

## Chapter Thirteen

### Financial Soundness Indicators and Macroprudential Analysis

#### Introduction

13.1 This chapter provides an overview of the use of FSI data in macroprudential analysis. It focuses on three questions:

- Why are FSI data needed?
- What is the financial stability framework within which FSI data can be used?
- What are some other tools that can enhance the usefulness and understanding of FSI data?

13.2 *The collection, compilation, and dissemination of data involve resource costs for suppliers and compilers. Therefore to justify such work, it is necessary to ask ...*

#### **Why are FSI data needed?**<sup>273</sup>

13.3 The recognition of the need for FSIs statistics among the international community arose out of the financial crises of the 1990s. A review of recent decades shows that many IMF member countries experienced financial crises that often resulted in severe disruptions of economic activity. The significant costs of these crises, both direct (such as the cost of recapitalizing the deposit-takers) and indirect (such as the loss of real economic activity), have highlighted the need to develop a body of—preferably high frequency—statistics that could help policy makers in macroprudential analysis, that is, in identifying the strengths and vulnerabilities in their countries' financial systems. Such analysis could form the basis for taking action to prevent crises from occurring.

13.4 Understanding of the nature and causes of financial system crises has developed a great deal in recent years, but analytical work continues.

13.5 Financial system crises can arise from the failure of one or more institutions, whose effects then spread through a variety of contagion mechanisms to affect the whole system. The original shock that caused the failure is likely to be external or *exogenous* to the institution. Indeed, prudential supervision supports efforts to identify potential vulnerabilities in individual institutions before they become severe, and if they do become serious to inform actions that limit their systemic consequences.

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<sup>273</sup> This section of the chapter draws on Borio (2003) and Crockett (2002).

13.6 Systemic crises can also arise from the exposure of a financial system to common risk factors. Under these circumstances, systemic stability is determined by behavior internal or *endogenous* to the system. In other words, financial crises arise when the collective actions of individual agents make the system itself vulnerable to shocks. The build-up of these vulnerabilities and risks tends to occur over time, such as during an economic upswing when confidence is high, before materializing in recessions.

13.7 The sources of vulnerability of the financial system can vary; for example, poor asset quality, undue exposures to market and credit risk, and lack of capital. The timing of a crisis and its immediate causes can also vary; for example, the deteriorating condition of private borrowers, excess government borrowing which undermines confidence, concern over a large current account deficit and/or a sharp swing in the exchange rate. When the financial system is vulnerable, such events can result in a financial system crisis that imposes severe losses on an economy, both directly and indirectly: directly as depositors lose funds as banks fail and as governments incur fiscal costs to rebuild the financial system; indirectly as economic activity is reduced by the disruption of financial intermediation and/or payment systems. Moreover, there can be adverse social consequences from the economic and financial disruptions.

13.8 Experience has shown that actions or policies that seem appropriate from an individual entity's viewpoint can have unwelcome systemic consequences. For instance, in the face of perceived higher risk caused by financial market developments, or a reduction in capital adequacy caused by weak profitability, individual deposit-takers might tighten lending terms. This might impede economic activity over significant periods of time and/or precipitate financial stress and asset price declines, which in turn could increase financial system risk.

13.9 FSIs and the framework provided in this *Guide* have been developed to assist macroprudential analysis. The position at a single moment in time and developments over time, such as through a full business cycle, can be assessed. Indeed, understanding how vulnerabilities build up over time is particularly relevant to this analysis, along with an understanding of the mutually reinforcing dynamic interaction between the financial system and the real economy. The focus of this body of data is somewhat different from, but also complements, that for prudential supervision (which is rationalized in terms of deposit-protection). The focus of this body of data is also different from that in the national accounts (which is used to monitor macroeconomic activity). Thus, while necessary, FSI data alone are not sufficient to meet all the needs of macroprudential analysis, as discussed later in this chapter.

13.10 *If the need for the body of data is understood, how do the set of data series fit together? In short ...*

### **What is the financial stability framework within which FSI data can be used?<sup>274</sup>**

13.11 The development of a financial stability framework for the analysis of FSIs and related data is still at a relatively early stage and indeed, dissemination of data would support further empirical research. In June 2003, the IMF staff presented to the IMF's Executive Board such a framework (see Figure 13.1). While it is considered a useful tool, it nonetheless requires further development.

