

Chapter 3

Assessing Financial Stability

Financial system stability in a broad sense means both the avoidance of financial institutions failing in large numbers and the avoidance of serious disruptions to the intermediation functions of the financial system: payments, savings facilities, credit allocation, efforts to monitor users of funds, and risk mitigation and liquidity services. Within this broad definition, financial stability can be seen in terms of a continuum on which financial systems can be operating inside a stable corridor, near the boundary with instability, or outside the stable corridor (instability).¹

Financial stability analysis is intended to help identify threats to financial system stability and to design appropriate policy responses.² It focuses on exposures, buffers, and linkages to assess the soundness and vulnerabilities of the financial system, as well as the economic, regulatory, and institutional determinants of financial soundness and stability. It considers whether the financial sector exhibits vulnerabilities that could trigger a liquidity or solvency crisis, amplify macroeconomic shocks, or impede policy responses to shocks.³ The monitoring and analysis of financial stability involves an assessment of macroeconomic conditions, soundness of financial institutions and markets, financial system supervision, and the financial infrastructure to determine what the vulnerabilities are in the financial system and how they are being managed. Depending on this assessment of the extent of the financial system's stability, policy prescriptions may include continuing prevention (when the financial system is inside the stable corridor), remedial action (when it is approaching instability), and resolution (when it is experiencing instability).

3.1 Overall Framework for Stability Analysis and Assessment

The analytic framework to monitor financial stability is centered around macroprudential surveillance and is complemented by surveillance of financial markets, analysis of

macrofinancial linkages, and surveillance of macroeconomic conditions. These four key elements play distinct roles in financial stability analysis.

- Surveillance of financial markets helps to assess the risk that a particular shock or a combination of shocks will hit the financial sector. Models used in this area of surveillance include early warning systems (EWSs). Indicators used in the analysis include financial market data and macro-data, as well as other variables that can be used for constructing early warning indicators (see section 3.2).
- Macroprudential surveillance tries to assess the health of the financial system and its vulnerability to potential shocks. The key quantitative analytical tools used for macroprudential surveillance are the monitoring of financial soundness indicators (FSIs) and the conducting of stress tests. Those tools are used to map the conditions of non-financial sectors into financial sector vulnerabilities. The analysis also draws on qualitative data such as the results of assessments of quality of supervision and the robustness of financial infrastructure (see section 3.3).
- Analysis of macrofinancial linkages attempts to understand the exposures that can cause shocks to be transmitted through the financial system to the macroeconomy. This analysis looks at data such as (a) balance sheets of the various sectors in the economy and (b) indicators of access to financing by the private sector (to assess the extent to which private owners would be able to inject new capital to cover the potential losses identified through macroprudential surveillance) (see section 3.4).
- Surveillance of macroeconomic conditions then monitors the effect of the financial system on macroeconomic conditions in general and on debt sustainability in particular (see section 3.4).

Assessing financial stability is a complex process. In practice, the assessment requires several iterations. For example, the effects of the financial system on macroeconomic conditions may produce feedback effects on the financial system. The profile of risks and vulnerabilities (ascertained through macroprudential surveillance) could feed into qualitative assessments of effectiveness of supervision, and those effects, in turn, might influence the analysis of vulnerabilities and overall assessment of financial stability.

3.2 Macroeconomic and Financial Market Developments

An analysis of macroeconomic and financial developments provides an important context for the analysis of financial sector vulnerabilities. The goal of the surveillance of macroeconomic developments and of financial markets is to provide a forward-looking assessment of the likelihood of extreme shocks that can hit the financial system.

The literature on EWSs—which deals with factors that cause financial crises—provides useful guidance for this mode of analysis. EWSs try—in a statistically optimal way (i.e., in a way that minimizes “false alarms” and missed crises)—to combine a number of indicators into a single measure of the risk of a crisis. EWSs do not have perfect forecasting accuracy, but they offer a systematic method to predict crises. Two approaches to constructing EWS models have become common: the indicators approach (Kaminsky,

Lizondo, and Reinhart 1998, and Kaminsky 1999) and limited dependent variable probit–logit models (Berg and Pattillo 1999). Berg and others (2000) assess the performance of those models and find that they have outperformed alternative measures of vulnerability, such as bond spreads and credit ratings. However, although those models can anticipate some crises, they also generate many false alarms.⁴

EWS models are seen as one of a number of inputs into the IMF’s surveillance process, which encompasses a comprehensive and intensive policy dialogue. The IMF puts significant efforts into developing EWS models for emerging market economies, which resulted, among other things, in influential papers by Kaminsky, Lizondo, and Reinhart (1998) and by Berg and Pattillo (1999). The IMF uses a combination of EWS approaches, in particular, the Developing Country Studies Division model and a modification of the Kaminsky, Lizondo, and Reinhart model, both of which use macro-based indicators of currency crises (IMF 2002b). It also makes use of market-based models that rely on implied probability of default and balance-sheet-based vulnerability indicators (e.g., see Gapen and others 2004).

In recent years, other institutions and individuals have also developed EWS models. Those efforts included EWS models developed or studied by staff members at the U.S. Federal Reserve (Kamin, Schindler, and Samuel 2001), the European Central Bank (Bussiere and Fratzscher 2002), and the Bundesbank (Schnatz 1998). Academics and various private sector institutions also developed a range of EWS models. The private sector EWS models include Goldman Sachs’s GS-watch (Ades, Masih, and Tenengauzer 1998), Credit Suisse First Boston’s (CSFB’s) Emerging Markets Risk Indicator (EMRI) (Roy 2001), Deutsche Bank’s Alarm Clock (Garber, Lumsdaine, and Longato 2001), and Moody’s Macro Risk model (e.g., Gray, Merton, and Bodie 2003).

The EWS literature covers three main types of crises: currency crises (sudden, sizable depreciation of the exchange rate and loss of reserves), debt crises (default or restructuring on external debt), and banking crises (rundown of bank deposits and widespread failures of financial institutions). One can distinguish three “generations” of crises models, depending on what determinants the models take into account. The first generation focuses on macroeconomic imbalances (e.g., Krugman 1979). The second generation focuses on self-fulfilling speculative attacks, contagion, and weakness in domestic financial markets (e.g., Obstfeld 1996). The third generation of models introduces the role of moral hazard as a cause of excessive borrowing and suggests that asset prices can be a useful leading indicator of crises (e.g., Chang and Velasco 2001). In general, empirical studies (e.g., Berg and others 2000) suggest that currency crises occur more often than debt crises (roughly 6:1) and that a large portion of the debt crises happened along with or close to the currency crises. Banking crises are hard to identify, tend to be protracted, and, thus, have a larger macroeconomic effect. Banking crises also tend to occur with or shortly after a currency crisis.

Forecasting banking crises is based on three approaches:

- The macroeconomic approach is based on the idea that macroeconomic policies cause crisis, and it tries to predict banking crises using macroeconomic variables. For example, Demirgüç-Kunt and Detragiache (1998) study the factors of systemic banking crises in a large sample of countries using a multivariate logit model and

find that crises tend to erupt when growth is low and inflation is high. They also find some association between banking sector problems, on the one hand, and high real interest rates, the vulnerability to balance of payments crises, the existence of an explicit deposit insurance scheme, and weak law enforcement, on the other hand.

- The bank balance-sheet approach assumes that poor banking practices cause crises and that bank failures can be predicted by balance-sheet data (e.g., Sahajwala and Van den Berg 2000; Jagtiani and others 2003).
- The market indicators approach assumes that equity and debt prices contain information on bank conditions beyond that of balance-sheet data. Market-based EWS models are based on the premise that financial asset prices contain information on market beliefs about the future. In particular, option prices reflect market beliefs about the future prices of the underlying assets. This information can be used to extract a probability distribution, namely, the probability of default. The advantage of equity and debt data is that they can be available in high frequency and that they should provide a forward-looking assessment (e.g., Bongini, Laeven, and Majnoni 2002; Gropp, Vesala, and Vulpes 2002).⁵

3.3 Macprudential Surveillance Framework

Surveillance of the soundness of the financial sector as a whole—which is macroprudential surveillance—complements the surveillance of individual financial institutions by supervisors—which is microprudential surveillance. Macroprudential surveillance derives from the need to identify risks to the stability of the system as a whole, resulting from the collective effect of the activities of many institutions.

Macroprudential analysis also closely complements and reinforces EWSs and other analytical tools for monitoring vulnerabilities and preventing crises. EWSs traditionally focus on vulnerabilities in the external position while using macroeconomic indicators as key explanatory variables. Macroprudential analysis (analysis of FSIs and stress testing) focuses on vulnerabilities in domestic financial systems arising from macroeconomic shocks, whose likelihood and severity can be judged from EWSs. At the same time, information from macroprudential analysis can provide input into assessing macroeconomic vulnerabilities. Analysis of FSIs for individual banks, along with other supervisory information, serves as a form of EWS for the financial condition of individual banks in many supervisory assessment systems (Sahajwala and Van den Berg 2000).

