



Monetary and Capital Markets Department
TECHNICAL ASSISTANCE HANDBOOK

Monetary Operations and Domestic Market Development

Reserve Requirements

Prepared by the Central Bank Operations Division (CO)
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July 2022

THIS ONLINE HANDBOOK

This handbook aims to distill, document, and make widely available the lessons learned from the Monetary and Capital Markets Department's (MCM) technical assistance (TA) over a long period while also incorporating lessons learned globally. It covers a wide range of central banking topics pertaining to governance and risk management, monetary policy, monetary and foreign exchange operations, and financial market development and infrastructures while highlighting, where relevant, specific issues for low-income, resource-rich countries. The handbook documents and promotes good practices and supports the consistency of advice over time. However, it stresses that one-size solutions cannot fit all, and all advice therefore needs to be tailored to country-specific circumstances. The handbook comprises self-contained, issue-specific chapters with cross-references on overlapping issues where needed. It is aimed at those who provide TA (both IMF and non-IMF personnel) and practitioners in central banks and other relevant institutions.

THIS CHAPTER: RESERVE REQUIREMENTS

The reserve requirement is an instrument used to influence the demand for reserves at the central bank. This chapter details how this instrument helps the central bank meet its mandates of price and financial stability, and how its effectiveness depends on the alignment of its design and parameterization with the purposes for which it is targeted. As different objectives may conflict, the chapter recommends seeking alternative instruments to streamline as much as possible the objectives of the reserve requirement and improve its efficiency. The use of the reserve requirement must be considered within the context of the operational framework more broadly.

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Glossary

FX	Foreign Exchange
HQLA	High-Quality Liquid Assets
IMF	International Monetary Fund
LCR	Liquidity Coverage Ratio
MCM	Monetary and Capital Markets Department, IMF
MOID	Monetary Operations and Instruments Database, IMF
OMO	Open Market Operation
RB	Reserve Base
RMP	Reserve Maintenance Period
RR	Reserve Requirement
TA	Technical Assistance
URR	Unremunerated Reserve Requirement

Executive Summary

A reserve requirement (RR) requires some financial entities to hold a specified balance at the central bank. The RR has been used to impose liquidity buffers on financial institutions (microprudential), increase systemwide resilience against systemic risks (macroprudential), and implement monetary policy in different operational frameworks. The multiple objectives could give rise to conflict between them.

This chapter provides guidance on the most frequently asked questions: What entities should be subject to the RR? What liabilities should be reservable? Should assets other than reserves be eligible to fulfill the RR? Under what circumstances should fulfillment be in domestic currency versus foreign currency? At what level should the reserve requirement be set, and should it apply uniformly to all liabilities? What is reserve averaging, when should it be used, and what is the optimal period for such averaging? Should the RR be included in the high-quality liquid assets (HQLA) of the liquidity coverage ratio (LCR)? Should the RR be remunerated, and if so, how?

This chapter highlights the difficulties that arise from using one instrument—the RR—to meet multiple objectives. It recommends updating and streamlining RR objectives with more closely targeted parametrization to improve its impact. While the RR can contribute to achieving microprudential and macroprudential objectives, it would be nonetheless useful to expand central bank policy toolkits to reduce the risk of tension between objectives; for example, in the case of microprudential objectives, the liquidity coverage ratio (LCR) should be used as soon as market conditions allow.

Technical assistance (TA) should aim at minimizing costs and distortions that arise from the RR. The chapter advocates a comprehensive set of counterparties (including non-bank financial institutions in some circumstances), a large reserve base (RB), a uniform ratio, reserve-only eligibility for fulfillment, and remuneration at the opportunity cost to minimize distortion and avoid circumvention. Distortions may be necessary to achieve macroprudential objectives, but they should be considered as part of a broader set of policies to tackle the underlying issues and should be temporary.

This chapter tackles other important issues. If the RR is used for monetary policy implementation (the most common objective), for example, it should be averaged over a sufficiently long maintenance period to facilitate the intertemporal smoothing of liquidity shocks to help stabilize short-term interest rates. The chapter argues that the RR could be partially included in the HQLAs of the LCR. Finally, it recommends setting the RR penalty above the lending facility rate to provide sufficient incentive to fulfill the RR, but not excessively harsh penalties that could encourage reserve hoarding.

I. Context

The RR has potential application to a wide range of financial market settings, regulatory setups, and monetary frameworks. The IMF's Monetary Operations and Instruments Database (MOID), last updated in 2018, shows that 116 out of 125 central banks employ some form of RR, confirming its appeal as a broadly used instrument. It also has a long history, dating back to the 19th century.

Some developments have, at least temporarily, lessened the importance of the RR. The RR has become irrelevant in a floor system with ample reserves—a system many central banks moved to following actions taken to support the functioning of financial markets or for providing additional monetary accommodation at the zero lower bound – where levels of excess reserves are considerably higher than the minimum required for keeping short-term market interest rates close to the floor. Further, liquidity regulation implemented in many countries in the aftermath of the global financial crisis, including those advocated by Basel III, has superseded the RR as a microprudential instrument.

II. Analytical Background

A. CONCEPTUAL FRAMEWORK

Bank reserves are the balances held by commercial banks at the central bank. Based on the motives to hold reserves, three overlapping concepts are relevant: (i) RR—the amount required to be held through regulation; (ii) voluntary reserves—the amount held for precautionary reasons (Box 1 includes a definition of the precautionary demand and methods to measure it); and (iii) excess reserves—the amount held in excess of the RR. Excess reserves can be held voluntarily if they have a precautionary motive or involuntarily if the central bank does not offer placement opportunities. Central bank quantitative easing, for example, forces banks to hold reserves in excess of their demand for voluntary reserves.

Box 1. The Precautionary Demand for Reserves

The *precautionary* demand for reserves is the minimum balance that banks would always try to keep, including by financing it at the central bank lending facility if one is in place. This part of the demand could change under the influence of exogenous factors such as size and frequency of liquidity shocks; opportunity costs of being long or short reserves (determined by the costs of borrowing from or depositing with the central bank relative to market rates and the conditions for accessing the central bank lending facility); cost of the RR under-fulfillment penalty; efficiency of the payments system; length of the RR maintenance period; specification of the reserve requirement (averaged or not); availability and price of alternative HQLA; counterparty risk perception; and the efficiency of the interbank market. Although the precautionary demand cannot be directly observed, several methods can be used to estimate it. Four common methods of estimation are:

Observed minimum holdings of reserves.

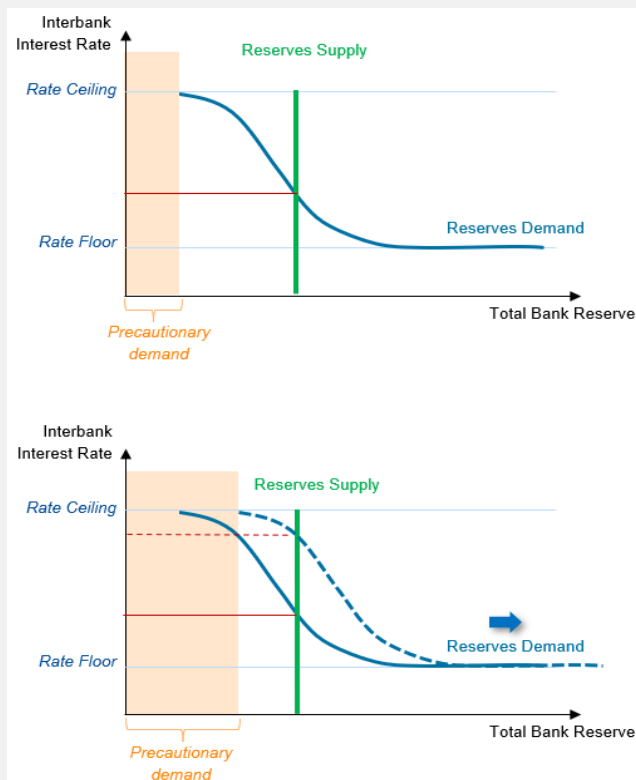
Assuming that the demand for reserves is stable in the medium term, the historic reserve holding pattern by individual banks can be used to gauge the demand. This involves summing the minimum daily level of reserves held by each bank over the course of several maintenance periods and selecting the lowest outturn as an indication of the precautionary reserves.

$$\text{Precautionary demand} = \sum_{1}^n \min (R_i)$$

Estimate the conditional distribution of the reserves. The distribution could be estimated as a function of market structure (and other factors influencing the demand for reserves) using statistical modeling techniques such as Generalized Autoregressive Conditional Heteroscedasticity. The lowest percentile of the conditional distribution would represent the precautionary demand for reserves. This method is an improvement over observed minimum holdings, as the precautionary demand is conditional on relevant exogenous variables and the estimate is forward looking. The distribution could be estimated on an aggregate basis or on a bank-by-bank basis to account for bank-specific factors.