13.12 The framework has four different elements:

- Assessment of the risk of a shock to the financial sector. Among the tools available are indicators used in early warning system (EWS) models. These indicators are typically based on country-specific data, developments in the global economy, and political risk.<sup>275 276</sup>
- The use of FSIs to assess the vulnerability of the financial sector to shocks; assess the condition of nonfinancial sectors; monitor financial sector vulnerabilities arising from credit, liquidity, and market risk; and assess the capacity of the financial sector to absorb losses, such as measured by capital adequacy.<sup>277</sup>
- Analysis of macrofinancial linkages to obtain an indication of the effect on macroeconomic conditions, debt sustainability, and impairment in the intermediation capacity of the financial sector.
- Surveillance of macroeconomic conditions to assess the effect of shocks on macroeconomic developments and debt sustainability.

13.13 From Figure 13.1 it can be seen that FSIs are part of a larger body of information and tools used to monitor financial stability, and there are interrelationships between the different elements.

13.14 While the financial stability framework indicates how a shock might be transmitted through the financial system, the direction of causality is not set. For instance, weakness in banks' capital adequacy could result in a tightening of credit standards that would affect the condition of the nonfinancial sector; and declining productivity and income in the nonfinancial corporations sector that reduces debt servicing capacity could make the

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<sup>274</sup> This section draws upon IMF (2003b).

<sup>275</sup> While EWS models offer a systematic, objective, and consistent method for predicting crises, they have a mixed record in terms of forecasting accuracy, and are only used as one amongst many inputs into IMF surveillance.

<sup>276</sup> See also Abiad, (2003).

<sup>277</sup> Moreover, these vulnerabilities and capital adequacy should be monitored for both the sector as a whole and for key peer groups that are sources of risk to financial stability.

financial system vulnerable. Therefore, widespread compilation and dissemination of FSIs and related data, such as the sectoral financial statements and the structural indicators outlined in the *Guide*, would help in the understanding of linkages among FSIs as well as between FSIs and other economic data.

### *Analysis of linkages among FSIs*

13.15 The complexities of the relationships or linkages among FSIs are still far from being fully understood. Nonetheless, even in the absence of widespread dissemination of FSI data, some linkages are clear.

#### *Corporate leverage and asset quality*

13.16 FSIs monitoring the financial condition of the nonfinancial corporations sector may help detect a potential deterioration in asset quality at an early stage, before it is reflected in NPLs. Such FSIs help compensate for the fact that NPLs—the best available measure of asset quality—is a lagging indicator, partly due to the period that a loan needs to be in arrears before it is declared nonperforming. The corporate leverage and debt service capacity ratios can be used as indicators of the asset quality, as the corporate sector is a key channel through which shocks affect the deposit-taking sector.<sup>278</sup>

#### *Asset quality and capital adequacy*

13.17 The linkages between FSIs of asset quality and capital adequacy derive from loan classification and provisioning rules that determine when, and how much, banks provision against nonperforming loans. Thus, these rules influence the size and timing of any reduction in capital that results from a deterioration in asset quality. Since these rules vary across countries, the linkages are likely to be different for each country. Especially when banks have significant discretion in classifying loans or there may be forbearance, close attention needs to be paid to these rules because of the greater scope for banks to under-report the actual deterioration in credit quality. Similarly, inadequate provisioning rules enable banks to delay addressing credit problems, which are likely to become more serious over time as a result.

#### *Taking account of macrofinancial linkages*

13.18 The macrofinancial linkages between nonfinancial sectors and the banking sector are important for gauging the possible impact of a financial crisis on macroeconomic developments. These linkages arise from the borrowing and the depositing of funds by other sectors with deposit-takers. The importance of these linkages can be measured through a combination of monetary data and, for transactions routed through foreign centers, BIS

