

Chapter 11

Assessing Systemic Liquidity Infrastructure

Systemic liquidity infrastructure refers to a set of institutional and operational arrangements—including key features of central bank operations and of money and securities markets—that have a first-order effect on market liquidity and on the efficiency and effectiveness of liquidity management by financial firms (see Dziobek, Hobbs, and Marston 2000). Key features of financial market infrastructure and financial policy operations that affect liquidity management include the following:

- Design and operation of payment systems and securities settlement systems
- Design of monetary policy instruments and procedures for money and exchange markets operations
- Public debt and foreign exchange reserves management strategies and operations.
- Microstructure of money, exchange, and securities markets

Those infrastructure elements are important for the effective implementation of monetary and fiscal policy, but their effect on the efficient functioning of financial markets, the soundness of financial institutions, and the broader systemic stability is a key focus of assessing systemic liquidity infrastructure. Another equally important consideration is to examine the extent to which limitations on the availability of infrastructure pose a constraint on the development of money and securities markets and on sound and profitable operations of financial institutions. The remainder of this chapter highlights the key issues to consider in assessing the above-listed infrastructure elements.

11.1 Payment and Securities Settlement Systems

The role and types of payment systems and securities settlement systems, key principles and practices to govern the sound operations of these systems, and the methodology for assessing the observance of these principles are discussed below.

11.1.1 Payment Systems

Payment systems (and securities settlement systems discussed in section 11.1.2) play an essential role in the functioning of financial markets, the maintaining and promoting of financial stability, and the facilitating of economic development. In the past decade, a broad international consensus has developed on the need to strengthen those systems by promoting internationally accepted standards and practices for their design and operation. This section briefly reviews the Core Principles for Systemically Important Payment Systems (CPSIPS) developed by the Committee on Payment and Settlement Systems (CPSS 2001) of the central banks of the Group of 10 countries, the systems and issues they cover, and the way they can be assessed.

Payment systems are characterized by a set of rules, procedures, and mechanisms for transferring money between two or more financial institutions and their customers. The principal mechanisms in a payment system are (a) the payment instruments, (b) the network arrangements for communication between the participants and the system provider, and (c) the facilities for clearing and for settlement operated by the system provider. Payment instruments can vary from a simple written order on paper to very complex electronic devices in e-money schemes. In modern systems, the use of paper documents is practically eliminated. To promote efficiency and to reduce the settlement cycle, payment orders are sent electronically through an international communication network like SWIFT or through a proprietary network that is specifically constructed for the relevant payment system. Also, Internet technology is used for communications that entail, in addition to payment orders, information exchange on statements of accounts, lists of settled payments, queued payments, and so forth. The facilities for clearing and settlement can vary considerably in complexity, depending on the way the settlement takes place, the availability of queuing mechanisms, the liquidity management and credit facilities, the links to other payment systems and securities settlement systems, and so on. However, in countries with very low amounts of inter-bank payments, clearing and settlement are sometimes done manually.

Payment systems can be divided into (a) large-value systems that are used for inter-bank payments, financial market transactions, and execution of monetary policy, and (b) systems for the clearing and settlement of retail payments. Large-value payment systems are mostly characterized by a relatively low volume of payment orders, whereas the amounts settled are often huge. On an annual basis, the turnover in a large-value system can be a multiple of the gross domestic product (GDP) in the country—in some highly developed markets up to 100 times or more of GDP. In retail payments, it is the other way around. The number of transactions (volumes) is huge, while, normally, the turnover (value) is modest. The separation of large-value and retail payment flows is not always clear-cut, and often in developing countries the same system is used for both inter-bank and retail payments, especially when checks are the main instrument used to transfer money.

Systems can settle on (a) a net basis, in which case an agreed bilateral or multilateral offsetting of positions or obligations by participants takes place, or (b) instruction-by-instruction (gross) basis. In a multilateral netting system, a participant's net credit position (the amount to receive) or net debit position (the amount to pay) is calculated as the

sum of the value of all payment transfers it has received during a certain period of time, less the value of all transfers it has sent to all other participants in the system. Netting reduces the amount of liquidity needed to settle the payment flows between participants substantially. However, the underlying payments will be settled with finality if, and only if, all participants with a net debit position are able to fulfill their obligations to pay at the end of the settlement cycle. If there are no adequate safeguards in the form of liquidity and loss-sharing arrangements, the netting result has to be unwound, deleting some or all provisional transfers that the participant is unable to settle. Such a procedure has the effect of transmitting liquidity pressures to other participants and may, in extreme cases, result in significant and unpredictable systemic risk. Such potential systemic consequences might lead to strong pressure on the central bank to intervene and to bail out the participant involved. In a gross settlement system, the unwinding risk does not exist. In a Real-Time Gross Settlement (RTGS) system, payments are processed on an individual basis as they arrive during the day and are settled with finality in real time whenever the participant has a sufficient balance in its account with the settlement bank. If the participant has insufficient funds, the payment is queued and settled later with the proceeds of incoming payments. In a real-time environment, participants have to manage their payment flows and balances in their accounts actively and can influence the throughput by obtaining intraday liquidity from the central bank or by borrowing funds in the inter-bank money market.

The intraday finality in an RTGS system means that the receiver can immediately use the funds for settling its own obligation. Intraday finality reduces risk and facilitates:

- Urgent inter-bank payments
- The settlement of intraday and overnight credit transactions with the central bank—for instance, fine tuning operations. (Because those operations are most often collateralized, an effective link with a securities settlement system should be in place to ensure delivery versus payment [DVP] on a gross basis.)
- The settlement of money market transactions
- The delivery of cash collateral
- Payment versus payment (PVP) in cross-border arrangements. (For instance, to ensure that in foreign exchange transactions, the payment in one currency will be settled at the same time as the corresponding transaction in another currency to avoid the settlement risk when the payment of one part of the currency transaction is delayed [due to time zone differences].)

In the past decade, hybrid systems have been developed and have combined elements of RTGS systems and netting systems. A hybrid system is most often an RTGS system with special bilateral and multilateral netting facilities. Participants may have payments intended for each other in their individual queues. In an RTGS system, if no participants have sufficient funds in their accounts to settle the individual queued payments, there is no throughput. Hybrid systems, however, will have procedures in place that will try to settle the queued payments (or part of them) on a bilateral netting basis. Within this framework, the system tries to identify groups of payments that can be settled simultaneously, most often on a bilateral basis but sometimes on a multilateral basis. The procedures enhance throughput in the system substantially.

In some countries, two parallel systems exist for large-value payments, one netting and one RTGS system. In such a situation, the outcome of the clearing process in the netting system is settled in the RTGS system. In almost all countries, retail payments are cleared and settled on a netting basis. A retail system can be dedicated to the settlement of a specific instrument such as checks or card payments. In such a situation, there might be two or more retail payment systems in a country, each operating on a netting basis and completed by an RTGS.¹

There are often links between the main payment system of the central bank and the so-called ancillary systems, most often netting schemes for large-value or retail payments operated by the private sector to settle in central bank money. Furthermore, the payment system of the central bank is often linked to securities settlement systems inside or outside the central bank to ensure DVP. DVP eliminates principal risk—the risk that the seller of securities will deliver the securities but will not receive a payment, or the risk that the buyer will make a payment but will not receive delivery.

The more links that are established, the greater the risk of contagion. An operational failure—or any other problem—in one system can prevent the timely settlement of a transaction—the delivery of cash or securities—in another system, thus spreading the problem across markets, and perhaps countries, and potentially magnifying its scale and effect.