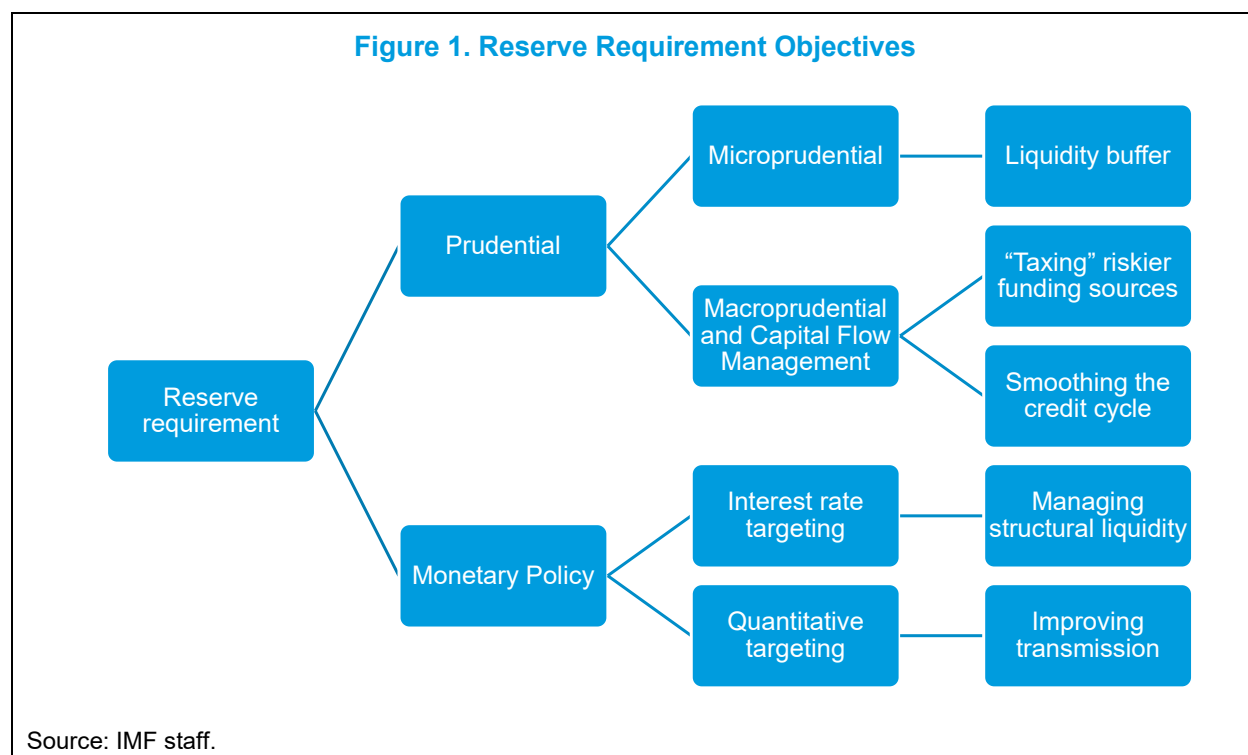
Money market rate sensitivity to reserve level changes. When reserves drop close to banks' minimum demand, short-term interest rates typically spike; therefore, the level of reserves at which interest-rate sensitivity increases can be used to infer the banks' demand for reserves. The demand for reserves could be estimated, factoring in the non-linear relation between interest rates and reserves as well as incorporating exogenous regressors that control for market sentiment and other factors that could influence the shape of the demand curve.

Market surveys. Central banks can regularly survey banks on their strategy for holdings reserves. Each bank treasurer will have an asset and liability risk management strategy, which will incorporate a target for their holdings of reserves. For instance, every six months the Federal Reserve Bank of New York surveys senior financial officers at major banks about their strategies and practices for managing their reserve balances.



B. OBJECTIVES OF THE RESERVE REQUIREMENT

Central bank motivations for imposing the RR are generally aligned with modern-day central bank mandates of maintaining price and financial stability. Operationally, this means that the RR is designed to meet either monetary or prudential policy objectives (Figure 1). However, some central banks have used the RR to pursue a combination of different objectives in different categories.¹



C. MONETARY POLICY OBJECTIVES

Quantitative Targeting

The RR was used in a quantitative targeting framework to control base money and guide credit growth. As credit to the economy expands, the RB increases, with new credits creating new deposits. Once the supply of reserves is set by the authorities at the desired level for an inflation objective and a given potential output, any credit expansion that is not consistent with this level would automatically lead to an increase in interest rates as the demand for reserves would exceed the supply. In turn, this interest rate increase would reduce the demand for credit and, thus, the RB, which ultimately pushes the demand for reserves back in line with the supply. The reserve requirement amplifies the traction of the demand for reserves on rates (precautionary demand may be small in well-functioning markets and not strongly tied to credit development), and its ratio can be adjusted to speed up or slow down the tightening process if necessary.

¹ An earlier taxonomy (Gray 2011) provided three categories: prudential, monetary control, and liquidity management.

Interest Rate Targeting in a Mid-Corridor System

Prior to the global financial crisis, many central banks operated a mid-corridor system in which the mid-rate was the operating target. The central bank either fully satisfied the counterparties' demand at the rate corresponding to the middle of the corridor (i^*) under fixed-rate full-allotment or calibrated its open market operations (OMOs) to keep market rates near i^* . The upper bound of the corridor is defined by an overnight lending facility whose rate is set at a margin (x) from i^* and an overnight deposit facility whose rate is set at a margin ($-x$) from i^* .

The RR can play a key role in calibrating OMOs in a mid-corridor system. As explained in Box 1, the precautionary demand for reserves is not observable, it is conditional to exogenous variables that can change, and it can only be estimated with some degree of forecast error. A RR with averaging² that comfortably absorbs the estimated precautionary demand for reserves would set a stable total demand for reserves that could then be incorporated in the calibration of OMOs.

Central banks may influence the OMO size by adjusting the structural liquidity position, a task for which the RR can be useful.³ Central banks should identify a range for the size of OMOs that delivers adequate control over short-term rates. The range will depend on the size of the financial sector, the number of its counterparties, and the efficiency of the interbank market. The structural position is influenced by trends in the autonomous factors.⁴ An increase in the RR ratio reduces the structural liquidity position (that is, it makes it more negative or reduces its positive position, depending on the starting point) as it locks away liquidity. In this case, when starting from a liquidity deficit, OMO injections would have to be increased to leave interest rates unchanged. Therefore, the RR may be used to adjust the structural position although other options using market-based instruments may be preferable. Changes in the RR should be supported by medium-term forecasts of the structural liquidity position.

Interest Rate Targeting in a Floor System

The RR with averaging helps to calibrate monetary operations in a parsimonious floor system.⁵ Compared with the mid-corridor system, the central bank aims at satisfying slightly more than the precautionary demand for reserves to keep the market rate pinned to the floor, which is remunerated at the policy rate. The reserve supply could be calibrated without a RR based on estimates of the demand for reserves and forecasts of the autonomous factors. If a RR is in place, the central bank would have to provide more than the demand for excess reserve because the RR is known exactly *ex ante*. The demand for excess reserve could be relatively stable if the RR is high enough and if averaging is allowed.

² "Averaging" is defined in Section IV (C).

³ The structural liquidity position is the position of commercial banks vis-à-vis the central bank after fulfilling the RR but prior to any short maturity OMOs. Banks have either an excess of reserves (a surplus they are looking to invest) or a shortage (a deficit, in which case they must borrow).

⁴ Autonomous factors are items in the central bank balance sheet that impact bank reserves, but they are generally outside the direct and immediate control of monetary authorities. These items include foreign and domestic assets, and currency in circulation (see chapter on Liquidity Forecasting).

⁵ Parsimonious floor systems aim at the minimum central bank balance sheet size to implement a floor and are different from floor systems arising from quantitative easing achieved through asset purchase programs.

D. PRUDENTIAL OBJECTIVES

Microprudential

The RR ensures that banks hold a minimum specific amount of high-quality and liquid assets as backing for deposits. The RR, from this perspective, serves both as a form of deposit guarantee and as a tool to manage banks' liquidity risk. The prudential role of the RR evolved from that of deposit guarantee to one of forcing banks to keep some liquidity buffer that can absorb temporary payment shocks (minimize settlement risk) and deposit outflows.