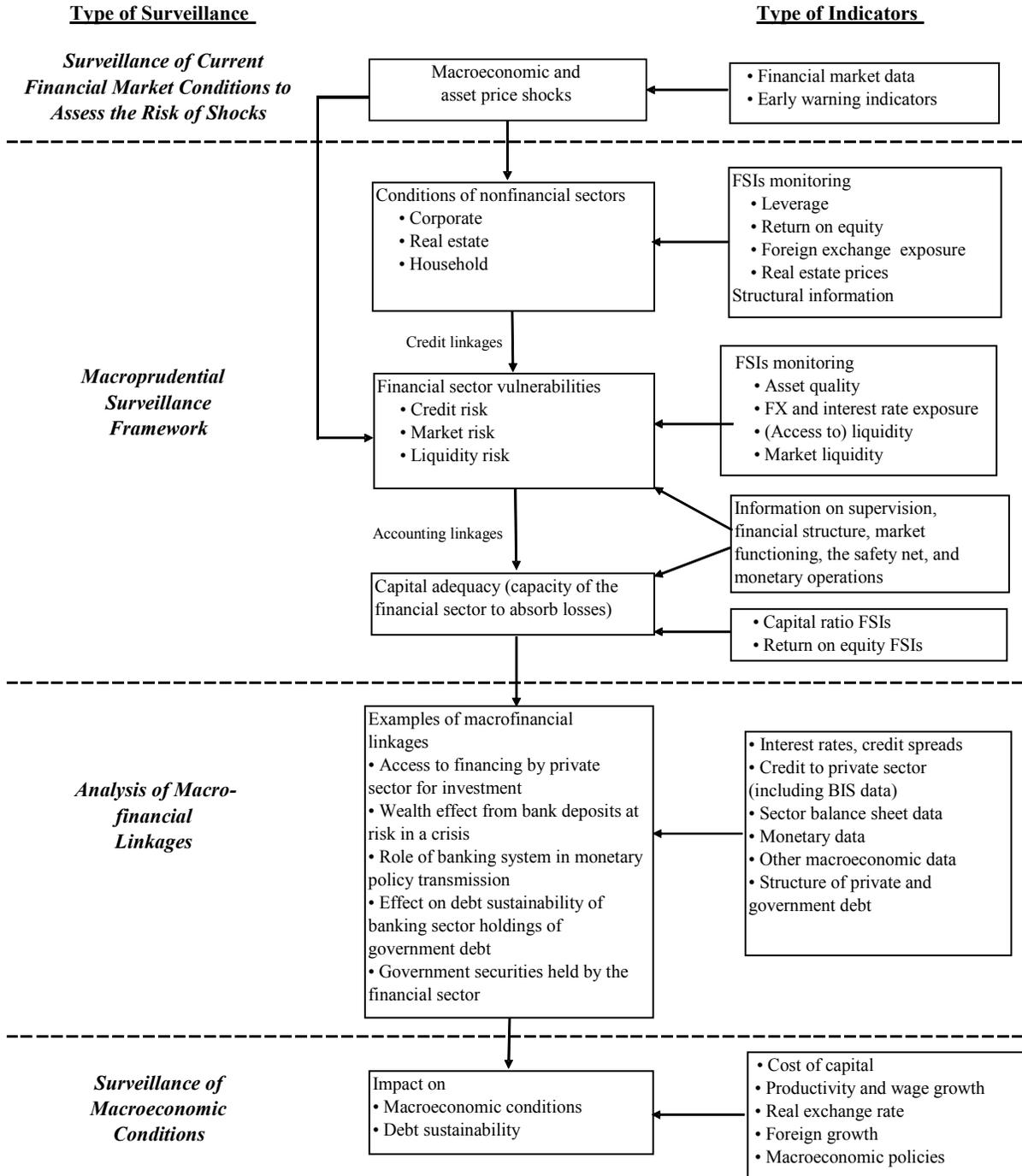
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<sup>278</sup> See page 24 of IMF (2003b). Work in the Fund described in IMF (2003b) found that the nonfinancial corporations sector's leverage ratio had a significant impact on deposit-takers' asset quality with a one year lag.

international banking statistics. As in most economies deposit-takers are at the center of the financial system, these linkages are likely to be very significant.

13.19 Table 12.2 sets out a set of structural indicators that help to understand the importance of deposit-takers to the economy and to gauge the possible impact of a financial crisis: the number of institutions and the structure of their ownership, the number of branches and employees, the absolute and relative size of financial assets held, and so on. Moreover, these indicators, through the information they provide on the ownership structure, can indicate the possibility that deposit-takers might receive outside support in a crisis, such as in the case of foreign- and government-controlled deposit-takers.