Macroprudential surveillance uses a combination of qualitative and quantitative methods. The key qualitative methods focus on the quality of the legal, judicial, and regulatory framework, as well as governance practices in the financial sector and its supervision. An important part of the qualitative information is often gathered through the assessments of internationally accepted standards and codes of best practice. The quantitative methods include a combination of statistical indicators and techniques designed to summarize the soundness and resilience of the financial system.

The two key quantitative tools of macroprudential surveillance are the analysis of FSIs and stress testing. The analysis of FSIs includes assessing their variation over time

and among peer groups, as well as assessing their determinants. FSIs help to assess the vulnerability of the financial sector to shocks. Stress testing assesses the vulnerability of a financial system to exceptional but plausible events by providing an estimate of how the value of each financial institution's portfolio will change when there are large changes to some of its risk factors (such as asset prices).

3.3.1 Analysis of Financial Soundness Indicators

FSIs are used to monitor the financial system's vulnerability to shocks and its capacity to absorb the resulting losses. Work on FSIs has produced a set of core FSIs and a set of encouraged FSIs (see chapter 2).⁶

- The *core set* of FSIs covers only the banking sector, thereby reflecting its central role. Those FSIs are considered essential for surveillance in virtually every financial system and, thus, serve as a small common set of FSIs across countries. Also, the data to compile those FSIs are generally available.
- The *encouraged set* of FSIs covers additional FSIs for the banking system and FSIs for key non-financial sectors because balance-sheet weaknesses in those sectors are a source of credit risk for banks and, thus, help detect banking sector vulnerabilities at an earlier stage. The encouraged set of FSIs are relevant in many, but not all, countries.

The choice of FSIs depends on the structure of a country's financial system and data availability. Although the core set provides an initial prioritization, the choice should not be limited to this set. In bank-dominated systems, the core and some relevant encouraged FSIs may be adequate. FSIs for other types of financial institutions may be needed if those institutions are systemically important. Of course, some countries may have other relevant indicators that are not included in the core or encouraged sets that may need to be monitored. In countries with well-developed markets, with information on key prices, spreads, and price volatility, other market information, including ratings, can be used as market-based indicators to monitor risks in individual sectors and institutions and to help assess the evolution of relative risks, thereby facilitating supervision and macroprudential surveillance (see box 3.1).

The analysis of FSIs typically involves examination of trends, comparison between relevant peer groups of countries and institutions, and disaggregation into various groupings. Control is often an important criterion for disaggregation because it can indicate the sources of outside support that are potentially available to institutions in distress and thus can influence their vulnerability to bank runs, as well as their exposure to cross-border contagion.

Domestically controlled banks are overseen by a country's central bank and supervisor and, in a crisis, would be recapitalized by the banks' domestic owners or otherwise by the state. Within this peer group, public banks, which have a state guarantee, are typically distinguished from private banks, which may fail if losses exceed some minimum level of capital and consequently may be more prone to bank runs. Within the group of domestically owned, private banks, internationally active banks may be grouped into a separate peer group because they are exposed to cross-border contagion. Those banks could entail

Box 3.1 Market-Based Indicators of Financial Soundness

Market-based indicators are among the key data sets used by macroprudential analysis, along with aggregated prudential data, macroeconomic data, stress tests, structural data, and qualitative information. They include market prices of financial instruments, indicators of excess yields, market volatility, credit ratings, and sovereign yield spreads.

The market-based indicators have a wide array of uses. In particular, market prices of financial instruments issued by financial institutions and their corporate counterparts can be used to assess financial soundness of the issuers. Sovereign yield spreads are commonly watched indicators of country risk. Market price data from the stock, bond, derivatives, real estate, and other financial markets can be used to monitor sources of shocks to the financial sector. Indicators of market price volatility can help assess the market risk environment. Finally, sovereign ratings and ratings of financial institutions and other firms (as well as the accompanying analysis by the rating companies) are important sources of information to any analysis of vulnerabilities.^a

Analysis of the market-based indicators complements the analysis of aggregated microprudential data. The use of market-based indicators to monitor financial institutions' soundness is based on the premise that market prices of financial institutions' securities could reveal information about their conditions beyond that of balance-sheet data and other aggregated microprudential data. If this premise is true, then the market-based indicators can usefully complement the FSIs, a majority of which—including all core FSIs—are based on aggregating financial institutions' microprudential data. The key premise is that the asset prices contain information on market beliefs, which, in turn, contain information about the future. In particular, option prices reflect market beliefs about the future prices of the underlying assets. This information can be used to extract a probability distribution, including the probability of default.

An advantage of using market prices rather than prudential data is that the price data are generally available at high frequency. The advantage of equity and debt data is that they are frequent, which allows for more sophisticated analysis, such as the analysis of volatility and covariance. Also, although the accounting measures of risk (such as nonperforming loans [NPLs] and loan loss reserves) are essentially backward looking, market price data should provide a forward-looking assessment (e.g., Bongini, Laeven,

and Majnoni 2002; Gropp, Vesala, and Vulpes 2002). In addition, confidentiality is generally not an issue with market data, which should make it easier for independent analysts to obtain input data and for the results to be publicly shared and verified.

The quality of the market-based indicators depends on the extent and quality of the financial markets. For asset prices to contain useful information, it is important that the market be robust and transparent. If it is not, then asset prices may be substantially affected by factors other than the financial health of the issuer or the underlying quality of the asset. In addition, the usefulness of market-based indicators to assess financial sector soundness may be limited if some financial institutions' securities are not publicly traded or if their trading is limited (as may be the case, for instance, for government-owned banks or family-owned banks). Finally, if relevant information is not publicly disclosed (e.g., loan classification data that are not disclosed in some countries), but if that type of information is collected by supervisors, then prudential data can be superior to market-based indicators in measuring financial sector soundness. However, market-based indicators can still be useful in assessing the potential shocks to the financial institutions arising from or transmitted through financial markets.

Empirical studies show that market prices can be helpful in forecasting bank distress. For example, recent studies for the United States suggest that subordinated yields explain not only bank rating changes but also regulatory capital ratios (Evanoff and Wall 2001), that equity prices provide useful information on bank failure (Gunther, Levonian, and Moore 2001), and that both equity prices and bond yields explain ratings (Krainer and Lopez 2003).

However, early warning systems that combine market information with other data tend to perform better than the nonmodel market-based indicators. Berg and Borensztein (2004) find that "market views," as expressed in spreads, ratings, and surveys, are not reliable crisis predictors, important as they may be in determining market access. They find that early warning system models, which combine a range of indicators, have outperformed purely market-based measures of vulnerability such as bond spreads and credit ratings. Their study was focused on predicting currency crises, but there is even less evidence about the market indicators' efficiency in predicting banking sector crises.

a. When assigning ratings, rating companies typically use a range of analytical approaches and data, including available prudential indicators. Nonetheless, ratings are classified as market-based indicators, thus recognizing that they are produced mainly for use by market participants.

significant risk exposure through their foreign branches and subsidiaries. FSIs should include the activities of those foreign branches and subsidiaries, even though the latter are not part of the domestic activity, because they are a source of risk to the banking system.

For the domestic branches and subsidiaries of foreign-controlled banks, support in a crisis can be expected to come in the first instance from their foreign owners. This type of support may be based (a) on the foreign bank's legal obligation, which generally extends to branches but not to subsidiaries abroad; (b) on broader reputation or operating concerns, which may lead the foreign bank to support its subsidiaries abroad in a crisis; or (c) both of those elements. At the same time, FSIs of the foreign parent banks may also deserve examination because the soundness of the parent bank would influence not only the potential for support to its subsidiaries but also the risk of contagion. Those FSIs are typically produced by the home country of the parent bank. When foreign-controlled deposit-takers play a significant role in the financial system, separate FSIs may need to be compiled for the local subsidiaries of those deposit-takers.

Quantitative information on the structure, ownership, and degree of concentration of the financial system helps to set priorities for analyzing FSIs while also providing a basis for the identification of structural issues and developmental needs. This information indicates the relative importance of different types of financial institutions (e.g., banks, securities companies, insurance companies, pension funds); the relative importance of different types of ownership (private, public, foreign); and the concentration of ownership. It provides a basic understanding of the main components of the sector and its degree of diversification (see chapters 2 and 4 for a further discussion of financial structure and its determinants).

3.3.1.1 Analysis of FSIs for Banking⁷

In most countries, banks form the core of the financial system and, thus, warrant close monitoring for indications of potential vulnerabilities. A range of quantitative indicators can be used to analyze the health and stability of the banking system, including financial soundness indicators (aggregated microprudential indicators), market-based indicators of financial conditions, structural indicators describing ownership and concentration patterns, and macroeconomic indicators. A range of qualitative information is also needed to assess the banking system, including the strength of the regulatory framework (which is based on assessments of the Basel Core Principles, or BCP), the functioning of the payment system, accounting and auditing standards, the legal infrastructure, the liquidity support arrangements, and the financial sector safety nets.