This function is most useful in countries that are financially dollarized. In these economies, the central bank cannot create FX in the same way it can create domestic reserve money, and for this purpose the RR on FX deposits should be held in foreign currency. While other tools for internalizing liquidity risk are preferable (for example, the LCR), a dearth of liquid securities in undeveloped markets may mean that a RR is the preferred tool.

Macroprudential and Capital Flow Management Measures

The RR can be used as a macroprudential tool to reduce systemic risks (IMF 2014a). Specifically, it can be used to: (i) increase systemwide resilience against systemic liquidity shocks; and (ii) contain systemic risks from broad-based credit growth, as raising the RR could contribute to moderating credit growth by increasing the spread between lending and deposit rates.

The RR could solve a market failure with financial stability implications. Ferrara and others (2019) distinguish between individually illiquid banks, whose liquid asset buffers are insufficient to meet cash outflows even in the absence of defaults by other banks, and banks that become illiquid due to the failure of these other banks to meet their obligations. At the individual level, treasurers ensure that their bank is individually liquid, but they do not internalize the risk of market illiquidity. Imposing a regulatory demand for reserves helps to guarantee that all banks hold enough liquid assets, which is potentially more than they would hold individually without internalizing the systemic illiquidity risks.

A RR remunerated below the opportunity cost of holding reserves widens the spread between deposit and lending rates (the “intermediation spread”). The lower the remuneration relative to the opportunity cost, the greater the impact of changes in the requirement ratio on the intermediation spread. If, for instance, a proportion of assets backing a deposit liability must be held as non-interest-bearing balances at the central bank, then the average interest rate that banks charge borrowers must be correspondingly higher than the average rate paid on its deposits.⁶

RR can be applied to funding sources deemed to pose elevated financial stability risks. Where the RR is unremunerated (URR) or remunerated below the opportunity cost, there is an effective tax on the liability on which it is based. This allows the authorities to alter the relative attractiveness of different funding sources and mitigate the buildup of systemic risk from a particular source.

In some circumstances, the RR could be a capital flow management measure (Central Bank of Iceland 2016; Ostry and others 2011). The RR could be used to tax capital flows as an alternative to an

⁶ See subsection on Remuneration, Penalties, and Period-End Consideration for details.

actual tax. The objective would be one of either monetary policy nature, taxing the interest rate differential between jurisdictions, or financial stability (i.e., taxing less stable funding sources and reining in the buildup of risk due to capital flows). Following the guidance in IMF (2012a), capital flow management tools may be useful in addressing a capital inflow surge when other policy instruments are constrained, but they should be appropriately targeted and not discriminatory. One challenge, however, is that the risk of circumvention increases as the RR becomes more targeted.

The RR can be used to reduce systemic risk arising from dollarization. FX intermediation entails risks due to unhedged exchange rate exposures (either of intermediaries or their clients) and due to the limited capacity of central banks to provide liquidity assistance in FX to the system. Macroprudential measures, including the RR, could contribute by addressing systemic risk arising from financial dollarization (IMF 2014b). The RR could penalize the recourse to funding (and lending) in foreign currency, if unremunerated. It could also impose a higher liquidity buffer for FX funding compared with local currency funding based on a higher ratio for the former.

The RR may be used to support macroeconomic policy adjustment or to achieve macroprudential objectives when the use of alternative instruments is constrained. For example, an increase in the policy rate could reduce credit growth and rein in procyclicality of credit in most circumstances as much as an increase in the RR ratio. However, if credit booms are fed by inflows of non-resident short-term funding, which may respond positively to higher interest rates, the RR may be a more appropriate form of tightening (Federico, Vegh, and Vuletin 2014) as it increases deposit-lending interest rate spreads and thereby limits capital inflow and exchange rate pressures. The benefits and costs of the RR should be weighed against those of other macroprudential tools that could achieve the same objective to allow for streamlining the RR objective where possible.

A RR used for macroprudential purposes potentially can be circumvented. Economic agents may try to avoid costs associated with macroprudential instruments through: (i) channeling of the funding to institutions that are not subject to the RR, for example, non-resident short-term flows intermediated via non-bank financial institutions instead of banks; or (ii) cosmetic changes to the contractual nature of the liabilities to change their classification, for example, introduce a time deposit with negligible penalty for early withdrawal.

E. GOVERNANCE OF THE RESERVE REQUIREMENT

The RR is best enshrined in law, with the central bank provided the flexibility to design and calibrate the instrument through regulation. Imposition of and changes to the RR should be possible without the need for legislative change. Therefore, the law ideally permits the central bank broad powers to impose RR on its counterparties. Parametrization, as discussed in the next section, is then left to the central bank (either management, the monetary policy committee, or the board) to decide and implement through regulation.

The organizational unit that owns the framework depends on the RR objectives. If the RR mainly aims at implementing monetary policy, the operational department or the implementation committee (sometimes called the liquidity committee) would propose changes to the decision-making bodies that are relevant for policy implementation. If the purpose is macroprudential, it would be the financial stability

committee. Multiple objectives for the RR may necessitate an assessment of tradeoffs by the decision-making bodies, which emphasizes why there should ideally be only one objective. Another common issue arises when the objective has changed while the responsibility for the regulation has not. For instance, the microprudential objective may no longer be relevant (because the LCR has been introduced) compared with the policy implementation objective, but the RR regulation is still under the control of the banking supervisor, which at times may resist relevant changes.

F. WHEN IS A RESERVE REQUIREMENT NOT NEEDED?

There is a strong case for streamlining the RR objectives where possible. Pursuing multiple objectives complicates design and calibration and likely reduces the efficiency of the instrument. And, if not remunerated, it can be distortionary and undermine financial deepening through the imposition of a tax. Therefore, alternatives should be explored to streamline the objectives of the RR, recognizing that not all central banks use the instrument.⁷ To operate without a RR, other options are needed to effectively implement monetary and prudential policies, as detailed below.

Microprudential Objectives

Credible liquidity regulation need not rely on a RR. Banking sector liquidity regulation has changed considerably since the global financial crisis with the introduction of the Basel III framework, which incorporates a short-term liquidity measure—the LCR. It ensures that banks have sufficient HQLA that can be easily and rapidly disposed of with minimal market impact in case of a liquidity shock. This regulation is, however, more applicable to countries that have a multitude of HQLA available for banks to hold as a buffer against liquidity shocks. Furthermore, a RR and LCR can coexist and, possibly, complement each other as explained in the section “Eligibility for the Liquidity Coverage Ratio.”

Macprudential and Capital Flow Management Objectives

The countercyclical capital buffer offers an alternative to the RR to smooth credit cycles. This tool enables the authorities to vary the amount of capital that banks must hold depending on their assessment of systemic risk. During peaks in the cycle, the countercyclical capital buffer is increased to curtail the extension of credit and to build a buffer, while it is released at the bottom of the cycle to support the flow of credit.

Managing Structural Liquidity

Central banks often have other options for managing structural liquidity. Central banks in advanced markets can use marketable securities to manage the structural liquidity position by buying/selling sovereign instruments, managing the issuance of their own securities, and perhaps dealing in more complex instruments such as cross-currency swaps markets (for example, New Zealand). Advanced, more developed, and deeper markets allow the central bank to execute sizable transactions in these markets whenever the structural liquidity position needs to be adjusted with minimal market impact. Market-based instruments are less likely to be distortionary than the RR, while also providing support to financial market functioning and development. That said, possible distortions from alternative instruments,

⁷ Central banks that do not use the instrument include Australia; Canada; Denmark; Hong Kong SAR, China; Mexico; New Zealand; Norway; Sweden; and Timor–Leste.

such as those arising from the central bank issuing and rolling over a large stock of securities, should be carefully weighed against the distortion attributed to the RR.

Interest Rate Targeting

Interest rates could be targeted in a mid-corridor or in a parsimonious floor system without a RR.

With accurate liquidity forecasts and well-functioning interbank markets, central banks would only need an OMO to steer interest rates, independent of the interest rate targeting framework. The RR with averaging is useful because of the unpredictable changes in the supply or the demand for reserves. In this respect, some central banks conduct OMOs daily with overnight maturity instruments and some (Mexico) do so twice daily. Such frequency makes it easier to calibrate due to the more accurate forecast on a shorter horizon. RR are therefore not used.

The RR becomes redundant under quantitative easing. Several central banks that engaged in balance sheet expansion after the global financial crisis pushed the excess reserve supply far into the section of the demand curve in which interest rates did not respond to liquidity shocks. In these circumstances, the RR does not play any monetary policy role.