Figure 13.1. Analytic Framework for Financial Stability



13.20 The financial sector's holdings of debt securities issued by the government and the private sector can be important. Specifically, credit or market losses and a sharp fall in the capital ratio can lead to an adjustment in the deposit-taking sector's holdings of this debt. When deposit-takers' balance sheets contain a significant share of outstanding government or private debt securities, the debtors' borrowing costs and capacity to roll-over their debt could be affected, with possible implications for debt sustainability. To assess the significance of these linkages, it can be useful to monitor FSIs in combination with sectoral financial statement data. Moreover, the sustainability of government debt might also be affected if there were a banking crisis in which the government had to bail out the banking sector.

13.21 Another linkage exists due to the potential impact of banking sector problems on the monetary policy transmission mechanism. Financial system weakness could make it more costly to tighten monetary policy, limiting the policy options of the central bank. In this case, FSI data complement monetary data. Data on financial structure, including the relative importance of market and bank financing can also be useful in this analysis. Payment systems are also vital links between the financial sector and the rest of the economy. This aspect of financial stability is discussed below.

13.22 *FSI and related data provide quantitative information on the current health and soundness of the financial system, but additional tools can be used.*

### **What are some other tools that can enhance the usefulness and understanding of FSI data?**

13.23 The analysis of FSIs can be strengthened by using stress tests and information on the effectiveness of banking supervision and the robustness of the financial system infrastructure.<sup>279</sup>

#### ***Stress testing and FSIs***

13.24 Analytical work has focused on how aggregate stress testing can be used in combination with FSIs to enhance their usefulness. Aggregate stress testing involves applying standardized shocks to deposit-takers' balance sheets and then aggregating the results across deposit-takers to obtain the impact on the sector as a whole. Stress testing also provides a way to assess certain types of risks that are hard to measure precisely using FSIs, including risks arising from derivatives and off-balance sheet exposures.

13.25 The relationship between FSIs and stress testing derives from the fact that changes in FSIs are typically outputs of stress tests and also "intermediate" inputs of stress tests in some cases. Specifically, in stress testing the impact of a macroeconomic shock is usually measured by its impact on the capital ratio FSIs. Moreover, some shocks are formulated in

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<sup>279</sup> Comprising payment systems, financial market infrastructure, systemic liquidity arrangements, accounting and disclosure, insolvency regimes, and financial safety nets.

terms of changes in the level of NPLs and thus provide a direct measure of the linkage between changes in the NPL-based FSIs and the capital ratio for the deposit-taking sector.

13.26 Stress testing and FSIs are different but complementary approaches to assessing risks to financial stability. FSIs allow more continuous monitoring of specific strengths and vulnerabilities over time, while the stress tests give an estimate of the losses (typically reported as a change in the capital ratio FSI) in the context of vulnerabilities from a one-time, plausible shock to a relevant macroeconomic risk factor. An introduction to stress testing is provided in Appendix VI.

13.27 While a systemic risk arising from interbank exposures can be monitored by aggregated data, such an approach does not take into account the structure of bilateral interbank exposures within the sector. Stress tests can use information on the distribution of interbank exposures within the sector to assess more precisely the risk of a systemic crisis being triggered by the failure of a systemically important bank, as described in Box 13.1.

**Box 13.1. Using Interbank Stress Testing to Assess Systemic Risk\***

Interbank stress testing can be used to assess the systemic risk deriving from the potential of a shock to trigger contagion through interbank exposures. It estimates the potential for the failure of one, or a few banks, triggered by a shock, to cause other banks to fail. This exercise has two stages: first, a standard stress test applied to individual banks is used to identify the bank (or banks) that are at greatest risk of failure. Second, an interbank stress test based on data on bilateral interbank exposures is used to assess whether failure of the vulnerable bank or banks could trigger the failure of other banks in the system (who could have already been weakened directly by the shock) due to the interbank exposures between them. The interbank stress test then identifies those banks (if any) that have a large exposure to the failed bank(s) and, thereby, could also be forced into insolvency. The interbank exposure data take the form of a matrix with the cells containing the net bilateral interbank exposures between banks, where each row in the matrix gives the interbank exposures of a bank to every other bank in the matrix (see Figure below). In effect, the nonzero cells serve to provide comparisons of these exposures to the banks' capital to ascertain if the losses incurred due to default on their interbank loans would reduce their capital sufficiently to cause them to also fail. This type of stress test has already been conducted on several FSAPs.