Good descriptions of payment and securities infrastructure in specific countries can be found in publications of the Bank for International Settlements (Red Books) and the European Central Bank (Blue Books), which also provide statistical information.² Also within the framework of payments initiatives of the World Bank in different regions, descriptions of the infrastructure, legal background, and regulation or oversight in a specific country in that region are published periodically (Yellow Books for countries in Latin America and the Caribbean, and Green Books for countries in southern Africa).³

11.1.1.1 Relevance to Structural Development and Stability Considerations

The availability of an effective set of non-cash payment instruments and a well-designed payment system are essential for the development of the economy. Non-cash payment instruments can enhance the efficiency in the economy by reducing the cost of making payments and reducing risks.

Large-value payment systems support the development and functioning of sophisticated financial markets. The systems are also the channel for the implementation of monetary policy and liquidity management of commercial banks. With the development of financial markets, the call increases for a more-sophisticated payment and securities settlement infrastructure that relies fully on electronic payments, intraday finality, DVP, and PVP.

The payment infrastructure is one of the first places where financial stress from credit and liquidity problems manifests itself. Liquidity problems can easily lead to contagion and domino effects, where the failure of one institution to meet its required obligations causes other participants or financial institutions to be unable to fulfill their obligations. Well-designed payment systems contain the effects and prevent spillovers to other participants or systems. Weaknesses in the design and operational reliability of a payment system

may expose the financial system to systemic risk, impair the effectiveness of monetary policy instruments, and jeopardize effective liquidity management by banks. Thus, an assessment of the soundness, safety, and efficiency of payment systems is a crucial element of any assessment of stability and financial sector development.

11.1.1.2 The CPSS Core Principles

The CPSS has defined 10 core principles and 4 central bank responsibilities with respect to payment systems. The core principles are intended to apply to a wide range of circumstances and types of systems, and can be considered as universal guidelines to encourage the design and operation of a safe and efficient payment infrastructure. The core principles cover (a) legal issues, (b) effective risk management, (c) electronic data processing (EDP) audit aspects, (d) efficiency and level playing field, and (e) governance, and are summarized in box 11.1.

The core principles apply to any system whose role in the economy is so critical that it is regarded as a systemically important payment system (SIPS). A system is regarded as systemically important if it (a) is the only payment system in the country or the principal system of aggregate value of payments, (b) handles mainly payments of high individual

Box 11.1 Summary of the CPSS Core Principles

Legal Foundation

- I. The system should have a well-founded legal basis under all jurisdictions.

Risk Management

- II. The system's rules and procedures should enable participants to have a clear understanding of the system's effect on each of the financial risks that they incur through participation in it.
- III. The system should have clearly defined procedures for the management of credit risks and liquidity risks, which specify the respective responsibilities of the system operator and the participants and which provide appropriate incentives to manage and contain those risks.
- IV.* The system should provide prompt final settlement on the day of value, preferably during the day and at a minimum at the end of the day.
- V.* A system in which multilateral netting takes place should, at a minimum, be capable of ensuring the timely completion of daily settlements in the event of an inability to settle by the participant with the largest single settlement obligation.

- VI. Assets used for settlement should preferably be a claim on the central bank; where other assets are used, they should carry little or no credit risk and little or no liquidity risk.

Security and Operational Reliability, plus Contingency Arrangements

- VII. The system should ensure a high degree of security and operational reliability, and should have contingency arrangements for timely completion of daily processing.

Efficiency and Level Playing Field

- VIII. The system should provide a means of making payments that is practical for its users and efficient for the economy.
- IX. The system should have objective and publicly disclosed criteria for participation, which permit fair and open access.

Governance of the Payment System

- X. The system's governance arrangements should be effective, accountable, and transparent.

* Systems should seek to exceed the minimum in those core principles.
Source: CPSS (2001).

Box 11.2 Responsibilities of Central Banks in Applying the CPSS Core Principles

- A. The central bank should clearly define its payment system objectives and should publicly disclose its role and major policies with respect to systemically important payment systems (SIPS).
- B. The central bank should ensure that the system it operates complies with the CPSS Core Principles.
- C. The central bank should oversee compliance with the CPSS Core Principles by systems it does not operate, and it should have the ability to carry out this oversight.
- D. The central bank, in promoting payment system safety and efficiency through the CPSS Core Principles, should cooperate with other central banks and with any other relevant domestic or foreign authorities.

Source: CPSS (2001).

value, or (c) is used for the settlement of financial market transactions or for the settlement of other payments in the same currency.⁴ Although retail payment systems are normally not seen as systemically important because they settle in large-value systems that fulfill the criteria for systemic importance, they can influence the function of the latter systems.

The responsibilities of central banks with respect to payment systems center on the effective oversight of payment systems, focusing on the compliance of the SIPSs with the 10 CPSS Core Principles and on crisis management (see box 11.2 for a listing central bank responsibilities). Crisis management deals with major problems in the systems—for instance, the bankruptcy of a participant, the technical problems in the systems itself or in the system of a larger participant, or the major liquidity problems. Crisis management often requires coordination between different authorities—for instance, between the payment system overseer and the banking supervisor and between the payment overseer and the securities regulator. Coordination with monetary policy departments is also necessary, because the payment system is the main channel for the transmission of monetary policy, and the decisions on liquidity support in the payment system will also influence monetary policy. Clear procedures for who should be involved, how decisions should be made, how the exchange of information is organized, and so forth should be in place. Preferably, scenarios should be developed in advance for dealing with specific problems. Cooperation, coordination, and exchange of information among the different supervisory authorities in the country, as well as with relevant foreign authorities, are often worked out in a memorandum of understanding (MOU).

In addition to an oversight role, a central bank might have other roles in the payment area such as a developmental role (designer of the strategy with respect to the development and international positioning of markets and infrastructure) and an operating role (system provider or owner of payment systems or securities settlement systems). Sometimes conflicts of interest might arise between the different roles. One way to make this potential for conflict clear is to enhance transparency of the different roles and the goals and objectives of a central bank in the payment area.

Oversight of payment systems is a core task of a central bank, and often a payment system department is charged with the function. If it is to avoid conflicts of interest with respect to the compliance of the systems operated by the central bank itself, the oversight unit, at a minimum, should be separated from the operational section.

The payment system oversight policy should comply with the International Monetary Fund (IMF) Code of Good Practices on Transparency in Monetary and Financial Policies. Transparency practices relate to (a) the roles, responsibilities, and objectives of a central bank or financial agency; (b) financial policy formulation and reporting; (c) public availability of information; and (d) accountability and assurances of integrity. The central bank responsibilities in the CPSS Core Principles document (CPSS 2001) include those good transparency practices.