Banking sector FSIs discussed in chapter 2 cover capital adequacy, asset quality, management soundness, earnings and profitability, liquidity, and sensitivity to market risk. An analysis of inter-linkages among those FSIs and their macroeconomic and institutional determinants, together with an assessment of their sensitivity to various shocks through stress tests, provide the basic building blocks of financial stability analysis.⁸

The linkages not only among the various groups of FSIs but also to other variables are derived from accounting and lending relationships within the financial sector and with other non-financial sectors. They also reflect institutional determinants, such as the key

parameters of the prudential framework. Topics studied in this area include, for example, determinants of asset quality, links between asset quality changes and capital, and determinants of profitability, all of which are discussed below.

One important topic of study involves determinants of asset quality. Asset quality is affected by the state of the business cycle, the corporate financial structure, and the level of real interest rates, which, together, influence the capacity for debt servicing. Therefore, in empirical work, FSIs of asset quality are typically regressed on various explanatory variables, such as corporate leverage, macroeconomic conditions, and interest rates. In some assessments, those types of regression estimates were based on panel data for banks in a country; in other cases, time series of aggregate data were used. As an example of cross-country time series regression, the IMF (2003c) estimated the relationship between corporate sector FSIs and banking sector asset quality FSIs on panel data compiled from large private databases for 47 countries over 10 years. It found that a 10 percentage point increase in corporate leverage was generally associated with a 1.8 percentage point rise in NPLs relative to total loans after one year. Also, a 1 percentage point rise in GDP growth resulted in a 2.6 percentage point decline in the NPLs-to-loans ratio, reflecting the fact that fewer corporations are likely to experience problems repaying loans during rapid growth.

Links between asset quality changes and capital are also studied. A deterioration in asset quality affects capital (and risk-weighted assets) through additional reserves that banks need to hold against the additional bad assets. The additional reserves reflect the rules in the country involving loan loss provisioning and the application of those rules in banking practice. Therefore, to model this link, one needs to understand well the prudential and supervisory framework in the country in question, which is where the findings of the BCP assessments can be of great help. The link between asset quality (and other risk factors) and capital is typically studied in the context of stress tests (see appendix D on stress testing for references on this issue).

Another important topic of study involves the determinants of profitability. There is a large theoretical and empirical literature on the bank-level and country-level factors determining bank efficiency. This issue is further discussed in chapter 4.

Quantitative analysis of FSIs can be complemented with information from assessments of the effectiveness of financial sector supervision. BCP assessments⁹ provide a vast array of contextual information that can be useful in interpreting FSIs. First, they can clarify the definition of data being used to compile FSIs by, for example, indicating the quality of capital. Second, they can help establish the underlying cause of observed movements in FSIs when there are competing explanations, such as whether a fall in the capital ratio might be supervisory action rather than rapid balance-sheet expansion. Third, they provide information on risks, such as operational and legal risk that cannot be captured adequately using FSIs. Fourth, they provide information on how effective the banks' risk management is and, thus, how effectively the banking system is likely to respond to the risk associated with particular values for FSIs. Finally, they 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. A lack of compliance with many of the BCP would suggest that the banking sector vulnerabilities detected using FSIs may be more serious than in a financial system with good compliance. Assessments

of financial infrastructure—corporate governance, accounting and auditing, insolvency and creditor rights regimes, and systemic liquidity arrangements—can also help interpret the liquidity and solvency indicators.

3.3.1.2 Analysis of FSIs for Insurance

Insurance is an important and growing part of the financial sector in virtually all developed and in many emerging economies; consequently, insurance sector soundness is important.¹⁰ Insurers help to allocate risks and to mobilize long-term savings (especially retirement savings) by spreading financial losses across the economy. Insurance companies facilitate economic activity in sectors, such as shipping, aviation, and the professional services that are particularly reliant on insurance. The insurance companies can help to promote risk-mitigating activities through their incentives to measure and monitor the risks to which they are exposed. Finally, insurance companies help promote stability by transferring risk to entities better able to evaluate, monitor, and mitigate those risks through specialization.

The risk profiles of insurers and banks differ. Insurance companies generally are exposed to greater volatility in asset prices and face the potential for rapid deterioration in their capital base. Insurance companies typically have liabilities with longer maturities and assets with greater liquidity than banks have, thus enabling the insurance companies to play a larger role in long-term capital markets. Life insurers often have significantly higher exposure to equities and real estate and lower exposure to direct lending than do banks. In some countries, insurers offer products with guaranteed returns, further exacerbating risks for life insurers.

The importance of the insurance sector for financial stability has increased recently because of intensified links between insurers and banks, thereby increasing the risk of contagion. Those links can include cross-ownership, credit-risk transfers, and financial reinsurance. Financial deregulation has caused insurers to diversify into banking and asset management products, thus exposing them to additional risk by making their liabilities more liquid. Insurers have also increased their exposure to equities and complex risk management products in response to deregulation and declining yields on fixed-interest products.

Assessing the soundness of the insurance sector requires good understanding of linkages among, and determinants of, the various financial soundness indicators for the insurance sector discussed in chapter 2. In addition, the analysis of those indicators should be supplemented by information on the quality of risk management in the insurance industry, which will draw on the assessment of observance of relevant supervisory standards (see discussion that follows). Capital adequacy can be viewed as the key indicator of insurance sector soundness. However, analysis of capital adequacy depends on realistic valuation of both assets and liabilities of the insurance sector. Compared with banking, asset side risks for the insurance sector are similar, but liability side risks depend on different factors, such as demographic and sectoral developments. Assessing the stability of the insurance sector should take into account the size and growth of the sector, the importance of banking-type and asset-management-type products, the structure of the industry (including the relative importance of the life sector), and the strength of linkages to the banking sector.

Data quality may be an issue because many countries lack the actuarial expertise, supervisory authority, or capacity to collect sufficient information.

The analysis and interpretation of soundness indicators should draw on an evaluation of the observance of Insurance Core Principles issued by the International Association of Insurance Supervisors (IAIS 2003) (see also chapter 5). This set of principles provides information on the effectiveness of supervision, the structure and characteristics of companies in the sector, and other useful qualitative information that is not always captured by financial ratios.¹¹ In particular, the specifics of supervisory and regulatory environment affect asset composition, as well as the mix of risks, and should be taken into account in interpreting insurance FSIs.

3.3.1.3 Analysis of FSIs for Securities Markets¹²

Securities markets are a major component of the financial sector in many countries. The capitalization of equity and bond markets in many industrialized countries, with savings in securities investments now exceeding savings in deposits, dwarfs the aggregate assets of the banking system. Exposures of households, corporations, and financial institutions to securities markets have increased substantially through investments in primary and secondary markets and through trading of risk in financial markets.

Well-developed securities markets offer an alternative source of intermediation, thus enhancing efficiency in the financial sector through competition. Well-functioning securities markets provide a mechanism for the efficient valuation of assets and diversification of risks, create liquidity in financial claims, and efficiently allocate risks. Those markets help reduce the cost of capital, thereby raising economy-wide savings and investment. They also foster market discipline by providing incentives to corporations and financial institutions to use sound management and governance practices.

The stability of securities markets can be monitored using a range of quantitative indicators measuring depth, tightness, and resilience of markets.¹³ Most quantitative indicators focus on market liquidity because of the important role that liquid securities play in the balance sheets of financial institutions. Chapter 2 discusses the FSIs that measure market tightness (bid–ask spreads) and depth (market turnover, measured by gross average daily value of securities traded relative to the stock). The analysis of securities markets' FSIs focuses on trends in those key variables and their determinants, including institutional factors and market structure (for an example of this type of analysis, see Wong and Fung 2002). The analysis also tries to assess resiliency of the market, which refers either to the speed with which price fluctuations resulting from trades are dissipated or to the speed with which imbalances in order flows are adjusted. Although there is no consensus yet on the appropriate measure for resiliency, one approach is to examine the speed of the restoration of normal market conditions (such as the bid–ask spread and order volume) after large trades. For more on the robustness of market liquidity under conditions of stress, see the discussion in section 3.3.2 and in appendix D. For an alternative approach to measuring soundness using market volatility as a financial soundness indicator, see Morales and Schumacher (2003).

Qualitative information drawn from standards assessments and other sources can also help assess stability of securities markets and can help interpret FSIs. The financial market

infrastructure (trading systems, payment systems, clearing and settlement systems, central bank operations and other systemic liquidity arrangements, and government foreign exchange reserve and debt management practices) affects financial institutions' access to funding on the liabilities side of their balance sheets, their ability to liquidate positions on the asset side, and their exposure to systemic and operational risk in the clearing and settlement system. This information can be derived from assessments of the Organization of Securities Commissions (IOSCO) objectives and principles (see also chapter 5), the Committee on Payment Settlement Systems (CPSS)–IOSCO recommendations for securities settlement systems (see also chapter 11), the CPSS core principles (see also chapter 11), and other sources such as event studies of past disturbances.