G. COMMON PITFALLS

The RR could result in disintermediation of the banking system toward more risky parts of the financial system. Although authorities can avoid the costs of sterilizing structural reserves by imposing an unremunerated RR, the effect is to tax financial intermediation, increasing the costs to savers and borrowers through wider intermediation spreads. In turn, financial activity is incentivized to move from regulated parts of the financial system to unregulated parts, undermining financial sector development and perhaps making it more difficult to identify and mitigate risks to financial stability.

III. The Design of the Reserve Requirement Framework

Designing the RR framework involves important decisions on the following parameters:

- The coverage and the RB: which counterparties would be subject to RRs and which of their liabilities would define the base of the RR.
- The RR ratio (c): the percentage to be applied to the RB representing the reserve requirement. The reserve requirement ratio is equal to $c \cdot RB$.
- The RR fulfillment: the eligible assets, averaging provision, and the maintenance period.
- Financial considerations: the remuneration of the RR and the penalties for non-compliance.

The RR should be clearly communicated to market participants, noting the legal basis for its application and the parametrization. This communication is needed to ensure participants understand its purpose, whether and how they need to comply, and how the instrument may complement other instruments to meet either monetary policy or prudential objectives. The simpler the parametrization, and the clearer the link between parameterization and the objectives, the easier the task to clearly communicate to counterparties and have them react in line with central banks' intended purposes.

A. COVERAGE AND THE RESERVABLE BASE

Coverage

Guidance: To ensure an even playing field and to minimize room for circumvention, apply reservable base to all commercial banks and consider other counterparties as may be necessary to meet intended objectives.

The RR is usually only applied to commercial banks, while there may be reasons to include some non-bank financial institutions (NBFIs). Increasingly, NBFIs (for example, investment banks and mutual funds) are competing to attract financial resources, are exposed to similar liquidity risks as banks, and are playing a more prominent role in the payment system and financial intermediation. As such, there might be a rationale to extend the RR beyond banks to ensure a level playing field and to avoid circumvention, especially if the RR imposes a cost (that is, is unremunerated). Furthermore, it would enhance the resilience and functioning of the payment system where NBFIs may be directly or indirectly members of the real-time gross settlement system. NBFIs are often outside of the regulatory perimeter of the central bank, which could be a barrier to imposing the RR on them. However, there may be a stronger case for inclusion if NBFIs are granted access to central bank services (IMF 2020).

The Reservable Base

Guidance: Apply to all non-equity liabilities using daily average balances over the calculation period.

The RR should be applied to all non-equity liabilities, including FX liabilities and repos with clients. This helps minimize distortions between type of liabilities and limit the room for circumvention, especially if the RR rate is uniform (see next section). It would not apply to FX swaps if the RR were applied to the currency provided by the institution in the swap. The approach allows for a lower across-the-board RR ratio for the same RR aggregated nominal amount, delivering a greater impact on the overall liquidity conditions for a given ratio.

Central banks sometimes exclude longer-dated liabilities to help deepen the financial sector, but the efficiency of the measure is debatable. The rationale is that longer-dated liabilities could have very high credit and liquidity premia embedded in some markets that would be partially offset through an exclusion from the RB. However, the RR “subsidy” could only compensate for a part of the premium and other more fundamental policies should be deployed to reduce risk. If used for this purpose, the exclusion should be temporary (while other policies are deployed) and should target only a small share of the base to avoid excessively reducing the base.

If longer-dated liabilities are excluded from the RR base, two important factors should be considered. First, the risks of circumvention should be minimized, which, for example, would rule out options for early redemption unless accompanied by penalties calibrated to dissuade such actions (emergency and hardship situations aside). Second, the RB should reflect the residual maturity of the liabilities and not the contractual (that is, original) maturity because longer-dated liabilities with short residual maturity have the same, or greater, liquidity risk as short-dated liabilities.

Liabilities to other institutions subject to the RR should be excluded. A loan from one reservable institution to another represents funds received from a lender on which the lender has already fulfilled the

RR. Without such exclusions, liabilities from the non-reservable institutions would effectively be double-counted in the RR calculation. Further, this increases the cost of interbank activity, undermining the pricing and distribution of liquidity and market activity more generally. When applied to marketable securities, however, such exclusions may be difficult to implement given that the borrowers may not know the actual holders at any given point. The European Central Bank addresses this problem by requiring banks to document the holders that will benefit from the deduction; otherwise, a standard deductible based on issuance patterns can be applied. The Bank of England, on the other hand, uses a bank's claims on other banks as the deductible.

Monthly average balances (taken at the end of each working day) is best used for the RB calculation, as it avoids potential volatility where the calculation is based on a single day. The deposit base could experience intramonth volatility due to typical swings in payments (salaries, taxes, and others). In addition, window dressing behavior may occur when the RB is calculated exclusively on the end-of-period balances. When a monthly average is not possible due to banks' systems constraints, a second-best option is to use averages for a subperiod, such as over the past five days of the maintenance period.

B. THE RATIO

The Level of the Ratio

Guidance: The ratio should be no higher than is necessary to meet its stated objectives.

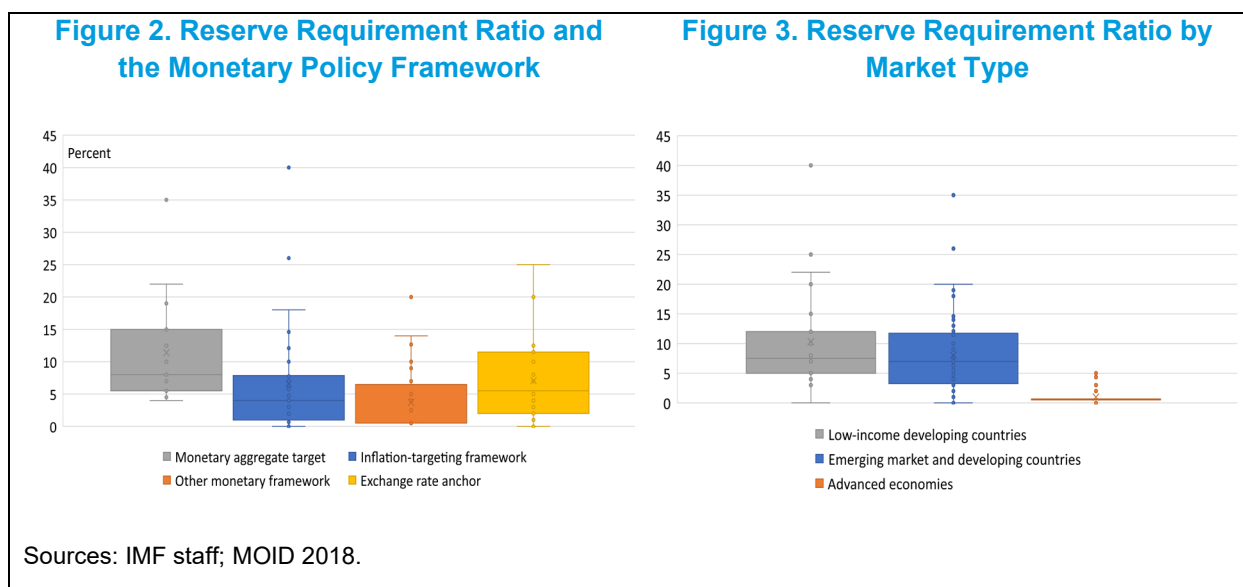
The RR should be set at a level consistent with rightsizing the volume of monetary operations. In the case of a corridor system, the RR level, in coordination with other structural operations, is a function of the optimal OMO range. Under a parsimonious floor, it would contribute to right size other types of structural operations.

The RR could provide a liquidity buffer facilitating intertemporal smoothing if it provides enough room for averaging. Assuming averaging is in place, the RR level should be high enough to cover the precautionary demand (that would not be used for intertemporal smoothing) and typical unpredictable autonomous factors fluctuation, which could be proxied by the typical forecast errors of the central bank. In some circumstances, providing enough room for averaging may require OMOs to be conducted in volumes outside of an optimal range. When this happens, other structural instruments, such as long-term securities transactions, should be considered to bring OMO volumes back into the desired range without lowering the RR ratio.

On foreign currency liabilities, the ratio should be high enough to ensure coverage of a sizable share of deposits. The central bank is constrained in its ability to provide a backstop (that is, emergency liquidity assistance in foreign currency) for FX liabilities. As a guide, the RR could be calibrated to cover between one-fifth and one-third of deposits in the absence of other liquidity regulations (for example, the LCR). This range roughly corresponds to the typical coverage ratio of banknotes to gold under the 19th century fractional banking system.