11.1.1.3 *The Assessment Methodology and Assessment Experience*

A CPSS assessment of core principles seeks to identify the strengths and weaknesses of the SIPS, including its potential to transmit shocks (also originating in other countries), as well as risks to the monetary system or financial markets or across the economy more generally. The methodology for the assessment and the structure and scope of the assessment report are explained in detail in the guidance note prepared by the IMF and the World Bank in consultation with CPSS (IMF and World Bank 2001). It contains guidelines for the assessment of the individual core principles by providing a short explanation and the assessment criteria, as well as additional aspects that should be evaluated in this context. Ideally, before an assessment takes place, the central bank of the country first provides a list of systems in the country that are deemed systemically important and then conducts self-assessments of those systems. The self-assessments are reviewed by the assessor, and they provide a basis for the discussions with the stakeholders in the payment system such as the central bank, system provider(s) in case systems that are privately operated, and any relevant governmental and private sector entities (including bankers associations, card companies, clearinghouses, and securities market operators).⁵

Experience with assessing the core principles of the CPSS has shown that the principles provide a useful and robust framework for assessing the reliability and efficiency of SIPSs and formulating policy recommendations (see IMF 2002). The assessments suggest that there are substantial weaknesses in many payment systems. Payment systems in advanced economies and, to a large extent, in transition economies observe most of the core principles. In developing countries, a significant majority of the systems suffers shortcomings of varying importance in design and operation that may expose the systems to risks in the events of a problem.

In many systems, the awareness of risk and the possibilities for the participants to manage and control those risks are insufficient. A significant majority of the net settlement systems have no adequate safeguards in place to ensure the timely completion of daily settlements in the event of a default. Nearly 70 percent of all systems give evidence of an uncertain legal basis, mainly from the absence of legal recognition of netting and finality, and from unclear rules and regulations governing the systems. The effectiveness of the governance structure could be improved in more than 60 percent of the systems. In around half of the systems, the operation reliability is not addressed in full and may

be vulnerable to failures that can prevent the daily settlement from being completed in time. Assessment of transparency of central banks' policy on payments shows that the objectives and institutional framework for oversight are not always transparent and that some central banks do not disclose the general policy principles for the oversight of payment systems.

The assessments, as appropriate, recommend changes or reforms to the SIPS. They also help make the authorities aware of those aspects of their SIPS that should be kept under review as the economy and financial markets develop. In practice, some assessments have used the core principles as a basis for more widely assessing the whole payment infrastructure of a country and the risks arising from interrelation between various payment systems (IMF 2002, p. 7, paragraph 12). While such wider assessment may be helpful, especially in developed financial systems where there are links between several systems domestically and sometimes abroad, a decision to assess the whole system must take into account the resource intensity of also assessing systems that are not systemically important.

The level of observance of the CPSIPS in the countries assessed highlights some key policy areas that require attention in many payment systems. The requirements to ensure prompt final settlement on the day of value (CPSS Core Principle IV) and the need to settle a net settlement system even if the largest single obligor fails (CPSS Core Principle V) were not fully observed in many countries that were assessed. This weakness was compounded by legal uncertainty, weak governance, and insufficient operational reliability in a significant number of countries. In light of this, policy recommendations have focused on the following:

- Reviewing procedures to deal with settlement problems, including loss-sharing and risk control systems, information to system participants, and provision of intraday liquidity
- Strengthening bankruptcy law (including the laws on bilateral and multilateral netting), ensuring finality of payments, and clarifying laws on pledges and collateral
- Establishing backup processing sites and testing contingency procedures, including procedures against potential liquidity problems through cross-sectoral and cross-border exposures
- Establishing transparent access criteria and reviewing cost structures and pricing policies, including full cost recovery, to improve efficiency

Assessments have also highlighted factors that could have potential negative impacts on the liquidity situation in payment systems in different countries. This negative impact is the result of (a) arrangements for resolution of troubled banks, (b) nontransparent systemic liquidity arrangements provided by the central bank, (c) liquidity that is concentrated among only a few of the banks in a country in which there is currently no intraday liquidity available from the central bank, and (d) settlement risks in the securities and the foreign exchange markets caused by the lack of DVP and PVP facilities, respectively. In many countries, it is implicitly assumed by most participants that the central bank would, in practice, cover liquidity shortages, even failures, to avoid any systemic effects (IMF 2002, p. 4, paragraph 4).

11.1.2 Securities Settlement Systems

The term *securities settlement systems* is defined to include the full set of institutional arrangement for confirmation, clearance, and settlement of securities trades and safekeeping of securities.

11.1.2.1 Recommendations for Securities Settlement Systems

In November 2001, the CPSS and the Technical Committee of the International Organization of Securities Commissions (IOSCO) issued Recommendations for Securities Settlement Systems (RSSS) as a benchmark to assess the soundness and effectiveness of securities settlement systems (see CPSS and Technical Committee of the IOSCO 2002). The 19 recommendations are considered to be minimum standards intended to reduce risks, increase efficiency, provide adequate safeguards for investors, and enhance international financial stability (see box 11.3). Those recommendations recognize the importance of securities settlement systems for the infrastructure of the global financial markets, and they note that weaknesses in securities settlement systems can be a source of systemic risks to securities markets and to other payments and settlements systems.

The recommendations are designed to cover securities settlement systems for all securities, including equities, corporate and government bonds, and money market instruments. They provide detailed descriptions of the institutional arrangements for confirmation, clearance, settlement, and safekeeping of securities. They also address specific topics and issues, including the legal framework for securities settlements, risk management, access, governance, efficiency, transparency, and regulation and oversight. Ensuring safe and reliable securities clearing and settlement systems requires a clear understanding of the various risks involved in the process of securities transactions. The recommendations describe those risks and provide a wide range of measures to address them. The main risk related to settlement activities is credit risk, which is the possibility that a counterparty to a trade may fail to settle its obligations when due or at any time thereafter. Liquidity risk—which is the possibility that a counterparty may not be able to meet its obligations when due but may settle at a later stage—is another relevant risk. Other risks involved in settlement activities are legal risk, custody risk, operational risk, and the risk of a settlement bank's failure.

The reduction of pre-settlement risks is considered crucial to ensure the timely settlement of securities transactions. In this context, the recommendations define some rules for trade confirmation, settlement cycles, central counterparties, and securities lending. In particular, the recommendations require that trade confirmation take place on the same trade date and that settlement cycles—the time of exchanging securities against cash—be no more than three days after trade execution. To reduce settlement failure, the recommendations advocate cost-benefit analysis for the introduction of a central counterparty (CCP) and encourage securities lending and borrowing.

The recommendations discuss the sources of settlement risks and provide several measures to address them. For instance, a recommendation on central securities depository (CSD) requests that securities be immobilized or dematerialized and then transferred by book entry in a CSD. By centralizing the procedures of issuance and safekeeping,

Box 11.3 Summary of the RSSS

Recommendation 1 deals with legal soundness.

Recommendation 2 requires confirmation of trade details between market participants within the same trade day.

Recommendation 3 requires that final settlement occurs no later than T+3

Recommendation 4 requests cost-benefit analysis for CCPs.

Recommendation 5 encourages the use of securities lending and borrowing to reduce settlement risk.

Recommendation 6 deals with dematerialization and immobilization of securities and book-entry transfer in CSDs.

Recommendation 7 requests securities transfers to be based on DVP.

Recommendation 8 requires settlement finality to occur no later than the end of the settlement day.

Recommendation 9 requests CSDs to put in place adequate risk control measures to deal with liquidity and credit risks.

Recommendation 10 deals with the cash settlement assets and expresses preference for central bank money.

Recommendation 11 requires CSDs and CCPs to identify and minimize operational risk, and it deals with outsourcing of clearing and settlement activities.

Recommendation 12 requires the employment of account practices and safekeeping procedures to protect customers' securities.

Recommendation 13 deals with governance structure of CSDs and CCPs.

Recommendation 14 requires CSDs and CCPs to have objective and fair access criteria.

Recommendation 15 requires settlement systems to be cost-effective in meeting the requirements of the users.