Information on market microstructures and the diversity of funding sources can be used to assess how well financial institutions can maintain access to funding in a crisis. The robustness of market liquidity depends on market microstructure, including whether markets are based on over-the-counter (OTC) or are exchange-based. For OTC markets, information on features affecting the capacity of market makers to make markets—for example, the number and capitalization 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 one another if one market loses liquidity.

Information on the operation of the payment systems, the clearing and settlement systems, and the safety nets is also useful for interpreting FSIs for securities markets, and it provides insights into access to liquidity in a crisis. Indicators of payment system functioning include the relative size of intraday, inter-bank exposures and daylight overdrafts, the length of settlement lags, the scope of loss-sharing arrangements, the level of reliance on collateral, and the particular markets that have real time gross settlement. All those indicators provide information on the potential credit and settlement risks in the payment system. The safety net and the central banks' providing of liquidity to markets influence the extent to which banks and other market intermediaries can continue to access market liquidity in a crisis. Central bank operating procedures are a key determinant of money market liquidity and of the liquidity of other markets in longer-term paper, where position taking by dealers is supported by access to money markets.

3.3.1.4 Analysis of FSIs for Nonfinancial Sectors

Monitoring the financial condition and vulnerabilities of the corporate, household, and real estate sectors can enhance the capacity to assess risks to the financial sector. Loans to the corporate sector typically account for a significant portion of bank loan portfolios; thus, the health of the corporate sector represents a major source of risk to the financial system.¹⁴ Households play an important role as consumers (of goods, as well as financial products and services), as depositors, and as holders of risky assets; hence, changes in their financial position can have significant effect on both the real economy and financial market activity.¹⁵ The real estate sector also has been an important source of risk because

of the key role that real estate plays as collateral, but this dimension has proved difficult to monitor because of the paucity of data on real estate prices.¹⁶

FSIs for the corporate, household, and real estate sectors can serve as early warning indicators of emerging asset quality problems. Shocks to their balance sheets, if significant, are eventually transmitted to the balance sheets of banks and other financial institutions. However, if one is to make effective use of FSIs for those sectors for this purpose, it is necessary to assess the exposure of the financial system to each sector (e.g., using FSIs of the sectoral distribution of lending) and to estimate how a deterioration of the financial condition of nonfinancial sectors, which would be based on FSIs for those sectors, is likely to affect banking sector asset quality. In some assessments, FSIs for corporate and household sectors were made endogenous by estimating the effect on those FSIs of changes in the relative price of debt to equity, level of interest rates, cyclical position, profitability, and unemployment. The prospective evolution of corporate and household leverage can then be projected by using the above variables, and such projections can help assess likely changes in asset quality of financial firms.

3.3.2 System-Focused Stress Testing

Stress testing, in the context of financial sector surveillance, refers to a range of techniques to help assess the vulnerability of a financial system to exceptional but plausible events.¹⁷ It is based on applying a common set of shocks and scenarios to a set of individual financial institutions and subgroups of institutions to analyze both the aggregate effect and the distribution of that effect among the institutions. Stress tests were originally developed for use at the portfolio level so one can understand how the value of a portfolio changes if there are large changes to some of its risk factors (such as asset prices). Those tests have now become widely used as a risk management tool by financial institutions. Gradually, the techniques have been applied in a broader context, with the goal of measuring the sensitivity of a group of institutions (such as commercial banks) or even an entire financial system to common shocks.

System-focused stress testing is best seen as a multi-step process that involves examining the key vulnerabilities in the system and providing a rough estimate of sensitivity of balance sheets to a variety of shocks. This process entails (a) identifying the major risks and exposures in the system and formulating questions about those risks and exposures, (b) defining the coverage and identifying the data that are required and available, (c) calibrating the scenarios or shocks to be applied to the data, (d) selecting and implementing the methodology, and (e) interpreting the results. System-focused stress tests attempt to marry a forward-looking macro-perspective with an assessment of the sensitivity of a collection of institutions to major changes in the economic and financial environment.

The process of conducting a system-focused stress test begins first with the identification of specific vulnerabilities or areas of concern and then with the construction of a scenario in the context of a consistent macroeconomic framework. Isolating key vulnerabilities is an iterative process involving both qualitative and quantitative elements. A range of numerical indicators can be used to help isolate potential weaknesses, including the “big picture” or macro-level indicators, broad structural indicators, and more institution-focused or micro-level indicators. Ideally, a macro-econometric or simulation model

should form the basis of the stress-testing scenarios. A working group of selected experts may facilitate the process.

Once a set of adjustment scenarios has been produced in a consistent macro-framework, the next step is to translate the various outputs into the balance sheets and income statements of financial institutions. There are two main approaches to translating macro-scenarios into balance sheets: (a) the “bottom-up” approach in which the effect is estimated using data on an individual institution’s portfolios and (b) the “top-down” approach in which the effect is estimated using aggregated data.

A variety of metrics can be used to summarize the results of stress tests. The most common ones use measures that express the effect of a shock as a percentage of capital, assets, or profitability. For example, the estimated decline in the value of assets (or in equity) or a reduction in net income caused by higher loan loss provisions or by interest rate shock can be expressed as a ratio involving either (a) capital or assets or (b) profitability. The dispersion of the effect (the standard deviation of the effect across the sample of banks) is also a key statistic to monitor. Public dissemination of the results of stress tests may present some difficulties, but the publication of results by a broad range of countries has shown that those difficulties are not insurmountable.

Stress tests are useful because they provide a quantitative measure of the vulnerability of the financial system to different shocks. This measure can be used with other analyses to draw conclusions about the overall stability of a financial system. The value added from system stress tests derives from a consultative process that integrates a forward-looking macroeconomic perspective, a focus on the financial system as a whole, and a uniform approach to the assessment of risk exposures across institutions. Recent trends in Financial Sector Assessment Program (FSAP) stress testing show a shift toward greater integration of a macroeconomic perspective, more involvement by country authorities and individual institutions, and greater coverage of the financial sector.

3.4 Analysis of Macrofinancial Linkages

Macrofinancial linkages focus on macroeconomic and sectoral implications of financial instability, and they derive from the many ways in which different nonfinancial sectors rely on intermediation by the financial sector to conduct their activities. Those linkages differ significantly across countries, but they are likely to include (a) the dependence of nonfinancial sectors (e.g., corporate, household, and government sector) on financing by domestic and foreign banks; (b) the deposits and wealth of those sectors placed with the financial sector that would be at risk in a financial crisis; (c) the role of the banking system on monetary policy transmission; and (d) the financial sector’s holdings of securities issued by, and loans to, the government so that problems in the financial sector could adversely affect debt sustainability. Thus, the monitoring of financial sector vulnerabilities using FSIs should be combined with an analysis of other data on macrofinancial linkages to assess the effect of shocks on macroeconomic conditions through the financial sector.

3.4.1 Effect of Financial Soundness on Macroeconomic Developments

A key macrofinancial linkage that is important in almost all countries derives from the dependence of nonfinancial sectors on financing provided by banks.¹⁸ The potential effect

on macroeconomic conditions of banking soundness problems in the banking sector may be detected using FSIs compiled by local and foreign authorities. Data on nonfinancial sectors' borrowing not only from the domestically controlled banking sector but also from foreign-controlled banks by country are needed for analysis. The data on the former are the same data used to compile the exposure concentration of FSIs. Data on borrowing by the nonfinancial private and government sectors from banks headquartered in BIS-reporting countries can be obtained from the BIS consolidated banking statistics.¹⁹ The coverage of the data is comprehensive because almost all international banking activity is conducted by internationally active banks from those countries. These BIS data indicate the scale of the potential reduction in financing to the domestic private and government sectors that could result from a deterioration in the soundness of the banking sector in that country.²⁰ The prospects for this type of deterioration can be monitored by examining the FSIs for banking in each BIS reporting country.

An example of this type of macrofinancial linkage is trade finance. IMF (2003d) discusses this linkage in more detail, noting that during recent financial crises, the trade financing to the crisis countries fell dramatically (more sharply than would seem to be justified by fundamentals and risks involved). The paper attributes the decline to the response by banks as leveraged institutions, to the lack of insurance when it was needed, to herd behavior (among banks, official export credit agencies, and private insurers), and to weaknesses in domestic banking systems. Because bank-financed trade credits are typically short-term, are backed by receivables, and are self-liquidating, their performance, transfer, and convertibility risks are considered lower than those for other cross-border lending. The loss of financing to the trade sector appears to have disrupted countries' trade and growth performance, possibly exacerbating the crisis.