In general, RR ratios are lower in inflation-targeting advanced economies. The RR ratios are higher among central banks that target monetary aggregates, which is consistent with the important role played by the RR in this framework (Figure 2). However, the difference between fixed exchange arrangements

and inflation targeting is relatively small. On the other hand, the difference between advanced economies and the rest of the sample is clearer, with emerging markets and low-income countries having higher ratios than advanced economies (Figure 3). Advanced economies used to have a leaner balance sheet than emerging markets and low-income countries because their needs for FX reserves and for monetary financing of government operations were smaller. More recently, advanced economies have introduced asset purchase programs that inflated their balance sheet. However, this was a deliberate change in the structural liquidity position that did not require an offsetting move on the RR side.



Uniform or Differentiated Ratio?

Guidance: The ratio should be applied uniformly across liabilities except where the RR has a macroprudential objective, in which case differentiated ratios may be necessary.

The starting point is to apply a uniform ratio to all reservable liabilities for ease of implementation and to minimize distortions as well as incentives to circumvent. A uniform ratio applies equally to the liabilities of a counterparty.⁸ A uniform ratio with broad coverage of financial institutions maximizes the impact of a change in the RR ratio on the structural liquidity position. Further, a uniform rate applied across all tenors avoids creating distortions and avoids the risk of circumvention evident when some liabilities have a lower rate applied. About half of the MOID-reporting central banks—mainly emerging markets and those with inflation-targeting frameworks—had only one RR ratio (Table 1). Some central banks introduced a lower ratio for longer-dated liabilities for the same reasons that they sometimes exclude those liabilities from the RR base. The limits of this measure are identical to those that exclude longer-dated liabilities from the RB.

⁸ With rare exceptions the ratio is applied to all reservable institutions. Hungary, for example, allowed banks to choose between a 2, 3, 4, and 5 percent RR ratio, which was then applied uniformly to all liabilities. The idea was to let counterparties determine the optimal buffer for them in a range of ratios determined by the central bank.

Table 1. Uniform Reserve Requirement Rate

By Income Level	
	Count
Advanced economies	4
Emerging market and developing countries	42
Low-income developing countries	21
Total	67
By Type of Monetary Arrangement	
	Count
Exchange rate anchor	19
Inflation-targeting framework	22
Monetary aggregate target	12
Other monetary framework	14
Total	67

Sources: IMF staff; MOID 2018.

For RRs to meet macroprudential objectives, differentiated ratios are needed to limit inflows of funding from volatile sources. Such sources may be of short-term duration, in foreign currency, and held by non-residents. Holdings by the latter are usually denominated in foreign currency and have higher risk of sudden flight. Under such circumstances, monetary authorities have only limited capacity to provide emergency liquidity assistance. Consequently, it is appropriate to ask banks to keep a larger part of this funding at the central bank rather than lend it.

In the same vein, some central banks use marginal RR ratios in specific circumstances. A few countries (for example, Chile, Croatia, and Peru during different periods of their history) set higher marginal ratios on new short-term funding from abroad to discourage destabilizing inflows of speculative capital. Other central banks apply a higher marginal ratio on the share of foreign currency deposits exceeding a predefined threshold of total deposits. For example, the Bank of Albania requires 10 percent RR on FX deposits up to 50 percent of total deposits and 20 percent for the share of FX deposits exceeding 50 percent of total deposits.

C. FULFILLMENT

Eligible Assets

Guidance: Eligible assets should comprise only reserve balances held at the central bank and in the same currency as the RB.

Cash in vault can be accepted for RR fulfillment, but this approach is not recommended. The rationale is that vault cash can be converted into reserves on the initiative of banks. Vault cash is included as an eligible asset to compensate banks where there are difficulties with the timely processing of their excess vault cash and for banks in remote regions that may have to hold higher vault cash buffers. However, reserves are held by banks for payments between themselves, while cash is used by the public for retail payments, and vault cash cannot be easily mobilized to meet interbank payment obligations (for example, in the real-time gross settlement system), challenging the idea that cash and reserves are

substitutes. Operationally, vault cash is difficult to accurately measure on a timely basis, giving rise to compliance issues. Including vault cash, all things being equal, effectively reduces the RR, and because it may be volatile excess reserves and interest rates may also become more volatile. However, if included, vault cash should be the average held during the calculation period and be capped at a percentage of the RR, for example, 20 percent, to avoid giving too much discretion to the banks to set their actual RR by adjusting the share fulfilled with vault cash. Alternatively, in the U.S., the vault cash eligible was the balance of previous periods; therefore, the amount were known ahead of the start of the RMP.

Generally, an RR on FX liabilities should be fulfilled in FX (IMF 2019). Denominating the RR fulfillment in the same currency as the base is the less distortionary option from a financial intermediation point of view. Local currency fulfillment of the FX RR requires banks to source additional local currency funding in the domestic money market, which is more expensive than other options. Banks usually try to make up for the extra cost by minimizing low-yield FX buffers, thereby taking additional risk to on-lend FX funding (loan dollarization) and passing on the cost of the FX RR to local currency depositors. In addition, the fulfillment in FX would force counterparties to keep some of their FX reserves at the central bank, thereby increasing the central bank's gross FX reserves.

There are, however, circumstances in which the fulfillment in local currency is justified. One example is when FX funding is not significant and requiring fulfilling RR on FX liabilities in local currency would not entail a significant additional cost compared with the same denomination. As a result, most advanced economies, in which financial dollarization is more limited than in emerging markets, require the fulfillment in local currency of the RR on FX liabilities. Banks could also have FX liabilities denominated in different currency, in which case the same principle would apply; all those that represent a significant funding source would be fulfilled in the same currency as their base, while the others would be fulfilled in local currency.

Further points are relevant regarding the fulfillment of RR for FX liabilities in FX. First, they should be ideally fulfilled with FX managed by the central bank (such as to ascertain the quality of the FX assets). Some central banks allow the requirement to be partially fulfilled with balances held with correspondent banks, in which case the supervisor should be confident that those FX reserves are prudentially invested. Second, they should be segregated from the central bank's FX reserves, invested prudently (as a Bank for International Settlements deposit or in an instrument with a similar risk profile), and subject to robust procedures on the instances and modalities with which they can be used. Third, any shift from a fulfilling regime in domestic currency to FX should be prescribed initially on new deposits and followed by harmonizing the ratio on FX liabilities across banks.

Including government securities undermines monetary policy implementation objectives. Excess reserves will be less stable and interest rates more volatile when banks can allocate their resources between reserves and government securities as they see fit. In a money-targeting world, the link between base money and broad money aggregates will similarly be less stable, rendering the calibration of policy more difficult. Often, the motivation to include government securities (or any asset other than bank reserves) in the RR is to underpin the demand for government securities to keep interest rates lower than they otherwise would have been, which is a form of financial repression.

Wholesale central bank digital currencies⁹ could be considered eligible for fulfilling the reserve requirement. The digital currency could be a close substitute to reserve at the central bank, depending on its remuneration. The main difference is that more counterparties could have access to the wholesale central bank digital currency than to reserves, but reservable institutions would very likely have access to both reserves and digital currency.

Maintenance Period: Lagged or Contemporaneous?

Guidance: The maintenance period should be fully lagged to the calculation period.

Lagging the maintenance period to the calculation period ensures that banks know precisely how much they need to comply with the RR. Lagging is the difference in days/weeks between the end of the period that serves as a reference for the calculation of the RR and the start of the period in which the RR needs to be fulfilled. The RR is said to be fully lagged when the reserve maintenance period starts immediately after the end of the calculation period. While the lag should be minimal, as a precondition, banks should know their RR with certainty from the first day of the new maintenance period.

Contemporaneous fulfillment could be justified in the case of quantitative targeting.

Contemporaneous fulfillment has the calculation and maintenance on the same actual dates. The justification is to have the RR more closely respond to changes in the demand for broad money. Contemporaneous fulfillment creates instant feedback from changes in deposits via required reserves to excess reserves and short-term interest rates, which may seem beneficial to implement quantitative targeting. However, contemporaneous fulfillment introduces an element of unnecessary uncertainty, as banks do not know until the end of the maintenance period the precise level of their RR.

Fulfillment Methods

Guidance: Reserve averaging is an effective mechanism to improve the efficacy of monetary policy implementation because it facilitates stability in short-term interest rates around the policy rate, which is also beneficial for market development.