Recommendation 16 encourages the use of internationally recognized communication procedures and standards.

Recommendation 17 requires CSDs and CCPs to provide market participants with sufficient information to identify and evaluate the risks and costs with clearing and settlement activities.

Recommendation 18 requests transparent and effective regulation and oversight, and it encourages central banks, securities regulators, and other relevant public authorities to cooperate within and outside the country.

Recommendation 19 deals with the risks related to cross-border links between CSDs.

Source: Adapted from CPSS and Technical Committee of the IOSCO (2001).

one can reduce costs through economies of scale. The centralizing would also affect the risk positively by reducing the number of intermediaries involved in the process of issuance and custody. To eliminate the risk that securities are delivered but payment is not received (principal risk), one recommendation requires that the transfer of securities and the cash payment are linked in a way that achieves delivery versus payment (DVP). It is also crucial that the finality of the settlement occurs during the settlement day. The recommendations also require that CSDs put in place risk control measures to address the failure of the participants. The use of unwinding—excluding the default participant and

recalculating the outstanding positions—as a risk control tool is discouraged. The CSDs should instead use a combination of limits and collateral requirements.

The operational risk is defined as the risk that deficiencies in information systems or internal controls, human errors, or management failures will result in expected and unexpected losses. To reduce operation risk, the recommendations require CSDs to identify and minimize the source of operational risk through the development of appropriate systems, controls, and procedures. Furthermore, the system should be reliable and secure and should have adequate scalable capacity. Moreover, contingency plans and backup facilities should be established to allow for timely recovery of operations and completion of the assessment with a high degree of integrity.

The recommendation on assets protection requires the entities holding securities in custody (custodians) to put in place measures that fully protect customers' securities. In particular, custodians should use adequate accounting practices and safekeeping procedures. Investors' securities should be protected against the claims of custodians' creditors.

Cross-border settlement arrangements also pose special challenges for regulation and oversight. For those reasons, cross-border links established by settlement systems should observe all relevant recommendations. In addition, a specific recommendation addresses the risks in cross-border links between CSDs.

The recommendations identify the key mechanisms to promote market efficiency. They consider competition as an important mechanism to achieve efficiency. However, because of the particular features of securities settlement industry such as economies of scale and economies of scope, the recommendations emphasize other mechanisms for ensuring efficiency such as fair and objective access criteria, appropriate governance arrangements, and regulation and oversight.

A specific recommendation addresses the regulation and oversight of securities settlement systems. It calls for transparent and effective regulation and oversight to ensure the safety and efficiency of such systems, and for cooperation between central banks and securities regulators to avoid unnecessary cost and to promote adequate information sharing. Furthermore, the central banks that operate the systems should ensure that those systems are compliant with the recommendations.

The recommendations recognize that some functions critical to the settlement of securities transactions are performed by institutions other than securities settlement systems. For instance, the confirmation of trades can be performed by a stock exchange or trade association, or bilaterally by counterparties. Thus, securities regulators and central bank overseers need to cover the relevant aspects of stock exchanges when assessing compliance with the recommendations.

11.1.2.2 Assessment Methodology and Assessment Experience

As a follow-up to the recommendations, the CPSS and Technical Committee of the IOSCO (2002) have developed a comprehensive assessment methodology. The purpose of the methodology is to provide a uniform guidance to assessors, thereby contributing to consistency across assessments. The primary responsibility for the implementation of the RSSS lies with the designers, owners, and operators of the systems. However, the report

stresses the need of national authorities—central banks, securities regulators, and other relevant public authorities—to promote implementation by carrying out self-assessments or peer reviews. The authorities should also identify steps to be undertaken in the event that the recommendations are not fully observed. The report is intended to serve as guidance for the Financial Sector Assessment Program (FSAP) assessments and for technical assistance.

The assessment methodology is composed of key questions to be addressed to operators of settlement systems. Some questions are also addressed to securities regulators, central banks, and other relevant public authorities. The replies to the key questions need to be summarized and translated into an assessment grade. There are four assessment grades: observed, broadly observed, non-observed, or not applicable. It is important that the assessor focuses on the system as it is at the time of the assessment and not on any plans and new systems to be introduced in the future. However, plans to enhance the soundness and efficiency of the system could be described in the general section of the report or in sections where the assessor provides comments on planned future actions. The results of the assessment, including recommendations to improve the system, should be summarized in a table.

When carrying out the assessment, one should consider whether there is a single system for all securities or several systems such as a securities settlement system for equities and another system for interest-based instruments. In the event that there is more than one system in the country, it is important to clarify the range of securities to be covered by the assessment. In some cases, it may not be possible to assess all securities settlement systems at the same time; therefore, there is a need to set priorities. From a systemic risk perspective, priorities should be given to the systems that settle the highest average daily value trades, because weaknesses in such systems will affect the smaller ones. Another consideration to be taken when setting priorities is to see which systems are used for monetary policy operations such as settling repurchase agreement (repo) or delivering collateral for central bank credits. Such securities settlement systems should be given priority because any disturbance will negatively affect the execution of monetary policy.

The RSSS were not designed to be applied to derivatives or to address in a comprehensive manner the risk management procedures of a CCP. A CCP interposes itself between counterparties to financial contracts traded in one or more markets, becoming the buyer to every seller and the seller to every buyer. A CCP has the potential to reduce risks to market participants significantly through more-robust risk controls and multilateral netting, but it requires strong risk management to avoid systemic risks. Therefore, the CPSS and the Technical Committee of the IOSCO (2004) has recently published a consultative report on recommendations for CCP that deals with several aspects of CCP, including risk management. For this reason, the RSSS should not be used to assess the CCP risk management, but only to evaluate the costs and benefits of a CCP because this issue will not be addressed by the new recommendations on CCPs. However, some other institutions such as major custodian banks may settle significant shares of securities transactions within their own books. Those entities should be considered as systemically important, and authorities may consider assessing the policies and procedures of the custodians against some of the recommendations dealing with DVP, finality, settlement assets, securities lending, and operational reliability.

11.2 Monetary and Foreign Exchange Operations—Instruments and Effectiveness

The prevailing monetary operations framework is based on monetary policy instruments and operating procedures, money and foreign exchange markets, and payment settlement system. Its design bears directly on banks' ability to manage short-term liquidity. The three structural components are closely interlinked, and they strongly influence and reinforce each other so that the design and framework of one will affect the characteristics that need to be given to the others.

The design features of monetary policy instruments affect liquidity management by banks. First, rules on averaging and maintaining reserve requirements and the rules of access, as well as volume, maturity, and rates of interest on standing facilities, all affect demand and supply of reserves and liquid assets by commercial banks. Second, those and other policy instruments influence and sometimes restrict banks' asset and liability management. Third, central banks' operating procedures in money markets can influence liquidity and efficiency of the markets in which they operate and of other related markets.

Usually banks operate in more than one currency and must, therefore, include foreign exchange considerations in their liquidity management. Access to liquidity in foreign exchange is affected by a number of factors that are different from those affecting liquidity in domestic currency. In this regard, banks operating in highly dollarized economies are faced with particular challenges. For example, deposits in domestic currency may prove less stable than those denominated in dollars. In addition, specific market and institutional factors affecting foreign exchange liquidity include (a) efficiency and liquidity of local foreign exchange markets, (b) foreign exchange intervention procedures of central banks, and (c) linkages between local and external financial markets, which will also have an important effect on liquidity in the local foreign exchange market.