Macrofinancial linkages also derive from residents' deposits and wealth placed with domestically owned and foreign-controlled financial institutions, which would be at risk in crises at home or abroad. The importance of this linkage depends on institutional features such as the extent to which the deposits are covered by domestic and foreign deposit insurance schemes. The linkage can be assessed using data on residents' deposit holdings, which, in principle, need to cover both (a) deposits held within the country with domestically owned banks or the local branches and subsidiaries of foreign banks and (b) deposits held abroad, either with domestic banks' branches and subsidiaries abroad or with foreign banks (in both domestic and foreign currency). Data from monetary statistics typically capture the first but miss the second (which can be substantial, especially in dollarized economies). Some information on the latter can be obtained from international investment position data and from the locational BIS international banking data.²¹ In this case too, FSIs monitor the soundness of the banking sector while the data on wealth placed with financial institutions give an indication of how much could be lost in the event of a banking crisis (taking into account the extent of protection provided by deposit insurance schemes).

Another linkage results from the effect of banking sector problems on the monetary policy transmission mechanism. Both the domestically owned banks and branches and the subsidiaries of foreign banks play a role in monetary transmission, so a deterioration in banking sector soundness, either domestically or abroad, could alter the effect of changes in monetary policy on the real economy. This linkage implies that it can be useful to ana-

lyze FSIs in combination with monetary data to understand how the effect of monetary policy could be affected by the soundness of the financial sector. The analysis would have to take account of financial structure, including the relative importance of market and bank financing, the role of foreign banks in financial intermediation, and the central bank operating procedures.

3.4.2 Effect of Financial System Soundness on Debt Sustainability

Debt sustainability refers to the ability of a borrower to service a given stock of debt, given the anticipated payments of interest and principal. Debt servicing ability depends on the stream of income accruing to the borrower, the stock and residual maturity profile of the borrowers' assets, the stock of debt outstanding, and the agreed terms—chiefly, the interest rate, currency, and time profile.²²

Developments in financial system soundness can have a significant effect on debt sustainability of households, corporations, and governments; debt sustainability problems in different sectors are mutually reinforcing. The resulting financial instability can impose massive restructuring costs on an economy and can lower overall growth rates, thus undermining the debt servicing capacity of the economy and potentially causing a sovereign default. Debt servicing difficulties in any one sector could arise because of market risk, rollover risk, or liquidity risk—or more fundamentally because of unsustainable debt levels and insolvency risk—and difficulties can spread throughout the system.

Even when sovereign debt is initially at a sustainable level, the realization of contingent liabilities in the event of a crisis can result in deterioration of the government's balance sheet and unsustainable debt ratios. Debt sustainability problems in the nonfinancial sectors can further weaken the financial system by affecting the value of loans and securities held by the financial sector. Sovereign defaults, in particular, have a severe effect on the financial system because of the key role that government securities often play in financial institutions' balance sheets as a risk-free asset, as a store of collateral, and as a liquid asset. In general, doubts about the debt servicing capacity of any large borrower or group of borrowers can cause a loss of confidence by depositors and other holders of securities, thereby prompting a flight to quality or a more widespread run on banks and other institutions. The economic dislocation caused by debt defaults or by a loss of confidence can be magnified by the effect on financial prices as interest rates typically rise and as credit becomes less readily available—unless the monetary authorities take concerted and credible actions. The exchange rate may also come under pressure if domestic assets as a whole become less attractive relative to foreign assets. The effect on financial markets can thus magnify the effect of debt sustainability problems on the macroeconomy.

Assessing debt sustainability and monitoring the two-way linkages between financial system soundness and financial soundness of nonfinancial sectors are key to fostering financial stability. Although it is difficult to specify a precise level at which a given stock of debt becomes “unsustainable,” it is possible to detect warning signs of excessive debt accumulation by examining a few key indicators and ratios. At the most simple level, growth rates of the stock of debt provide an indicator of potential problems if the growth rates exceed reasonable estimates of the growth rate of productive capacity, which ultimately determine the ability to repay. The evolution of financial soundness indicators of

nonfinancial sectors—including the relative size of the debt stock (e.g., debt-to-GDP or debt-to-equity ratios; see section 3.3.1) and its key determinants—provides some useful information on prospective developments in debt ratios or in debt service capacity. For example, a common rule of thumb for public sector debt sustainability is to relate primary fiscal balance to the real interest rates and real growth rates. Similarly, an analysis of the determinants of corporate debt-to-equity ratios (real interest rates, rate of profit, and real return on equity are likely to be among the determinants) could provide an indication of the dynamics of this ratio.

3.4.3 Effect of Financial Soundness on Growth and Financial Development

The issue of whether financial sector soundness influences growth has received little attention in cross-country empirical research. There is a growing consensus that more finance (i.e., a larger financial sector) causes more growth.²³ Recent empirical evidence suggests that countries with better-developed financial systems indeed tend to grow faster. Specifically, the size of the banking system and the liquidity of stock markets are each positively linked with economic growth. Better functioning financial systems ease the external financing constraints that impede corporate and industrial expansion.²⁴

Even though empirical cross-country studies on the issue are limited, there are cases of countries with protracted output losses because of financial sector crises. There is ample case-study evidence (e.g., from the Asian crisis²⁵ or bank restructuring episodes in the Central and Eastern Europe [CEE] countries in the late 1990s) suggesting that financial sector problems can result in significant or protracted output losses. Although few empirical cross-country studies directly address the issue, there seems to be a consensus that is based on the theory and the analysis of country cases that, in the medium to long run, financial soundness is positively related to economic growth.

In the short run, country authorities may be faced with a tradeoff between economic growth and financial sector soundness. Fast growth can make financial markets vulnerable to shocks, constraining potential output.²⁶ In particular, rapid credit expansion may, at times, exceed banks' capacity to assess risks, thereby leading to reduced asset quality. At the same time, credit expansions can be only a symptom of rapid financial deepening.²⁷ In a country experiencing rapid credit growth and rapid output growth, the key is to determine whether the credit growth can be interpreted as a structural and positive development (e.g., if it follows a period of financial liberalization and bank restructuring). Even if credit growth is determined to be the result of structural developments, as has arguably been the case in some transition countries in the late 1990s and early 2000s,²⁸ policy makers have to evaluate carefully its implications for financial stability and macroeconomic developments. In particular, they need to distinguish to what extent a rapid financial sector growth reflects improvements in access to finance and to what extent the growth reflects a loosening in risk management practices and supervision.

3.5 Special Topics in Financial Stability Analysis

This section deals with selected topics in financial stability, namely,

- The analysis of international financial centers and offshore financial centers and of financial stability
- Key stability issues in the opening of capital accounts
- The implications of dollarization for stability
- Implications of Islamic banking

This list is not an exhaustive list of financial sector issues; it is a list of several issues that are not common to all financial systems and, consequently, were not fully addressed in the general sections, but they are still important in several financial systems.

3.5.1 International Financial Centers and Offshore Financial Centers

International Financial Centers (IFCs) are the primary markets where finance capital and currency are collected, switched, disbursed, and exchanged on a regional or global basis.²⁹ An IFC's share in the global financial business is disproportionately large relative to its size as measured by area, population, or nonfinancial economic activity. In most rankings, London, New York, and Tokyo (in this order) are the world's three primary IFCs. They are complemented by a range of secondary and tertiary IFCs, which play important roles as regional financial centers or as major offshore financial centers (OFCs). Although IFCs and OFCs are quite distinct in terms of scale and structure, they are treated together in this section for convenience because they have in common certain stability issues that arise as a result of their international operations.

Although there is no generally approved definition of an OFC, a useful one defines it as a center where the bulk of financial sector activity is offshore on both sides of the balance sheet (that is, the counterparties of the majority of the financial institution's liabilities and assets are nonresidents), where the transactions are initiated elsewhere, and where the majority of the institutions involved are controlled by nonresidents. Thus, OFCs are usually referred to in the following ways (the third listed is the most popular):

- Jurisdictions that have relatively large numbers of financial institutions engaged primarily in business with nonresidents
- Financial systems with external assets and liabilities that are out of proportion to domestic financial intermediation designed to finance domestic economies (For most OFCs, the funds that are on the books of the OFC are invested in the major international money-center markets.)
- Centers that provide some or all of the following services: low or zero taxation, moderate or light financial regulation, and banking secrecy and anonymity (Activities of OFCs are centered around international banking and around asset and risk management, including setting up special purpose vehicles and trusts that are aimed at large corporate entities and at high net worth.)

The key defining characteristics of an IFC are (a) the economies of scale and scope in financial activities, (b) the extent of international economic and banking links, (c)

the credibility of government policies, and (d) the creditworthiness of the financial sector. Important requirements or prerequisites are economically strong and credible banks within a strong legal system, including property rights, contract enforcement, a functional and credible court system, and bankruptcy processes. Although those conditions are necessary to become an IFC, they are not necessarily sufficient; there are also various historical and other reasons why certain places have become IFCs. Moreover, any financial center requires a long time to establish itself as an IFC. IFCs typically engage in a variety of onshore and offshore financial activities, including foreign exchange trading such as cash, forward, and swap transactions. IFCs also engage in a wide range of equity and debt securities and derivatives trading on the cash, futures, and options markets, not only in organized exchanges and over-the-counter transactions but also in activities such as money management, payments clearing and settlement, merger and acquisition, and securities underwriting. In some cases, some of this activity is carried on in institutions that are favorably treated for tax and other purposes.