There are two main methods for fulfilling the reserve requirement: (i) banks keep the level of reserves corresponding to the requirement permanently in blocked accounts; and (ii) banks meet the RR on average (reserve averaging) following the identity below:

$$\frac{\sum_{i=1}^n R_i}{n} \geq RR, R_i \geq 0$$

Where:

RR is the reserve requirement; and

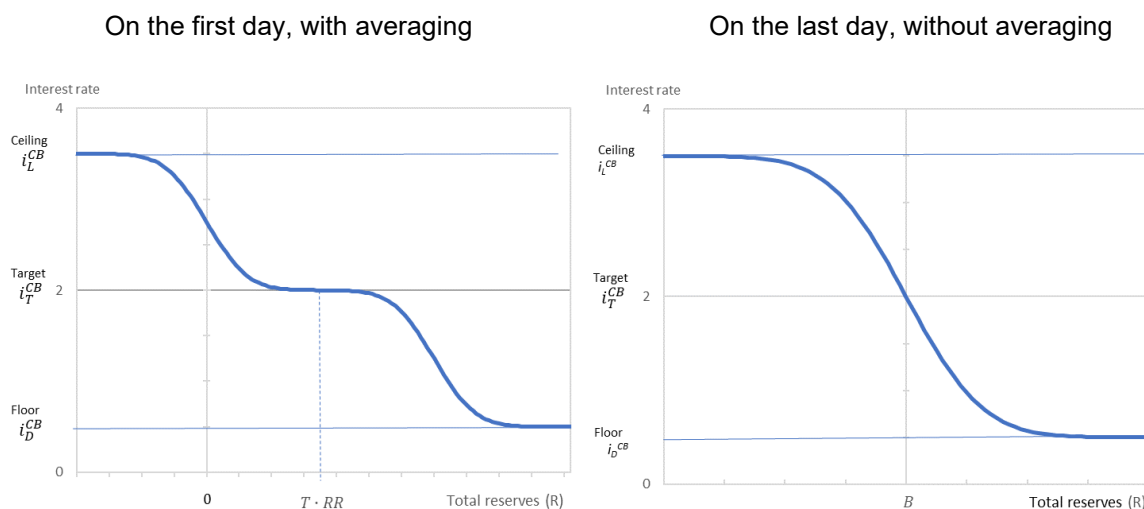
R_i is the reserve held on day i , and day $1 - n$ are all single days in each reserve maintenance period.

Reserve averaging is beneficial as it reduces the liquidity risk premium:

⁹ Digital currencies issued by the central bank to a limited set of counterparties.

- The RR with averaging should envelop the precautionary demand and is not additive (as it is without the averaging provision).** Also, where averaging is not allowed, banks will hold higher levels of precautionary reserves as insurance against liquidity shocks. As such, the increase in the inelastic part of the demand curve (i.e., the liquidity premium) is less under averaging than without averaging. The proportion of the RR subject to averaging (expressed as a percentage of RR) should, thus, exceed the precautionary demand for reserves (Box 1), as banks would not use this balance flexibly as a buffer to reap the benefits of averaging.
- The RR with averaging lessens the impact of autonomous factor shocks on the volatility of short-term rates in the early part of the maintenance period.** It allows banks to offset an under-fulfillment of the RR on any given day of the maintenance period with an over-fulfillment on another day. This should tend to pull market rates toward the targeted policy rate if: (i) banks expect the market rate to be close to the policy rate toward the end of the maintenance period, and thus that the central bank to provide the required level of reserves during the maintenance period; and (ii) that the policy rate will not be changed during the rest of the maintenance period. In Figure 4 (left-hand figure), averaging flattens the demand curve, which lessens the impact on interest rates of a given shock to liquidity, thereby reducing deviations from the policy rate. This benefit decreases as the remaining days in the maintenance period decline and the demand curve steepens. It also underscores the point that a longer maintenance period reinforces the benefits of the averaging provision.

Figure 4. Demand for Reserves, with and without Averaging



Note: T is the number of days in the RMP, RR is the reserves required to be held on average during the RMP, and B is the unfulfilled reserve requirement on the last day of the RMP. $B=RR$ without reserve averaging.

Source: IMF staff.

Partial averaging could be considered where both microprudential and monetary policy implementation objectives are targeted. The rationale for partial averaging is to reap some of the

demand smoothing benefits of averaging while ensuring a minimum share of RR is always fulfilled. This is useful for microprudential purposes (where the LCR cannot be effectively implemented).

Averaging may be positive for market development. Banks with a liquidity shortfall that can fulfill their RR on average do not have to make up a shortfall on any particular day—that is, they do not have to transact on the interbank market. However, when averaging is applied, any upward deviation of short-term rates from the average rate expected throughout the maintenance period should encourage banks to lend, as they could make up any reserve shortfall later at lower rates and vice versa. Also, averaging should be beneficial for overall market development because it helps stabilize short-term rates and with it, reduces the liquidity premium. This, in turn, adds support to the development of the markets for medium- and long-term debt instruments.

Length of the Maintenance Period

Guidance: The maintenance period should be long enough for effective intertemporal smoothing.

The maintenance period is the period over which the RR is fulfilled. Its length is related to how banks are allowed to fulfill the requirement.

- If banks are required to fulfil the RR on a permanent basis, the RR is akin to a deposit guarantee, available at the central bank in case of a bank failure. The length of the maintenance period (and, thus, the update of the RR base) should then be relatively short to closely track developments in the liabilities the RR is supposed to cover.
- If banks can fulfill the reserve requirement on average, the maintenance period should be long enough to allow for meaningful intertemporal smoothing but should not straddle the policy rate decision cycle to avoid short-term interest rate uncertainty throughout the maintenance period.

International experiences show that maintenance periods vary widely. Where averaging is allowed, the period is usually one calendar month, or a multiple of weeks close to one calendar month (from four to six weeks), which is effective for intertemporal smoothing of the impact of typical payment flows (salaries, taxes, and others) on banks' reserves. On the other hand, blocked RRs have shorter maintenance periods, usually one to two weeks. Table 2 shows that maintenance periods are usually longer when averaging is allowed.

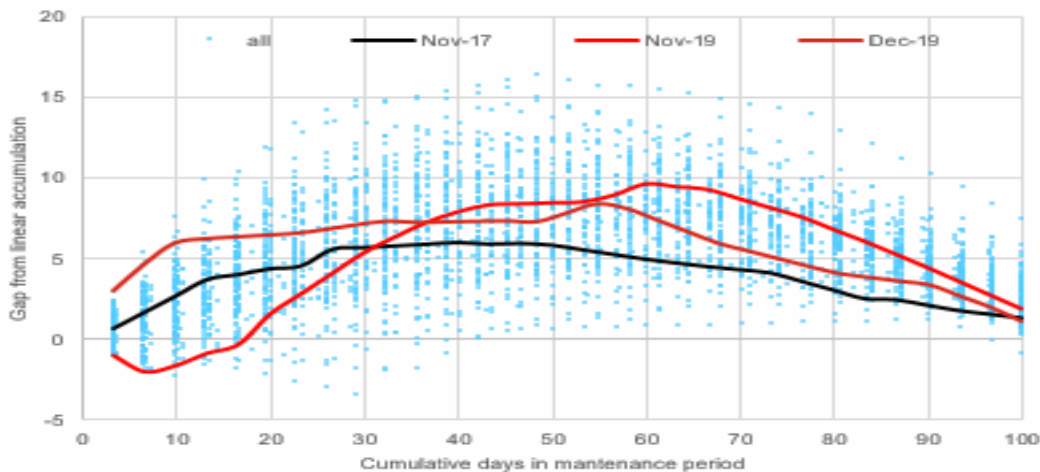
Is holding period averaging allowed?	How long is the reserve maintenance period?		
	(Number of days)		
	Minimum	Maximum	Average
Yes	7	49	26.6
No	1	30	19.3

Sources: IMF staff; MOID 2018.

Ideally, the end and the beginning of maintenance periods should take into consideration the main liquidity flows and policy rate decisions. Consequently, it is good practice to:

- Avoid a maintenance period that begins or ends at the close of a week. Instead, it should span multiple of weeks and it should begin and end in the middle of the week. Autonomous liquidity factors are more difficult to forecast before and after weekends, when banknote demand surges and banks stock ATMs in anticipation of weekend banknote demand. This may lead to maintenance periods of variable lengths. In practice, these have been implemented without major drawbacks.
- Avoid a maintenance period that begins or ends at the close of the month, which is a special period for payments. Avoidance will facilitate the calibration of the end of the maintenance period finetuning operations, through which the central bank injects or drains any liquidity imbalance accumulated from the start of the period and from the last OMO.
- Avoid changes in the policy rate during a maintenance period. The policy rate setting meetings can take place before the start of a maintenance period (for example, on the Monday or Tuesday prior to the RMP starting on a Wednesday), and any rate change can be applicable only as of the start of the next maintenance period. When banks expect a rate cut, they may have an incentive to under-fulfill the RR in the early part of the maintenance period, and vice versa. For example, they may over-fulfill the RR at lower costs in the earlier part of the maintenance period if they expect a rate hike (ECB 2003). When such expectations are broad based, they can be disruptive from money market and liquidity management perspectives.
- Avoid a change in the policy rate over the maturity of an operation. The maintenance period should end when one operation matures and start when the next one settles. This will prevent policy rate expectations from affecting the demand for central bank operations. Accordingly, the period is defined as several OMOs between policy rate decisions, which avoids changing in the policy rate in the middle of an outstanding short-term OMO.