Box 13.1 Figure: Illustrative Matrix of Net Bilateral Interbank Exposures

	Bank 1	Bank 2	...	Bank n
Bank 1	-- --	Interbank exposure of bank 1 to bank 2	...	Interbank exposure of bank 1 to bank n
Bank 2	Interbank exposure of bank 2 to bank 1	-- --	...	Interbank exposure of bank 2 to bank n
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.	.	.		.
.	.	.		.

\* Interbank stress tests are reported in the Luxembourg FSAPs (see IMF, 2002) and in Elsinger, Lehar, Summer (2002).

### ***Basel core principles (BCP) and FSIs***

13.28 A wide range of information relevant to assessing the soundness of the banking sector can be found in the assessment of compliance with the BCP for effective banking supervision.<sup>280</sup> Assessing compliance with the BCPs is an integral part of every FSAP. The assessments are sometimes conducted separately also.

13.29 The link between compliance with core principles and financial stability remains complex. It involves, for example, lags in the implementation of rules, and their ultimate effect on the health of the financial system. The descriptive information contained in the assessments of BCPs can help assess how a lack of compliance with specific core principles may contribute to banking sector vulnerabilities and affect the capacity of the banking sector capital to absorb potential losses.

13.30 Table 13.1 lists specific BCPs that may contain relevant information to assess particular aspects of the stability of the financial system and indicates in which area of macro-prudential analysis this information may be useful. The table suggests that many of the core principles contain information potentially relevant to the assessment of risks to the stability of the financial system.<sup>281</sup>

13.31 More broadly, the information provided in the assessments of BCPs can be used to help interpret FSIs in a number of ways:

- To support the metadata that should be provided with the dissemination of FSI data, assessments of BCPs can clarify what is being measured by the FSIs. For example, when assessing capital adequacy FSIs, BCP 6 clarifies the definition of capital by providing information on the types of instruments that supervisors allow banks to include in capital. In addition, BCP 8 helps assess the impact of accounting and provisioning rules on reported banking sector capital used in FSIs.
- Assessments of BCPs can help establish the underlying cause of observed movements in FSIs when there are competing explanations. For example, a decline in the risk-weighted capital adequacy ratio may reflect an FSI deterioration or improvement, depending on whether this change is driven by a rapid growth of assets that are considered more risky or by a remedial action that requires higher loss recognition. The latter interpretation is more likely in a supervisory system where prompt remedial action is usually taken. Assessment of BCP 22 provides information on the extent to which supervisors take prompt remedial action to reduce risk in the financial system.

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<sup>280</sup> The IMF and World Bank (2002) reviews the experience of the IMF and the World Bank in conducting BCP assessments in over 60 countries to identify the extent to which it is possible to use these assessments to investigate the effectiveness of banking supervision.

<sup>281</sup> The assessments of BCPs contain two types of information: descriptive information regarding the way in which specific criteria are met; and, a rating of the degree of compliance with each core principle.

- Assessments of BCPs can indicate the responsiveness of the supervisory system to emerging financial sector problems, which reveals how quickly vulnerabilities identified by FSIs are likely to be corrected. For example, BCP 7 on the adequacy of banks' credit policies can help judge when FSIs monitoring asset quality warrant concern. Similarly, BCP 9, covering the restrictions on large exposures and portfolio concentrations set by supervisors, is relevant to the interpretation of FSIs monitoring sectoral loan concentrations. Finally, BCP 12, covering market risk, can help reveal whether the banks have the discretion to build up market exposures large enough to pose a risk to the soundness of the system.
- Assessments of BCPs provide information on the effectiveness of banks' risk management. This indicates how effectively the banking system is responding to the risk associated with particular values for FSIs. For example, BCP 11 provides complementary information on the adequacy of banks' management of country risk. Similarly, information from BCP 12 on limits and capital charges on market exposures and banks' market risk management can help interpret FSIs of sensitivity to market risk. Finally, BCP 13 gives information on banking sector management of liquidity risk.
- Assessments of BCPs provide information on risks that cannot be captured adequately using FSIs, such as operational and legal risk.