Technical and institutional characteristics of payment and settlement arrangements strongly influence short-run liquidity management by commercial banks. For example, at least three factors help reduce the need for precautionary balances (Borio 1997): design of settlement procedures, access to money markets, and access to central bank facilities. First, if settlement procedures are designed to allow banks to borrow and lend among themselves toward the end of the day after settlement positions are known or can be estimated with a comparatively small margin of error, then the need for precautionary holdings of reserves is reduced. Second, provided the inter-bank market among participants works smoothly, the institutions can be reasonably confident of obtaining funds at the going market rate, and this expectation of being able to finance imbalances at a rate with no penalty also reduces demand for excess reserves. Finally, both the central bank operating procedures, including practices that discourage banks from turning to the central bank, and the market operations that smooth liquidity will encourage the development of inter-bank markets.

The ability of financial institutions to access liquid funding markets and their use of effective techniques for liquidity management will contribute to financial sector resilience. Without ready access to markets that recycle liquidity, market participants would

Box 11.4 Liquidity Forecasting Frameworks

Liquidity forecasting enables a central bank to decide on how much liquidity to provide to or withdraw from the market with the objective of smoothing undesirable fluctuations that could distort the implementation of monetary policy and could result in excessive market volatility. Liquidity forecasting involves the centralization of a wide range of information on financial transactions that affect the main items of the central bank's balance sheet, including the sources of base money creation that are not under the control of the central bank (autonomous factors), and those that are under its direct control (policy position). The supply of bank reserves can be derived as

$$\begin{array}{rcl}
 \text{Supply of bank reserves} = & \text{Net foreign assets} & \\
 & + \text{Net credit to the government} & \left. \vphantom{\begin{array}{l} \text{Net foreign assets} \\ + \text{Net credit to the government} \end{array}} \right\} \text{Autonomous} \\
 & + \text{Other items net} & \text{factors} \\
 & - \text{Currency in circulation} & \\
 & + \text{Lending to banks} & \left. \vphantom{\begin{array}{l} - \text{Currency in circulation} \\ + \text{Lending to banks} \end{array}} \right\} \text{Policy} \\
 & & \text{position}
 \end{array}$$

Note: Further details can be found in Schaechter (2000).

The first four items are beyond the control of the central bank in the very short run or—more generally—not related to monetary policy actions (autonomous factors). When the central bank acts as a banker to the government, the ability of the government to prepare accurate cash-flow projections and to share them with the central bank is vital for liquidity forecasts, because variations in the net position of the government often account for the most significant changes in liquidity supply.

In contrast, the policy position consists of central bank lending to banks through a standing facility, and net lending through discretionary money market operations.

be severely constrained in managing payments, transforming maturities, and managing interest rate risk, hence undermining prudent intermediation. Sound arrangements provide confidence to the market that liquidity can be mobilized and repaid on demand in a predictable and transparent manner.

Effective liquidity management by central banks—management that is based on anticipating liquidity conditions in money markets and acting at their own initiative to smooth liquidity—is essential both for monetary policy implementation and for a well-functioning money market that provides access to liquid funds. Forecasting the banking system's liquidity situation is a key element of a central bank's liquidity management framework (box 11.4). The main purpose of the framework is to create an information set that puts the central bank in a position to decide on the size of the central bank's operations in the money market, and to smooth changes in liquidity conditions in the money market at its own initiative to create stable liquidity conditions and to steer the central bank's operating target effectively.

For effective liquidity management, central banks rely on a wide range of monetary and foreign exchange instruments, in accord with the legal provisions governing the conduct of monetary policy. The mix of instruments that a central bank relies on varies from country to country and from time to time, depending on the state of development of financial market and monetary policy objectives (see box 11.5). The central bank may choose to regulate monetary and credit expansion by using administrative measures that set limits on the price (interest rate controls) or the quantity (credit ceilings) of bank borrowing and lending operations. Alternatively, it may seek to exploit its monopoly in the creation of base money to regulate overall liquidity conditions in the economy

Box 11.5 Monetary Policy Instruments

Rules-Based Instruments

Rules-based instruments include reserve requirements (RRs), liquid asset ratios (LARs), and standing facilities. Unlike money market instruments (which are market-based), rules-based instruments are based on the regulatory power of the central bank.

RRs are requirements for a bank to hold minimum reserves with the central bank, typically as a percentage of its liabilities. When averaging provisions are allowed, banks can fulfill RRs on the basis of average reserve holdings during the maintenance period. RRs serve the following functions: a buffer function for short-term money market rates when averaging provisions apply, a liquidity management function, and a seignorage function when they are not remunerated or remunerated at below-market rates. Efficient cash management requires that sufficient liquid assets are held to meet normal business requirements. Where this voluntary demand for liquid assets coincides with the requirement for reserve holdings, the requirement does not constitute a problem for banks if they are generally able to mobilize these RRs for liquidity management purposes. If RRs are set very low, banks have less leeway through averaging to manipulate their reserve positions without the risk of incurring the penalty of noncompliance. In such cases, banks would have to voluntarily maintain higher levels of reserves.

LARs require a bank to hold minimum amounts of specified liquid assets, typically as a percentage of the bank's liabilities. Where government securities qualify as the main eligible asset, the restrictions (if binding) limit the volume of securities that can be readily used to realize liquidity in the short run. Some countries impose restrictions on banks' loan portfolios by stipulating proportions to be lent to particular sectors or by setting absolute quantitative ceilings on outstanding credit. In the former case, the restriction limits the ability of banks to sell loans affected by the stipulation, while in the latter case, income is constrained and so reduces the incentive to sell those assets in the event that liquidity is needed. Ceilings on loan rates or interest spreads reduce the flexibility to price loan assets for sale.

Standing facilities are policy instruments that may be used at the initiative of banks and that bear a pre-specified interest rate. Refinance standing facilities allow banks to borrow from the central bank; deposit standing facilities allow banks to deposit funds with the central bank. In settlement facilities and in some rediscount arrangements, credit is provided at mar-

ket or below-market rates. In the latter case, many central banks establish volume limits on access to this window or alternately limit usage through moral suasion. For commercial bank liquidity, the management, the rules of access, the volume of credit allowed, and the maturity and rates of interest on the credit available are all relevant design features. In this regard, many countries operate standing credit facilities, most often with unlimited volumes of credit at market or above-market rates. In the case of rediscount operations, the bulk of credit is restrained by penalty rates of interest rather than volume restrictions. Some countries restrict the number of banks that can access the overnight standing facilities, the frequency of access, and the intervals between access.

Money Market Operations

These operations are transactions in money market instruments initiated by the central bank and operated through a competitive mechanism that aims at adding (liquidity providing operations) or withdrawing (liquidity absorbing operations) reserves to and from the system, respectively. Money market operations include the following:

- Open market operations (OMO). Those operations are conducted by the central bank as a participant in regular markets. They involve (a) buying and selling assets outright on the secondary market, and (b) buying and selling assets under a repurchase agreement in the repo market or foreign exchange swaps.
- OMO-type operations. Those operations are conducted using a specific central bank instrument. OMO-type operations involve (a) lending and borrowing against underlying assets as collateral, (b) primary market issuance of central bank securities or government securities for monetary policy purposes, (c) accepting fixed-term deposits, and (d) auctions of foreign exchange (as a tool for both foreign exchange and liquidity management).
- In their market operations, central banks may use various auction techniques. With volume tenders, banks bid only for volumes supplied by the central bank at a preset interest rate. With interest rate tenders, banks bid for the amount and the rate; the central bank charges the rates offered (multiple-rate auction) or the cutoff rate (uniform-rate auction).