Development of an IFC has several potential benefits for the host economy. There is some evidence in the literature quoted earlier that the large presence of foreign banks in IFCs tends to increase competition. More intensive competition, apart from its static benefits, can also widen the range of financial services available to clients. However, there are also cases of IFCs in jurisdictions where domestic markets have failed to overcome some inherent inefficiencies. An important issue to consider is the competition that is taking place among IFCs. From the viewpoint of global welfare, the competition among countries to host offshore banking can result in a gain to a host center that may represent little net gain overall.

At the same time, the presence of an IFC or OFC may be an additional source of instability for the host economy. Financial surveillance needs to analyze not only the complex structure of the key financial institutions operating in an IFC but also the operations in which those institutions are engaged so people can understand the sources of the risks (which are often outside the host jurisdiction) and the transfers of risks within and from the IFC. The effect on domestic financial stability caused by the presence of an IFC or OFC arises from both macro-channels and structural channels. Financial stability would be affected if the domestic economy were more susceptible to shocks than would otherwise be the case, because a segment of the global or regional financial services that are provided takes place in the domestic economy (through the OFC–IFC transactions). Some of those additional factors affecting financial stability follow:

- Additional cross-border business in an IFC or OFC could add to the demands on domestic clearing and settlement systems.
- The presence of an IFC or OFC may make it easier for domestic residents to invest offshore or for nonresidents to invest in securities or claims issued by domestic residents. This condition may improve liquidity in domestic markets and facilitate technology transfer; it may also facilitate excessive risk taking unless restrained by supervision or market forces.
- The effect on domestic economic activity and employment resulting from the presence of an IFC or OFC could be substantial—as is often the case in many OFCs;

hence, shocks to the volume and stability of IFC operations could affect the domestic economy and could indirectly affect domestic financial stability.

- Although foreign institutions operating in an IFC or OFC are supervised by their home regulators, the trading activities among those institutions—particularly in OTC markets occurring in the IFC or OFC—may be largely self-regulated and may call for the involvement of host authorities to achieve stability.
- The global reach, large size, and complexity of transactions of domestic- or foreign-controlled institutions in an IFC or OFC may pose supervisory challenges for both host and home jurisdictions.

The operations of large and complex financial institutions (LCFIs) in an IFC or OFC may have financial stability implications. An LCFI is typically a large player in both wholesale and retail financial markets and has substantial international operations spanning a number of financial activities. The group is likely to be prominent in the local payments, clearing, and settlements structure. The group is likely to encompass many different legal entities, and the link between those and the group's internal management structure may appear complicated or even opaque. The group may not have an overall lead supervisor monitoring its activities at an overall level on a consolidated basis. At the host-country level, responsibility for supervision of an LCFI's local affiliates may reside within a single regulator or several functional regulators. The size of the LCFI and its geographical diversification has the potential to threaten financial stability not only in the IFC but also in several countries and markets. The operations may be of concern not only to its many financial regulators but also to the central banks and insurance or guarantee agencies. The latter group of institutions, in the event of a crisis, could be involved in providing or facilitating liquidity or other official financial support, either to the LCFI itself or to its local counterparties.³⁰

The assessment and monitoring of offshore financial centers has increased in recent years, in part, because of heightened concerns about consolidated supervision and money laundering and because of the associated emphasis on cross-border cooperation and information exchange with OFCs.³¹ The assessment methodology for OFCs places emphasis on fostering compliance with international standards for supervision and financial integrity. Because they reflect the concerns about consolidated supervision and money laundering or terrorist financing, the assessments generally focus on compliance with the supervisory standards in banking and standards for anti-money laundering and for countering the financing of terrorism. In addition, when warranted, the assessments also include securities and insurance supervision.³²

Levels of compliance with financial sector standards in OFCs tend to be, on average, higher than in other jurisdictions assessed by the Fund; however, shortcomings remain in the supervisory systems of many of the OFCs. The higher level of financial standards compliance in OFCs reflects, in part, the higher income levels of the OFCs and their concerns to protect their reputation. The shortcomings arise mainly from inadequate resources and expertise in the supervisory agencies located in OFCs with lower per capita income. Those shortcomings are reflected in lower conformity with principles that are concerned with the effectiveness of onsite supervision and in technical areas such as risk management and guidance for financial institutions (IMF 2004c).

The evidence that OFCs pose a risk to financial stability in non-OFC countries is limited. The potential for risk is seen to lie in the following areas:

- Banks have been the most common source of financial instability, and most major OFCs have branches or subsidiaries of globally important banks. Many of those banks are also conglomerates, which pose additional risks. Potential threats to financial instability may increase with weaknesses in consolidated supervision and cross-border consolidated supervision of those institutions.
- The lack of information about the activities booked in OFCs restricts the ability to understand global financial flows and to analyze potential stability effects.
- Hedge funds and reinsurance companies located offshore have the potential to affect stability through their high leverage and exposure to catastrophic events, respectively.

However, an OFC itself may face significant macroeconomic risks, which result from its characteristics as an OFC. Given that financial intermediation in the OFC is typically out of proportion with the size of the domestic economy, most OFCs depend on the financial intermediation as a source of income. Shocks to the volume of financial intermediation (e.g., those caused by shocks to the reputation of the OFC) are likely to have a substantial effect on the domestic macroeconomy.

3.5.2 Capital Account Liberalization

Capital account controls can have a significant effect on the way that external shocks are transmitted to the domestic financial system and on how domestic financial developments affect the macro-economy. When one considers the effect of the capital account on domestic financial stability, it is important to be aware of existing capital controls, including the nature and scope of recent liberalizations and any plans to relax them.³³ Experience has demonstrated that liberalizing the capital account before the home-country financial system has been adequately strengthened can contribute to serious economic problems.³⁴ For example, studies have shown that a significant number of countries that suffered from a financial crisis have liberalized their financial systems, including their capital accounts, within the past 5 years before the crisis.³⁵ These experiences have highlighted the importance of (a) appropriate sequencing and coordination when opening capital accounts and (b) domestic financial liberalization policies to preserve financial stability. See box 3.2 and chapter 12 for additional discussion.

3.5.3 Dollarization: Implications for Stability

Dollarization can have important implications for financial stability. A dollarized economy can be defined as one where (a) households and firms hold a fraction of their portfolio (inclusive of money balances) in foreign currency assets, (b) the private and public sector have debts denominated in foreign currency, or (c) both. Dollarization can be “official” when the U.S. dollar is adopted as the legal tender or “partial” when the local currency remains the legal tender, but transactions are allowed to be denominated in dollars, thus effectively allowing a bicurrency system to take hold. It is useful to distin-

guish among three generic types of dollarization that broadly match the three functions of money: (a) payments dollarization (currency substitution) is the resident's use of foreign currency for transaction purposes in cash, demand deposits, or central bank reserves; (b) financial dollarization (asset substitution) consists of the resident's holdings of financial assets or liabilities in foreign currency (either domestic or external); and (c) real dollarization is the indexing, formally or de facto, of local prices and wages to the dollar.³⁶ Dollarization can be measured using a variety of statistics, including the ratio of onshore foreign currency deposits to total onshore deposits, the ratio of foreign currency deposits to broad money, the ratio of domestic government debt in foreign currency to total government debt, and the share of private sector debt in total external debt.³⁷ Additional risks to financial stability resulting from dollarization and the implications for financial policy are discussed below.

Empirical evidence suggests that financial dollarization may increase the vulnerability of financial systems to solvency and liquidity risks. Cross-country estimates of the effect of dollarization on key financial soundness indicators are consistent with the hypothesis that increased dollarization increases financial vulnerability. The variance of deposit growth is positively and significantly correlated with dollarization, suggesting that dollarized financial systems may be more exposed to credit cycles and liquidity risk. A cross-country comparison of estimates of nonperforming loans (NPLs) or a composite systemic risk measure will show that dollarized economies also tend to be more exposed to solvency risk.

The limited backing of banks' dollar liabilities by U.S. dollars and their convertibility at par subjects the financial system to a very specific type of liquidity risk. Systemic liquidity risk arises when the demand for local assets falls because of a perceived increase in country or banking risk, thus prompting foreign banks to recall short-term lines of credit and depositors to convert their deposits into dollars or to transfer them abroad. Unless liquid dollar liabilities are backed by sufficient liquid dollar assets abroad, banks could run out of dollar liquid reserves and could fail to pay off dollar liabilities. Similarly, central banks could run out of international reserves to provide dollar lender-of-last-resort support to distressed banks. When those international reserves are depleted, deposit (or loan) contracts may need to be broken and disruptive or confiscatory measures taken, thereby imposing a heavy cost on the financial system.