Table 13.1. BCPs Containing Information Relevant to the Interpretation of FSIs

Information Relevant to Macroprudential Surveillance	BCPs Providing Relevant Information to Macroprudential Surveillance	
	BCP Number	Information Content of BCP
<b>I. Robust financial infrastructure</b>		
Sound and stable macroeconomic policies	Precondition 1	Soundness of macroeconomic policies
Well-developed public infrastructure	Precondition 2	Judicial system, accounting principles and auditing systems, payment and clearing system
Efficient bank resolution procedures	Precondition 4	Bank resolution procedures
Appropriate public safety nets	Precondition 5	Bank safety nets
<b>II. Effective supervision</b>		
Autonomy, power, and resources of supervisory authority	BCP 1	Independence
	BCP 1	Enforcement powers
	BCP 1	Legal protection
Capacity to take prompt remedial actions in response to identified weaknesses	BCP 22	Remedial measures
Capacity to collect necessary information	BCP 16-19	On- and off-site supervision
Capacity to verify data provided by banks	BCP 21	Accounting standards
Capacity to collect and verify information on cross-border activities	BCPs 1	Information sharing
	BCP 23-25	Cross-border information sharing
<b>III. Macroprudential surveillance</b>		
Surveillance of FSIs of capital adequacy	BCP 6	Capital adequacy
	BCP 8	Loan evaluation and loan loss provisioning
	BCP 20	Consolidated supervision
	BCP 23	Globally consolidated supervision
Surveillance of FSIs of asset quality	BCP 7	Credit policies
	BCP 8	Loan evaluation and loan loss provisioning
	BCP 9	Large exposure limits
	BCP 10	Connected lending
	BCP 20	Consolidated supervision
	BCP 23	Globally consolidated supervision
Surveillance of FSIs of earnings and profitability	-	-
Surveillance of FSIs of liquidity	BCP 11	Country risk
	BCP 13	Other risks
Surveillance of FSIs of sensitivity to market risk	BCP 12	Market risk

*Role of information on financial infrastructure*

13.32 Information on the financial system infrastructure can also help interpret FSIs. The financial market infrastructure includes payment and settlement systems and a broad range of different markets that banks rely on as funding sources and for trading. It also includes central bank operations and other systemic liquidity arrangements. The financial system infrastructure affects financial institutions' capacity to access and manage liquidity. Tables 8.1 and 8.2 provide a framework for disseminating some information on the financial system infrastructure, and can be used to help interpret the liquidity FSIs.

13.33 Information on the types of markets and their functioning can be useful in assessing how vulnerable the banking sector is to a loss of access to market funding in a crisis. For example, while the interbank market is generally the most important and lowest cost source of funding for banks, the latter can lose access to interbank funding if their credit quality deteriorates by even a relatively small amount. In contrast, in repo markets and securities markets, access to liquidity is likely to be more robust to such deterioration, as repo markets lend on a secured basis while securities markets price risk by charging lower quality borrowers a wider interest rate spread.

13.34 Information on market micro-structure, such as whether markets are in organized exchanges, over-the-counter (OTC), or rely on electronic trading systems, can provide insights into the robustness of market liquidity. For OTC markets, information on features affecting the capacity of market makers, such as the number of market makers and the size of the positions they take, could be useful. For exchanges, information on the trading systems, price transparency, margining rules, and capital committed by the exchange to support trading could be used. For electronic trading systems an indicator of liquidity is the standard transaction size. Also relevant is the extent to which closely related assets are traded on the different types of markets, which can substitute for each other if one market loses liquidity (for instance some currencies are traded on OTC markets, exchanges, and electronic trading systems). By reducing credit risk, the liquidity of financial markets can also be affected by the extent to which trades are cleared through a central counterparty.

13.35 The BIS's so-called Red Book (see the Text Annex to Chapter 8) provides information on payment systems of individual countries. Specifically, very large, short-term (including intra-day) credit exposures can arise in some payment systems, which could make banks less willing to lend to each other in a crisis. Thus, it may be desirable to monitor indicators of payment system functioning, such as on intra-day interbank exposures and daylight overdrafts. Moreover, it may be useful to have information on the settlement lags, loss-sharing arrangements, reliance on collateral, and markets which have Real Time Gross Settlement; all this information provides indications of the extent to which banks may have succeeded in controlling this source of credit risk.

13.36 Also relevant to interpreting liquidity FSIs is information on the financial system safety net, including deposit protection schemes, and central banks' liquidity support to markets which influences the extent to which banks can continue to access market liquidity in a crisis.