Note: Further details can be found in Balino and Zamalloa (1997).

by influencing the underlying demand and supply conditions for central bank money. It does so by exchanging financial assets (domestic assets or foreign exchange) for its own liabilities (hereafter referred to as money market operations), or by requiring banks to maintain minimum balances with the central bank (reserve requirements). All of those measures are aimed at influencing the balance sheet of the commercial banks, either directly (through administrative measures) or indirectly (through the balance sheet of the central bank and its money market operations and reserve requirements). The operations, in turn, allow the central bank to influence the liquidity of money and financial markets and to facilitate the achievement of its objectives.

Industrial countries started moving from reliance on credit or interest rate controls toward reliance on money market operations in the 1970s, in view of the increasing inefficiency of the former controls in a context where financial markets had become more integrated both domestically and internationally. In addition, allowing market forces to distribute financial resources was associated with increased economic efficiency and growth. While the instruments used have varied on the basis of country circumstances, the following common trends can be observed: (a) lesser recourse to open-ended or standing facilities that banks may use at their discretion to place funds with, or borrow funds from, the central bank under certain pre-established conditions; (b) increased use of market-based operations conducted at the discretion of the central bank to add or withdraw liquidity from the system; and (c) reduced reliance on reserve requirements. Concomitantly, governments have ceased to rely on the central bank to finance their needs, relying more on the markets to fund their operations.

Central banks in emerging market economies and developing countries have also moved toward reliance on money market operations. At the same time, they have maintained a high reliance on reserve requirements and, at times, liquid asset ratios, which create a captive demand for qualifying assets (typically government securities). Frequently, the central bank has continued to act as banker to the government. The move toward money market operations was the counterpart in the monetary area to the trend toward enhancing the role of price signals in the economy. It has involved reducing direct government intervention in the economy, improving the capacity of financial institutions to mobilize domestic savings, and strengthening the role of market forces in the allocation of financial resources.

As one carries out financial sector assessments, therefore, it is important to assess the functioning of money and foreign exchange markets and to evaluate central banks' monetary operating procedures from the perspective of systemic liquidity management. One objective of assessing systemic liquidity infrastructure is to provide an input in formulating recommendations that will enhance the liquidity of funding markets and will improve access to such markets, thereby helping increase financial sector resilience. Another key objective of assessments is (a) to examine whether monetary operating procedures are efficient and adequate to foster efficient and liquid markets and (b) to help contain interest rate and exchange rate volatility along with the associated risks and vulnerabilities in the system.

11.3 Monetary and Foreign Exchange Markets—Microstructure and Functioning

Market microstructure refers to the mechanics of price formation and liquidity provision, whereas market functioning is about the effectiveness and reliability of those mechanics.⁶ A well-functioning market is one where trades can be executed quickly and with minimal costs and where prices adjust to market-clearing levels in an orderly way. In most cases, a well-functioning market requires some combination of market making or a system of order queuing arising from the market microstructure. In other words, the functioning of the market is determined by its microstructure.

The microstructure and functioning of money and foreign exchange markets differ from that of other financial markets because of the singular role of the central bank.⁷ The central bank is usually the regulator of those markets and is responsible for the development of market institutions. The central bank frequently serves as market maker and dominant supplier of liquidity, particularly in less-developed markets. In a context of shallow markets, the central bank faces the challenge of establishing operating procedures to guide its interventions that balance the need to achieve its policy objectives with the need to promote market development.

Markets may be organized as dealer markets, where market makers provide liquidity by holding inventory and where they aid in price discovery by quoting prices ahead of transactions. In deep markets in which the central bank does not intervene, dealers will adjust their price quotes in response to changes in order flow. In this way, prices will move in response to market fundamentals. However, when markets are shallow or the central bank seeks to control the interest rate or the exchange rate, the central bank often acts as a market maker by providing price quotes and liquidity to the market. Central banks may seek to encourage the deepening of markets by designating authorized or primary dealers to act as market makers. It is important that those dealers have sufficient capital to absorb losses arising from market making and have access to liquidity (including through repo or swap operations with the central bank) to fund their positions.

Central banks also conduct auctions of short-term instruments, repo contracts, and central bank credit; such auctions centralize market activity and concentrate order flows over a short period of time. The central bank may choose to refrain from participating in the auction directly and may allow prices to adjust to clear the market. However, the central bank could actively manage price outcomes by participating in the auction or by imposing cut-off prices.

The functioning of the markets should be assessed by examining the following:

- *Market Liquidity.* Indicators of liquidity include what the bid–ask spread is, whether large trades can be executed without significant price movements and how quickly they can be executed, and whether order imbalances lead to lasting price movements. Liquidity may differ among market participants, especially if there are exchange restrictions. Further, the withdrawal of dealers from the market during times of crisis can lead to sudden stops in liquidity provision.
- *Immediacy of Trades.* This immediacy is crucial in money markets because it underpins effective liquidity management and the operation of the payments system.

The presence of dealers or the access to central bank liquidity facilities is important in ensuring that transactions in the money market can be quickly executed.

- *Efficiency.* Transaction costs in those markets affect the efficiency of financial intermediation and international payments.
- *Transparency.* The regular and reliable supply of information on market activities facilitates orderly price adjustment and better risk management, and the information can be used to inhibit anticompetitive behavior by market participants.
- *Market Participants and Their Behavior.* The entry of different participants (hedge funds, pension funds, and insurance companies) and the consolidation of existing participants that has occurred as markets have been liberalized and developed has implications for market functioning. Risk management and trading strategies have also evolved and have led to shifts to market liquidity over time.⁸
- *Transmission of Policy.* The effectiveness of market makers, be they the central bank or primary dealers, is a key component for the implementation of monetary policy using indirect instruments and for effective intervention in the foreign exchange market.
- *Electronic Trading.* The introduction of electronic trading has sharply reduced transaction costs and has led to a mingling of the inter-dealer market and the dealer-customer market.

11.4 Public Debt Management and the Government Securities Market⁹

Sovereign debt management is the process of establishing and executing a strategy for managing the government's debt in order to raise the required amount of funding; achieve its risk and cost objectives, such as ensuring that the government's financing needs and its payment obligations are met at the lowest possible cost over the medium to long run, which is consistent with a prudent degree of risk; and meet any other sovereign debt management goals that the government may have set, such as developing and maintaining an efficient market for government securities.

A government's debt portfolio is usually the largest financial portfolio in the country. It often contains complex and risky financial structures, and it can generate substantial risk to the government's balance sheet and to the country's financial stability. Sound debt structures help reduce government exposure to interest rate, currency, and other risks.

Risky debt structures are often the consequence of inappropriate economic policies—fiscal, monetary, and exchange rate—but the feedback effects undoubtedly go in both directions. Poor structures in relation to the maturity profile and the interest rate and currency composition of the debt portfolio have often contributed to the severity of an economic and financial crisis. However, if macroeconomic policy settings are poor, sound debt management may not by itself prevent any crisis. The Fund's balance sheet approach (Allen et al. 2002) has also highlighted the risks involved in inappropriate debt structures that are tilted toward foreign currency and short-term debt and are not matched by assets with similar structure, while underplaying the role of inflation indexed debt (see also IMF

2004). Consequently, poor debt structures could be obvious signs of weakness in the debt management framework, particularly in the risk management framework.