Dollar deposits are often more vulnerable to runs than local currency deposits, even in the absence of exchange rate adjustments. In highly dollarized countries, local currency deposits are mostly held for transaction purposes and are less affected by expected yield differentials than dollar deposits, which are predominantly held as store of value and are close substitutes for deposits abroad or dollars cash. Moreover, even when the demand for local currency deposits is affected, the small size of these deposits in the most highly dollarized countries limits the threat they represent for banks' liquidity.

The lack of dollar monetary instruments can further inhibit the scope for interest rate defenses against deposit withdrawals. An interest rate defense may be ineffective once a run has started, because the central bank has limited ability to raise the interest rate on dollar deposits. Banks are often reluctant to raise interest rates on dollar deposits, because of concerns that increasing rates may be interpreted as a sign of weakness, thus further exacerbating deposit withdrawals.

Box 3.2 Capital Account Liberalization and Financial Stability

Capital account liberalization exposes the domestic financial sector to greater competition and risk taking. In the absence of appropriate bank supervision, banks can expand risky activities at rates that exceed their capacity to manage them, including the use of derivatives and other complex cross-border transactions that are difficult to monitor and regulate. Large capital inflows can also lead to rapid credit growth, possibly to unproductive sectors of the economy such as real estate and government-supported industries, thus contributing to asset price bubbles and financial sector difficulties.^a Capital account liberalization can also increase banks' credit risk through aggressive foreign currency lending to unhedged borrowers.

Capital account liberalization may facilitate a faster transmission of economic and financial system shocks, thereby increasing asset price volatility.^b Exchange rate risks tend to be more pronounced when a fixed exchange rate peg has been maintained for a considerable period of time and if market perception of an implicit exchange rate guarantee has promoted inadequate hedging. If the banking system

is weak, the monetary authorities may be reluctant to increase interest rates to stabilize the exchange rate.

The supervisory agency needs to have prudential standards and technical skills to cope with the challenges that accompany capital account liberalization. Experience shows that careful planning of the sequencing and the pace of reforms could be critical to successful liberalization efforts, as further discussed in chapter 12. Before liberalizing the capital account, particular attention should be given to the effectiveness of existing capital controls, the soundness of the macroeconomic environment and consistency of macroeconomic policies, the prudential and supervisory framework, the financial system's level of development, and the ability of both financial and nonfinancial corporations to manage potential risks and shocks that may arise. Successful capital account liberalization requires complementary monetary and financial sector reforms. Policies should be focused on improving internal governance of financial institutions, developing deep and liquid financial markets, and fostering market discipline.

a. In Korea, before the 1997 crisis, capital inflows helped finance sectors that subsequently experienced difficulties. In Sweden, the large credit expansion that followed financial deregulation contributed to the asset price bubble in the 1980s.

b. Cross-border contagion may be exacerbated if portfolio managers in developed countries bundle instruments from different countries in the same risk class.

The main solvency risk faced by dollarized financial systems results from currency mismatches in the event of large depreciations. Currency-induced credit risk is generally the key source of vulnerability because borrowers are highly susceptible to defaulting on dollar-denominated loans in the event of a large depreciation. Banks with large domestic dollar liabilities must balance their foreign exchange positions either by extending dollar lending to local currency earners or by holding dollar assets abroad. Thus, to maintain their profitability (especially in light of generally lower rates of return on foreign assets than on local dollar assets) and to satisfy the pent-up demand for loans, banks generally end up lending domestically a large share of their dollar deposits, thus effectively transferring the currency risk to their unhedged clients and retaining the resulting credit risk. Borrowers' currency mismatch is enhanced by the fact that prices and wages may continue to be set in local currency even when financial dollarization is widespread. Counterparty exposure is also amplified if collateral is denominated in domestic currency, and it declines relative to the loan after a depreciation. Banks' direct exposure to currency risk is generally limited by tight regulatory limits on open foreign exchange positions, but off balance-sheet positions (e.g., in derivatives) are often misreported and may cause exposures to be underestimated.

In the event of large depreciations, widespread currency mismatches can have systemic effects that compound the deterioration of banks' financial situation. Because of balance-sheet effects, large devaluations in highly dollarized economies are more likely to be contractionary, further undermining borrowers' capacity to service their debts. Because it impairs the solvency of both borrowers and banks, the credit risk deriving from a large devaluation also increases the scope for a credit crunch and heightens the risk of deposit withdrawals by concerned depositors. Thus, solvency and liquidity risks are closely inter-related.

The interaction between prudential risks and the monetary regime, which instills fear of floating, subjects the financial system to risks similar to those incurred under a rigid exchange rate system. The more financially dollarized an economy is, the more vulnerable to large exchange rate fluctuations it becomes; hence, the less disposed the monetary authorities are to let the exchange rate float. Empirical evidence indicates that both nominal and real (bilateral) exchange rates are less volatile in more dollarized economies (see Gulde and Ize 2004). Instead, interest rates must bear the brunt of the adjustment to shocks, thereby raising interest rate risk both for local currency and for dollar intermediation and then heightening credit cycles. Credit booms are accentuated by the fact that incoming dollar flows feed domestic lending and, through the banking multiplier, boost dollar intermediation.

The dollarization of public debt can be an important collateral source of financial fragility when banks have large holdings of public securities. Sharp exchange rate depreciations can undermine the sustainability of the public debt and, in turn, can undermine the solvency of banks when the latter hold large volumes of public securities.

In countries with a high degree of dollarization, stability assessments should indicate the extent to which dollarization is a potential source of vulnerability and should suggest appropriate measures. Where available, reports also should provide supporting quantitative information such as the degree of co-circulation, shares of foreign currency deposits and loans, short-term foreign assets and liabilities of the main financial institutions, net foreign assets, and net open foreign currency positions of banks.

3.5.4 Islamic Banking—Stability Issues

The provision and use of financial services and products that conform to Islamic religious principles pose special challenges for a stability assessment. Institutions offering Islamic Financial Services (IIFS) and Islamic capital market instruments constitute a significant share of the overall financial system in several countries; in Sudan and Iran, the entire system is based on Islamic finance principles. This situation requires the recognition of the unique mix of risks in IIFS and key aspects of Islamic securities markets not only in stability assessments but also in the design of policies. See box 3.3 for details.

3.6 Key Policy Issues and Policy Priorities to Support Stability

The previous sections of this chapter (3.1–3.5) have described a range of qualitative and quantitative information and techniques that can be used to identify potential strengths

Box 3.3 Stability Issues in Islamic Banking

Unique risks in Islamic finance arise both from contractual design of instruments that are based on Sharia Principles and from the overall legal, governance, and liquidity infrastructure governing Islamic finance. The following list^a summarizes the features that need to be taken into account when assessing stability in a financial system that includes (or is based on) institutions offering Islamic financial services (IIFS).

- Profit-and-loss-sharing (PLS) modes of financing shift the direct credit risk from banks to their investment depositors, but they also increase the overall degree of risk of the asset side of banks' balance sheets because they make IIFS vulnerable to risks normally borne by equity investors rather than by holders of debt. In particular, operational risk is crucial in Islamic finance. It arises from (a) the fact that the administration of PLS modes is more complex than conventional financing (which also makes standardization of the products more difficult to achieve) and (b) the fact that IIFS often have no or limited legal means to control the agent-entrepreneur. Non-PLS modes of financing are less risky and they more closely resemble conventional financing facilities, but they also carry special risks that need to be recognized.
- Sales-based methods of financing often bundle commodity price risks, operational risks, and credit risks in complex ways, making it difficult to price risks.
- Another specific risk inherent in IIFS stems from the special nature of investment deposits, whose capital value and rate of return are not guaranteed. This condition increases the potential for moral hazard and creates an incentive for risk taking and for operating financial institutions without adequate capital.
- Finally, Islamic banks can use fewer risk-hedging instruments and techniques than do conventional banks and can operate in an environment (a) with underdeveloped or nonexistent interbank and money markets as well as government securities and (b) with limited availability of, and access to, lender-of-last-resort facilities operated by central banks.

The above risk factors have historically forced IIFS into holding a comparatively larger proportion of their assets in reserve accounts with central banks or in correspondent accounts than do conventional banks, and those risk factors have also led to reliance mostly on sales-based facilities on the asset side rather than PLS modes. This situation has affected their competitiveness and has increased their vulnerability to external shocks, with potential systemic consequences. Sundararajan and Errico (2002) provide suggestions on how to address the risks inherent in Islamic banking.^b

a. This subsection is based on Sundararajan and Errico (2002).

b. For more on regulatory and risk management issues in Islamic banking, see exposure drafts of various prudential standards in the Web site of the Islamic Financial Services Board (<http://www.ifsb.org>), an international organization that was established to promote good regulatory and supervisory practices and to develop international prudential standards for institutions offering Islamic financial services.

and vulnerabilities in the financial system. Once weaknesses have been identified, the next issues to consider are how this information can be used to help maintain financial stability and how policies can be enacted or changed to minimize the risks to financial stability. The responses to those issues are multifaceted and depend on the nature of the vulnerabilities that have been identified.

