many important decisions relating to the state of the economy and the well-being of citizens are increasingly taken by central bankers and regulators, respective parliaments have to oversee the design of central banks, including as regulatory institutions, so that their roles are kept sufficiently clear and focused. Central banks need to inform their parliaments and the public about their actions and policies to avoid suspicions, wrong impressions or adverse perceptions. This is even more so after the recent global financial crisis, as central bankers (and financial regulators in general) have gained more influence and authority as a result of their actions to prevent a global financial system collapse. In a recent book, Tucker (2018) examines the enhanced role of central bankers and regulators and lays out principles needed to ensure that they remain stewards of the common good.

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