The Guidelines for Public Debt Management (IMF and World Bank 2003a) could be used as a framework to review debt management framework and practices. Note, however, that the guidelines should not be viewed as a set of binding practices or international standards against which countries are to be assessed. Instead, the guidelines should be viewed as a tool in assisting governments in designing debt management reforms. According to the structure of the Guidelines for Public Debt Management, a review should focus on the following aspects:¹⁰

- Debt management objectives and coordination
 - Are objectives well spelled out, and do they give adequate weight to risk over cost?
 - Do debt managers and fiscal and monetary policy makers understand the ways in which their policy instruments interact, and are mechanisms in place to facilitate the exchange of information?
 - Are contingent liabilities such as the bail-out costs of the banking sector and other key liabilities such as guarantees for public enterprises covered?
- Transparency and accountability
 - Are the roles and responsibilities for agencies responsible for debt management clear and disclosed to the public?
 - Is information on debt management policies and the regulations and procedures for the primary and secondary markets of government securities publicly disclosed?
 - Are debt management activities annually audited?
- Institutional framework
 - Is the legal authority to undertake financial transactions on the government's behalf clear? Are institutions responsible for public debt management identified?
 - Are mandates and roles in debt management activities well divided and articulated?
 - Are internal operational controls well managed according to international best practices? Do debt management information systems generate accurate debt records?
 - Do debt managers receive appropriate legal advice, and do transactions incorporate sound legal features?
- Debt management strategy and risk management framework
 - Does the debt manager have access to useful methodologies and models to assess costs and risks (for example, the IMF's debt sustainability templates)?
 - Are risks—such as interest rate, rollover, and exchange rate risks—taken into account in borrowing decisions? Is the risk of the currency composition of

debt carefully considered, especially against the potential movements in the exchange rate that are a function of the size of the external deficit and of how closed the economy is? Is the risk of short-term or floating rate debt (especially under fixed exchange rate regimes) appropriately assessed? Is the risk of increased cost of debt management and its effect on interest rates and debt sustainability reviewed? Are debt structures reviewed for “lumpiness” in cash flows? Are put options and covenants avoided that make it likely that a large number of payments will come due when the timing is unfortunate?

- Are stress tests regularly conducted?
- Development and maintenance of an efficient market for government securities
 - Are debt management operations in the primary market transparent, predictable, and, to the extent possible, on the basis of market-based mechanisms?
 - Are the development of secondary markets and a broad investor basis being promoted? Are investors treated equitably?

11.5 Foreign Exchange Reserve Management

Countries hold official reserves to meet a range of objectives that will vary from country to country. Typically, reserves are held to limit external vulnerability by maintaining foreign currency liquidity (a) to absorb shocks; (b) to provide a level of confidence to markets that a country can meet its external obligations, including the government’s ability to repay its external debt; (c) to maintain confidence in policies for monetary and exchange rate management; and (d) to maintain a reserve for national disasters or emergencies.

Specifically, reserves play a key role in preventing the cascading of sectoral liquidity problems into national liquidity and even solvency problems (through the effect on interest rates). Claims on reserves can arise from public and private sector risk and liquidity management. The size of short-term (by remaining maturity), economy-wide, external debt in relation to available international reserves is typically the starting point in determining reserve adequacy for emerging market countries. However, in the absence of effective capital controls, short-term foreign currency debt between residents can also result in pressures on reserves. Therefore, with flexible exchange rates, overall maturity mismatches in foreign currency are the chief concern as they can spill over into claims on reserves and national liquidity problems (see IMF 2004). When exchange rates are fixed and capital controls are weak, all domestic private sector liquidity problems can spill over into national liquidity problems: Domestic claims that fall due or are available on demand can be turned into claims on the limited foreign exchange reserves.

In all cases, reducing currency mismatches,—and for banks also maturity mismatches in the foreign currency book—and more generally strengthening private sector risk management through improvement in the quality of prudential supervision can contribute to mitigating external vulnerabilities by decreasing the chances of confidence and liquidity crises. Reducing the mismatches might also reduce the need for holding large stocks of international reserves by the monetary authorities. Generally, maturity mismatches in

foreign currency are the chief concern because they can spill over into claims on reserves and national liquidity problems. Policies to contain this mismatch include both prudential supervision and macroeconomic debt management policies.¹¹

The overriding objective of reserve management is to ensure that an adequate level of foreign exchange reserves is available for meeting a defined range of objectives and that the security and liquidity of those reserves are safeguarded. The generation of a reasonable return is usually subordinated to such considerations. The Guidelines for Foreign Exchange Reserve Management (IMF 2001a) spells out the objectives and good practices in meeting those objectives.¹² The guidelines could be used as a framework to review reserve management practices, although the guidelines are not an international standard against which country practices are to be assessed. Key issues regarding the reserves' adequacy, transparency, and accounting and measurement of reserves are also covered in IMF's work on Article IV surveillance and on the Safeguard Assessments. Measurement and disclosure issues are also dealt with in the Data Template on International Reserves and Foreign Currency Liquidity. The guidelines provide additional focus on whether existing reserves are effectively managed so that they are available to monetary authorities in the event of crises, and the guidelines avoid reputational risk to the central bank that could undermine its authority (see section 1–4 of the guidelines). The guidelines spell out a range of institutional and operational practices that are based on a wide range of country experiences and that encompass (a) the clear objectives for management of reserves; (b) a framework of transparency that ensures accountability and clarity of reserve management activities and results; (c) the sound institutional and governance structures; (d) the prudent management of risks; and (e) the conduct of reserve management operations in efficient and sound markets. The following aspects of the guidelines would merit special attention:

- Reserve management strategy and coordination
 - Are their clear investment guidelines? Are the degrees of freedom of the various decision-making levels to deviate from the strategic asset allocation appropriate, or do they provide too much leeway for taking market risk at low levels in the organization?
 - Are methodologies to establish the strategic asset allocation appropriate in light of the objectives of holding reserves? The currency composition is especially important, but so is also the maturity, credit, and liquidity profile.¹³
- Transparency and accountability
 - Is there a clear allocation of reserve management responsibilities and roles between the government, the reserve management entity, and other agencies, and is that allocation publicly disclosed?
 - Is the conduct of reserve management included in the annual audit of the financial statements, and is the audit performed by independent external auditors? Is the auditors' opinion publicly disclosed?
 - Is information on official foreign exchange reserves publicly disclosed on a pre-announced schedule? Does information on the pledging of assets and the use of

derivatives relative to domestic currency need to be officially disclosed? Is there any such activity taking place?

- Institutional framework
 - Are the reserve management entity’s responsibilities and authorities clearly established through a legislative framework?
 - Are general principles for internal governance to ensure the integrity of the reserve management entity’s operations in place? More specifically, is there a clear decision-making hierarchy, and are operational responsibilities adequately separated, preferably between a front office (initiating transactions), a middle office (performing measurement, management, and reporting of risks), and a back office (arranging settlements of transactions)?
- Risk management framework
 - Is there a framework for identifying and assessing the risks of reserve management operations?
 - Are risk exposures monitored continuously to warrant that exposures stay within acceptable limits?