Banks could adopt different patterns for the fulfillment of the RR depending on their degree of risk aversion and on how they perceive their market access (Figure 5). If treasurers are risk neutral, forecast their cashflows well, have good market access, and are confident in central bank liquidity management, they can gradually and proportionally fulfill the RR during the maintenance periods. In practice, the fulfillment of the RR is rarely linear and deviations from it should be analyzed. The most typical pattern consists in risk-averse treasurers trying to frontload the RR, that is, to reach the average target early in the maintenance period. Concerns may arise from market access or the quality of the central liquidity forecast (and thus the calibration of its operations). On the other hand, some, higher risk-taking treasurers might backload the RR to take advantage of market opportunities early in the period, especially if most of their counterparts try frontloading the RR.

Figure 5. Reserve Requirement Fulfillment Pattern in Chile


Sources: Banco Central de Chile; IMF staff calculations.

Banks' preferred fulfillment patterns need to be factored into the central bank operation allotment strategy. Under the baseline, the central bank should calibrate its operations by assuming that the demand for reserves due to the RR will be linear, with RR averaging absorbing randomly distributed liquidity shocks. However, if banks try to frontload the requirement and the central bank sticks to an allotment policy based on a linear fulfillment, the interbank interest rate would soar at the beginning of the maintenance period and decrease afterward. Under these circumstances, the central bank should recalibrate its OMOs to provide more reserves during the earlier part of the maintenance period, and proportionally less through the latter part.

D. ELIGIBILITY FOR THE LIQUIDITY COVERAGE RATIO

Guidance: Include part of the RR as level 1 HQLA eligible for the LCR.

The question is whether RR should count in the LCR numerator. The LCR allows banks to meet this requirement with a range of assets based on their estimated liquidity in times of stress. Furthermore, banks are required to demonstrate that they can monetize HQLA in a stress event without adversely affecting their reputation or franchise.

The LCR allows for central bank reserves, including RRs, to be included in level 1 HQLAs if they can be drawn down in times of stress.¹⁰ While the inclusion of excess reserves is straightforward, as banks can always draw them down, the LCR regulation leaves the assessment of whether RR should be included to local supervisors after discussion with the central bank. Different central banks have taken different approaches.

¹⁰ See the Basel Committee on Banking Supervision's "Basel III: The Liquidity Coverage Ratio and Liquidity Monitoring Tools," published in 2013.

While RR balances should not count when averaging is not allowed, excluding them when averaging is allowed is problematic in many circumstances. Excluding the RR when its ratio is high or when there is a dearth of alternative HQLAs is problematic, as it could boost the demand for excess reserves for LCR compliance purposes. This would also complicate compliance with the LCR. Excluding the RR would shrink the balance sheet space for lending, as a significant proportion of the banks' balance sheet would be taken by HQLA and RRs. It would make the voluntary demand for reserves for LCR compliance purposes additive to the RR and difficult to predict.

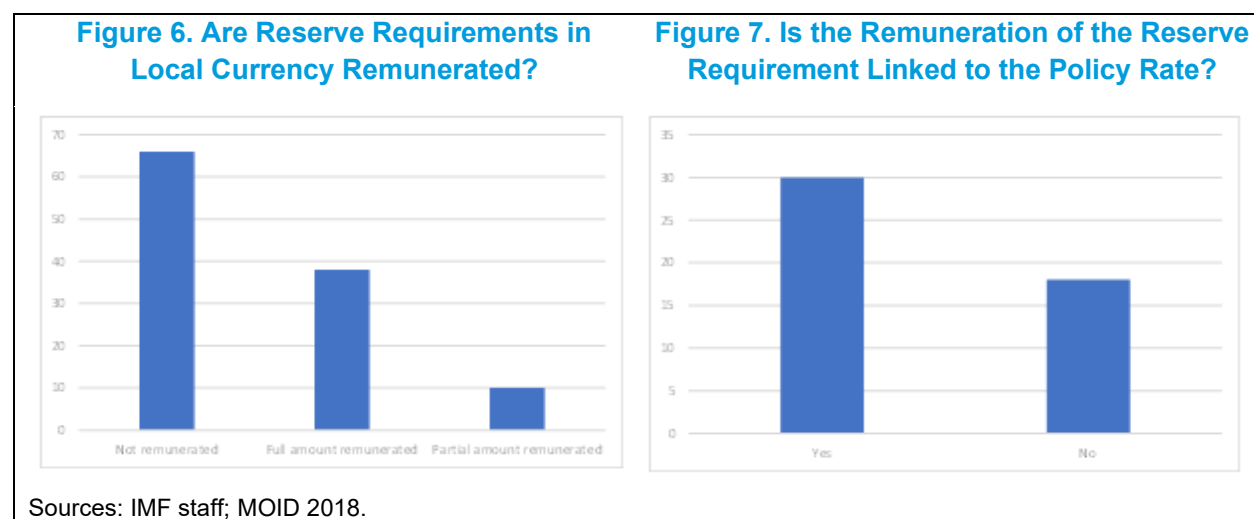
The inclusion of the RR in the LCR, however, depends on a few preconditions. The reserve maintenance period should be long enough to cover the LCR 30-day stress period, and reserves should be fully accessible to banks. However, if reserves are used and the liquidity stress lasts more than a few days, the use of the RR can be costly, as it increases the probability of under-fulfilling the reserve requirement to which a penalty is attached (see next section). Therefore, although reserves are, by definition, the most liquid asset, the RR is not always the cheapest (and, thus, the most liquid) to use in case of prolonged liquidity stress. Hence, the central bank should set a maximum limit on the share of RR that could be counted in the LCR.

E. REMUNERATION, PENALTIES, AND PERIOD-END CONSIDERATIONS

Remuneration

Guidance: The RR should be remunerated at the opportunity cost to avoid interfering with the monetary policy stance and undermining financial deepening (unless the RR is aimed at taxing specific funding sources).

As the issuer of reserves, the central bank sets their remuneration. In turn, this remuneration would influence the interest rates that banks will transmit to their deposits and loans. Most central bank do not remunerate the RR, which represents, in those jurisdictions, a tax on the financial system (Figure 6). Interestingly, those with unremunerated RRs apply a higher ratio than those that remunerate (estimated at 6.5 percent and 4 percent, respectively). Still, the macroprudential objective that would justify such a treatment of the remuneration is not anticipated at many central banks. Most of the remuneration is explicitly linked to the central bank policy rate (Figure 7).



The key dimension is the remuneration of the RR relative to the opportunity cost of the reserves.

The opportunity cost for domestic reserves is the key policy rate, which is expected to determine the marginal borrowing cost in the money market. A remuneration below the opportunity cost creates a wedge between funding and lending rates. The lower is the remuneration relative to the opportunity cost; the greater is the impact of changes in the requirement ratio on the intermediation spread. Therefore, one could assess the wedge between short-term deposits and the policy rate due to a remuneration of the reserve requirement that deviates from the opportunity cost by computing the breakeven deposit rate, based on the policy rate presented below.

$$\text{deposit breakeven} = pr * (1 - c) + r * c$$

And between lending and deposit rates as:

$$\text{Minimum LR} = (DR - c * r) / (1/c)$$

Where:

pr is the policy rate, LR is the lending rate, DR is the deposit rate, *c* is the RR ratio; and *r* is the RR remuneration.

The deposit breakeven rate is the maximum deposit remuneration rate that ensures a non-negative intermediation margin. It assumes that deposits, net of the reserve requirement, are reinvested at the policy rate. Marginal funding costs in efficient markets tend to converge toward this breakeven rate. The *minimum LR* (or lending break even rate) is the minimum lending rate necessary for a null gross interest rate margin at a given deposit rate.

Unremunerated RRs (URRs) are sometimes used as a substitute for changes in the policy rate, but this approach can be counterproductive.¹¹ Changes in the ratio of URRs have ambiguous and hard-to-predict effects on the intermediation spread. The impact on the intermediation spread would, in principle, depend on the relative interest rate elasticity of the credit demand and deposit demand curves.