11.6 Microstructure of Securities Markets—Trading Systems, Price Discovery, and Determinants of Market Liquidity and Efficiency

The microstructure of secondary markets for equity and debt securities will have an effect on liquidity and efficiency of price discovery in the markets. Microstructure refers to the type of trading systems used, the rules governing execution of trades on those markets, and the nature and role of intermediaries in the markets. Liquidity can be defined as the relative ease (cost) of selling a security in the market or converting it to legal tender, and liquidity can be vastly different in normal conditions and in times of stress.¹⁴ Liquidity is a “self-fulfilling phenomenon” in that liquidity (investor confidence) is attracted by the perception of an already liquid market. Price discovery is the market’s ability to determine pricing of an asset (security), and the more-efficient price discovery mechanisms are, the more reliable the market price will be, thereby reducing volatility.

Organized markets can be stock exchanges—using electronic or physical trading systems—or bulletin boards, over-the-counter markets, or other alternative trading systems such as electronic communications networks.¹⁵ Trading systems may be either auction (or order-driven) markets, wherein orders are entered into the system and compete directly with each other for execution, or dealer markets, wherein market makers post bids and offers and directly execute incoming orders. Many trading systems incorporate elements of both markets. Many jurisdictions maintain anticompetitive rules disallowing competition between markets, which is achieved by refusing to license alternative trading systems or by maintaining rules that require execution on a particular market. Competition between markets provides incentives to cut the costs of trading, but in some markets, fragmenta-

tion of liquidity pools between competing markets can make price discovery less efficient and can increase execution costs for large orders.

Trading systems have different levels of transparency; in most major electronic auction markets, there is a depth of transparency for price and volume of pre-trade bids and offers, as well as full post-trade transparency (real time volume and price, and identity of executing dealer). Over-the-counter markets (usually used for less-liquid equity markets, government securities, and corporate debt) would have less transparency, sometimes only post-trading. While transparency is generally encouraged, in some markets it has a reverse effect on liquidity because transparency can drive up impact costs for large trades.¹⁶

Trade execution rules include obligations to execute on a particular market or exchange, obligations to get the best price for a customer, and limitations on “internalization” of orders—orders never see the exchange floor but are filled inside the dealer by matching one customer’s order against another. In general, dealers should be required to get the best price for customers, although the best execution rule, as this requirement is called, can arguably interfere with the timely execution of an order. Parochial requirements for execution in a regional market, for example, should not be allowed to inhibit best execution. Internalization of order flow is a controversial issue in most markets—dealers and banks will execute client orders either against their own trading books or against each other, rather than exposing the orders to the market. In some markets, internalization can drastically reduce perceived liquidity in the market (because executed trades are not transparent), but there are many arguments that customer orders are more efficiently executed at a fair price when internalized. Policy decisions to prohibit internalization are not necessarily the answer—it is far from clear whether exchanges (particularly as they become privatized) should be afforded a monopoly on liquidity as a matter of policy.

Quality of intermediation—how well dealers, asset managers, and advisers operate—in the market will also affect price discovery and liquidity. Intermediaries should be a reliable source of information (thus reducing asymmetry concerns) through their research function and should, along with a sound payment and settlement system, ameliorate settlement risk. Without a strong research and advisory element in the market place, investors (especially minority investors) will not have sufficient confidence in the accuracy and completeness of disclosure by public issuers. Of course, adequate accounting and auditing standards are the foundation for research, analysis, and disclosure. Without adequate prudential standards, intermediaries will not mitigate settlement risk,¹⁷ and weak or absence of prudential standards will damage investor confidence and inhibit liquidity. Lack of prudential standards also may rule out margin lending and securities lending—contributors to liquidity (Group of Thirty, 2003)¹⁸—because of the risk involved. Lack of ability to short sell and to invest in derivatives prevents investors and intermediaries from using hedging strategies or acting on all their information,¹⁹ and this situation, too, inhibits liquidity. As with rules governing trade execution, regulation of market intermediaries and disclosure regulations should be transparent and predictable in order to attract liquidity (State Street, 2001).

Market integrity (which promotes liquidity) requires entry standards that will protect the market by allowing only “sound” participants; however, unreasonable impediments to entering or exiting the market for either foreign or domestic investors will have a negative impact on liquidity. Transaction, infrastructure, and tax costs will also have an effect on

liquidity. Investors need assurance that holdings can be liquidated when the need arises, without encumbrance or disruption in the market (market failure) and at a reasonable cost. Barriers for cross-border trading, including transaction taxes and reserve requirements, will reduce liquidity. However, once firms are allowed to cross-list on large international markets, trading will be attracted to the larger liquidity pool, leaving smaller, less-developed markets with reduced liquidity.

Notes

1. For example, checks, because of the way they have to be presented and processed, are relatively costly and time-consuming to settle when compared with credit transfer instruments such as payment orders. The credit and liquidity exposures in a check system are substantially more difficult to manage. Although some arrangements can be devised to manage the interbank risks, systemic risk almost inevitably remains in check systems if they are used to channel large-value payments. Therefore, countries with such systems usually establish a dedicated RTGS system to take large-value and time-critical payments out of the check-clearing system. However, an RTGS system might not always be cost-effective in a smaller country.
2. See <http://www.bis.org/publicpss53.pdf> and <http://www.ecb.int/pub/html/index.en.html>.
3. See <http://www.bis.org/cpss/paysysinfo.htm>.
4. See CPSS (2001, paragraph 3.0.2) for a discussion of what constitutes a SIPS. The definition in the text is based on IMF and World Bank (2001), which provides guidance on how to conduct assessments.
5. When a self-assessment is not available or contains significant information gaps, a questionnaire is sent to the central bank of the country in that bank's capacity as the payment system overseer.
6. The definitions are from Barth, Remolona, and Woodbridge (2002).
7. The microstructure literature has mostly focused on securities markets. However, there has been recent research on the role of microstructure on exchange rate determination and central bank intervention (see Lyons 2001).
8. See Barth, Remolona, and Woodbridge (2002) for a further discussion of the issues.
9. The section is based on IMF and World Bank (2003a).
10. For more detailed discussions and guidance, see IMF and World Bank (2003a, b).
11. For a comprehensive discussion of policy framework to assess reserve adequacy and to manage foreign currency liquidity, see IMF (2004). Also, required reserves on foreign currency deposits in foreign, rather than domestic, currency can help discourage such mismatches in the foreign book.
12. See IMF (2001a). For an elaboration of the guidelines that are based on country practices, see IMF (2003).
13. For more detailed discussions, see IMF (2001b).
14. Definitions of liquidity are discussed in Sarr and Lybek, (2002). For a recent discussion of modeling liquidity, see von Wyss (2004). Many econometric models are available, and none are absolutely conclusive.

15. For a description of various microstructure choices see Glen (1994) and Dattels (1997).
16. For an analysis of pre-trade and post-trade transparency, see Ganley, Holland, Saporta, and Vila (1998)
17. By limiting access to the clearing and settlement of trades to properly regulated and well-capitalized intermediaries, the risk that a party to a transaction will default is significantly reduced.
18. The Group of Thirty (2003) advocates removal of tax and regulatory barriers to securities lending. Another barrier may be weak prudential regulation, which creates risks in such activities and causes regulators to disallow lending practices. See also CPSS and Technical Committee of the IOSCO (2001).
19. Selling short provokes strong responses from policy makers. While it should be regulated appropriately, prohibiting short selling will act against liquidity and price discovery. Without the ability to sell short, a trader without a position can only buy and cannot act on information that indicates that price will drop. If a trader cannot act on negative information, the price discovery mechanism will be distorted.

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