- Where interest rate elasticities for credit and deposit demand are similar, an increase in the RR would lead to an increase in the lending rate and a proportional decrease in the deposit rate. The policy stance is, therefore, unaltered, although the higher intermediation spread could have a negative impact on economic growth over time.
- Where the interest rate elasticity for credit demand is higher than that for deposit demand, an increase in the RR would largely be reflected in lower deposit rates, encouraging consumption at the expense of saving, thereby relaxing monetary policy. An increase in the RR to tighten monetary policy in this circumstance, if unremunerated, may well be counterproductive.
- Where the interest rate elasticity for credit demand is less than that for deposit demand, an increase in the RR would be largely reflected in higher lending rates, which would increase the cost of capital, thereby tightening monetary policy.

¹¹ Glocker and Towbin (2012) find that reserve requirements can support price stability only if financial frictions play a major role in the market.

A remuneration at the opportunity cost would also be justified for RR with a microprudential purpose. The remuneration would prevent an undue regulatory cost, as the microprudential objective is to enhance resiliency without unduly affecting intermediation costs and banks' profitability.

A remuneration below the opportunity cost will be necessary when distortions are deliberate (macroprudential) to penalize specific sources of funding. Higher ratios can be applied on shorter maturities, FX-denominated liabilities, and/or nonresident funding to penalize the use of these funding sources, while improving resiliency by having more reserves available to finance the reversal of these more volatile flows (microprudential). However, only a remuneration significantly below the opportunity cost would impose a financial cost on intermediaries (the "tax"), which is passed on to investors to discourage recourse to this type of funding and to drive a wedge between lending and deposit rates (IMF 2012b, paragraphs 35-43 on reserve requirements).

While the opportunity cost of domestic RRs is represented by the policy rate, the foreign currency RR opportunity cost is the yield on FX HQLAs. The presumption is that banks pursuing prudent liquidity risk management would need to hold voluntary reserves in FX invested in HQLAs as liquidity buffers against liquidity shocks invested in FX HQLAs. Therefore, the yield of available HQLAs in international markets should be the baseline reference for the FX RR opportunity cost, including if negative (as experienced in the euro, the Japanese yen, or the Swiss franc markets). Any remunerations exceeding those references (for example, FX URRs) is a subsidy to FX intermediation.

Whenever the RR is remunerated below the opportunity cost, the remuneration should be set at a fixed spread off the opportunity cost. A fixed spread below the policy rate should at least mean that the distortion implied by the partial tax on intermediation does not vary when the policy rate varies, as would happen if the reserve requirement were not remunerated, for instance.

Penalties

Guidance: Penalties should be financial and higher than the central bank's standing marginal facility rate.

Penalties should provide a *significant* incentive for compliance. They must be higher than the central bank's end-of-day marginal lending facility rate because banks should be encouraged to fulfill the RR with available central bank instruments and facilities. If the rate on the marginal lending facility were higher than the penalty rate, banks would under-fulfill the RR rather than access the marginal lending facility.

In practice, penalty rates are often anchored either to the policy rate or a short-term market rate. The penalty generally consists of applying an interest rate to the shortfall vis-à-vis the RR for the duration of the shortfall. Out of 112 respondents to MOID, 47 specified the penalty as a multiple of the policy rate or the lending facility rate. The others often derived the penalty rate from the monetary market interest rate of the period, the rate at which the RR could have been fulfilled in the market.

Penalties should *not be excessive* as they would encourage reserve hoarding. Large financial penalties together with heightened vigilance and supervisory intrusion may generate an unnecessary stigma of being noncompliant. This may encourage banks to significantly over-comply and to frontload compliance within the maintenance period, undermining market functioning and complicating the central banks' calibration of operations. In addition, as penalties should be *systematically and fully applied*, they should not be disproportionate.

Period-end Considerations

Guidance: Flexibility around end-period with small volume carryovers or additional fine-tuning operations can be useful to contain interest rate volatility.

Allowing small liquidity surpluses or deficits to be carried over to the next maintenance period reduces the potential for inelastic demand to generate interest rate volatility at the end of the period. The carryover provision was often used when the RR base was contemporaneous (such as in the quantitative targeting framework) and there was, thus, significant uncertainty regarding the exact RR target that banks had to comply with. For the carryover option to be effective in reducing volatility, it should be larger than the size of the autonomous factor forecast errors. An alternative to a carryover provision is for the central bank to conduct a finetuning operation at the end the maintenance period to address any liquidity imbalance.

IV. Technical Assistance Approach

Technical assistance on the RR must consider the specific features of each environment. There needs to be clear understanding of the monetary policy operational framework, including how monetary instruments interact with each other and with prudential regulations. A three-pronged strategy can be followed:

- Identify the objectives.
- Determine the parameters needed to meet the identified objectives.
- Design a transition strategy.

A. IDENTIFY AND STREAMLINE THE OBJECTIVES

The objective(s) for which the RR is used must be well understood. This will require an understanding of the monetary policy operational framework, including the interactions between various monetary instruments, and perhaps more broadly, the financial sector context. The RR should be used where it is assessed to be the most efficient and least distortionary approach to meeting an objective.

The TA should look for options to streamline the RR. Experience shows that the RR frequently pursues more objectives than necessary, leading to an inefficient setup. It is also often an instrument that has been in place for a long period and whose parameters have not been updated to account for new objectives and changes in context. Therefore, the TA should critically assess the objectives of the RR, recommend alternative instruments, and reparametrize for a narrow set of objectives.

B. DETERMINE THE PARAMETERS TO MEET THE IDENTIFIED OBJECTIVES

The RR framework should be designed to meet the identified objective(s). Such design is easier where the RR is directed to meet a single objective. If the RR needs to meet more than one objective, it is important that fulfilling the main objective is not compromised by parameterization aimed at meeting other objectives (Table 3). This might be achieved, for example, by assigning different purposes to different RR bases, for example, monetary policy implementation for local currency RR and microprudential for FX RR.

The framework should be administratively efficient and designed to minimize distortions. Typically, this would imply a relatively broad set of counterparties, the inclusion of all non-capital liabilities, and remunerating the RR at the opportunity cost. Deviations from this parametrization are conceivable to pursue macroprudential objectives, but they are expected to complement other, more fundamental, policies tackling the underlying issue, relatively limited in scope, and to be temporary.

C. DESIGN A TRANSITION STRATEGY

A transition strategy should recognize and mitigate operational and financial stability risks arising from the changes. Once the framework has been finalized, it should be well communicated to all relevant stakeholders, mainly commercial banks. But the wider financial market community should be engaged, given that the availability and pricing of some financial assets may be impacted. The changes should be phased in over a timeframe that recognizes the financial stability risks that may arise from institutions having to make significant portfolio reallocations. However, delays only prolong a suboptimal framework.

Table 3. Purpose and Parameters

Purpose/Parameters	Sub-purposes	Base	Ratio ¹	Uniform or Differentiated Ratio	Period of Maintenance	Remuneration	Averaging
Prudential	Micro—liquidity buffer	Short- and medium-term liabilities ²	TBD ³	Differentiated	1–2 weeks	Opportunity cost	Yes
	Micro—deposit insurance	Liabilities to be insured ⁴	20% to 30%	Uniform	1–2 weeks	Less than opportunity cost	No
	Macro—penalizing riskier sources of funding	Targeted source of funding ⁵	TBD in connection with remuneration	Differentiated	1–2 weeks	Less than opportunity cost	Yes
	Macro—smooth credit cycle	All liabilities	To be altered throughout the cycle	Uniform	1–2 weeks	Less than opportunity cost	No
Monetary policy implementation	Base money target	M2/M3 component ⁶	Demand for money calibration	Uniform	4–5 weeks, following monthly cycle	Opportunity cost	Yes
	Interest rate target—liquidity management	All liabilities	OMO calibration	Uniform	4–5 weeks, following monthly cycle	Opportunity cost	Yes

Source: IMF staff.

1/ In some cases, the central bank does not set any ratio, but allows banks to define the desired level of “contractual” RR to be held as a liquidity buffer to absorb autonomous factors shocks.

2/ Typically includes demand and short- to medium-term time deposits, and excludes longer-dated deposits and debt obligations.

3/ To be determined. Used when there is no general prescription for a parameter.

4/ Typically includes retail liabilities and with small businesses.

5/ Typically includes short-term funding, foreign currency-denominated funding, and non-resident funding, or a combination of the three.

6/ Reflects traditional practices. However, a larger base should not be discouraged.

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