Vulnerabilities and the corresponding policy actions can be categorized into four key areas:

- Macroeconomic (such as aggregate imbalance in payments to nonresidents)
- Institutional (relating to weaknesses in particular institutions or classes of institutions)

- Regulatory or supervisory (relating to the design and implementation of regulations and prudential standards)
- Structural (relating to the operational infrastructure of markets, settlement systems, and safety nets)

The mix and the timing of policy tools need to be appropriate for the vulnerability addressed. For example, if rapid credit growth were mainly a result of macroeconomic imbalances, it would need to be addressed primarily by macroeconomic stabilization policies, while prudential tools would play only an auxiliary role. Conversely, if a vulnerability were mainly a result of weaknesses in banking supervision and regulation, then using macroeconomic policies would be second best should reforms of supervision and regulation turn out to be insufficient or slow to yield results. Weaknesses such as these should be addressed in a timely manner through improved prudential supervision and oversight, effective surveillance of individual institutions and markets, and development and maintenance of a robust financial infrastructure. Macroeconomic policy adjustments, even when they are second best, could be crucial, for example, to limit inflationary pressures, credit growth, or bubbles in certain sectors that could substantially affect the financial sector. In addition, by themselves, policies to develop institutions and markets (e.g., money or government securities market development) and to build infrastructure (e.g., design a large value payment system) pose additional financial and macroeconomic risks, which need to be managed through prudential policies and macro-policy adjustments, as further discussed in chapter 12.

The calibration of policies can take into account information obtained from the quantitative macroprudential tools, in particular, stress tests. For example, in the context of macroeconomic policies, stress tests or sensitivity calculations can provide an assessment of how a certain interest-rate and exchange-rate policy mix can affect the financial sector and of what the resulting effect on the economy as a whole would be. Similarly, in the context of regulatory policies, simulations can be used to assess what the effect would be of an envisaged policy change (e.g., an increase in the rate of providing loans) on the health of the financial system. In the context of supervision, stress-test results can be used to direct supervisory attention to those groups of institutions that pose the greatest risk for the system as a whole. Similarly, evolution of financial soundness indicators and information from macroprudential surveillance may call for more intensive supervision in specified areas (e.g., market risks or country risks).

An assessment of the overall stability of the financial system is based on combining the analysis of risks and vulnerabilities with the assessment of various financial policy responses and policy frameworks. If the potential vulnerability to plausible shocks were not high or if the policy framework and policy responses—as seen, for example, from standards assessments—were considered appropriate, then the system would be judged stable. The stability considerations would typically dictate that a range of prudential and market development policies be given high priority.

Notes

1. See Houben, Kakes, and Schinasi (2004, appendix II) and Schinasi (2004) for a discussion of definitions of financial stability.

2. Financial stability analysis is intended to assess the stability and efficiency of a financial system as a whole and not of individual institutions. Although a focus on systemically important institutions is needed to assess stability, the analysis cannot be expected to address legal or governance issues such as fraud that pertain to specific institutions.
3. See Borio (2003) for a discussion of this point.
4. For useful overviews of the EWS literature, see Kaminsky, Lizondo, and Reinhart (1998), Berg and others (2000), Altman and Narayanan (1997), and Abiad (2003). See also Altman and Narayanan (1997).
5. See box 3.1 for further details on market-based indicators of financial soundness.
6. See IMF (2004b) for further details of the use of FSIs.
7. This section is based on Craig and Sundararajan (2004), Sundararajan and others 2003, and IMF (2004b, chapters 6, 8, and 14).
8. Several market-based indicators may also be used to analyze the evolution of financial system risks, including credit risks.
9. Basel Core Principles (BCP) assessments examine compliance with 25 basic principles for effective banking supervision. The scope and coverage of BCP are analyzed in chapter 5 and in IMF and World Bank (2002b). For more information on how BCP assessments can provide information that is useful for interpreting FSIs and for a mapping of FSIs with relevant core principles, see IMF (2003c).
10. A general introduction to insurance sector soundness is also provided in International Association of Insurance Supervisors (IAIS; 2000, 2002). This section is based on the discussion in Das, Davies, and Podpiera (2003). Insurance firms often sell pensions or manage pension funds, other mutual funds, and unit trusts. Those in the insurance and pension fund management industry can significantly affect the stability of markets and financial stability generally through their investment behavior. See the IMF *Global Financial Stability Report* for April (2004d) and September (2004e).
11. See Das, Davies, and Podpiera (2003, appendix I) for an explicit mapping of Insurance Core Principles into FSIs for the insurance sector and for examples of core FSIs in a number of countries.
12. This section is based on Craig and Sundararajan (2004), IMF (2004b, chapter 8), and IMF and World Bank (2002a).
13. The basic definitions of the FSIs are provided in chapter 2. See also chapter 8 of IMF (2004b) for an overview of statistics on securities markets, and see BIS (1999, 2001) for a detailed discussion of market liquidity.
14. Chapter 5 of IMF (2004b) reports empirical analysis demonstrating a linkage between corporate leverage and asset quality across a large number of countries. See also Pomerleano (1998).
15. IMF (2005) examines household sector behavior, with a focus on assessing the shifting of market risks to the household sector. See also Debelle (2004).
16. Hilbers, Lei, and Zacho (2001) conclude that unbalanced real estate price developments often contribute to financial sector distress. Also, see chapter 9 of IMF (2004b) for a discussion of real estate price indices. For a comprehensive analysis of real estate indicators, see BIS (2005). See also Borio and McGuire (2004).
17. This section contains a general discussion on stress testing. For more technical details, see appendix D.

18. This section builds on IMF 2003, part I.
19. See the BIS Web site for more information: <http://www.bis.org/statistics/constats.htm>.
20. In the limited number of countries where banks from a non-BIS-reporting country have a significant presence, other data must be used. Specifically, the local supervisory authorities may need to ask those banks to report their consolidated lending to the country (if they are not doing so already).
21. The BIS locational international banking statistics are a separate set of data from the BIS consolidated banking statistics that measure banking sector assets and liabilities in foreign countries but are not consolidated on a cross-border basis. See <http://www.bis.org/statistics/bankstats.htm> for more details.
22. The debt sustainability will also depend on other policy and environmental elements that affect future cash inflows and outflows, such as the expenditure policies of a sovereign borrower. See “Assessing Sustainability,” IMF (2002a) for a comprehensive discussion of different concepts of sustainability.
23. See Levine (2003) or Rajan and Zingales (1998), as well as other references in chapter 4.
24. For a further discussion on this subject, see chapter 4.
25. See Ghosh and others (2002).
26. Bell and Pain (2000) review the literature suggesting that banking crises tend to be preceded by credit booms.
27. Gourchinas, Valdes, and Landerretche (2001) find that financial development typically occurs in bouts that are characterized by short periods of intense financial deepening.
28. See Cottarelli, Dell’Ariccia, and Vladkova-Hollar (2003).
29. Analyses of IFCs by economists have been sparse. More attention has been devoted to this area by geographers, who have focused primarily on why IFCs are located where they are. Good reviews of the literature are provided by Choi, Park, and Tschoegl (1990) and Tschoegl (2000).
30. For more on the analysis of risks associated with LCFIs, see Miles (2002).
31. See IMF (2000, 2003b) for a more detailed discussion of rationale and lessons of the OFC assessment program of the IMF. See also Financial Stability Forum (2000).
32. These types of standards assessments are done as part of a broader stability assessment in FSAPs for countries that host an OFC or IFC. A stand-alone assessment of an OFC, however, is limited only to an assessment of observance of relevant international standards.
33. A detailed description of exchange arrangements and restrictions of individual countries is provided in IMF (2003a, 2004a).
34. Ishii and others (2002) provide country examples. For instance, capital account liberalization against a weak and poorly supervised financial sector contributed to the 1994 crises in Mexico and Turkey. Expansionary macroeconomic policies, a weak regulatory environment, and a fixed exchange rate policy together with capital account liberalization fueled the 1992 crisis in Sweden.
35. See Williamson and Mahar (1998) and Kaminsky and Reinhart (1999).

36. See Gulde and Ize (2004) and De Nicoló, Honohan, and Ize (2003) for a discussion of the various forms and consequences of dollarization.
37. These measures may not fully capture the extent of dollarization insofar as dollars are held as cash and used for transactions.

References

- Abiad, Abdul. 2003. "Early Warning Systems: A Survey and a Regime-Switching Approach." IMF Working Paper 03/32, International Monetary Fund, Washington, DC.
- Ades, Alberto, Rumi Masih, and Daniel Tenengauzer. 1998. *GS-Watch: A New Framework for Predicting Financial Crises in Emerging Markets*. Emerging Markets Economic Research, December. New York: Goldman Sachs.
- Altman, Edward I., and Paul Narayanan. 1997. "Business Failure Classification Models: An International Survey." In *International Accounting and Finance Handbook*, ed. Frederick D. S. Choi, chapter 35, 2nd ed. New York: Wiley.
- Bank for International Settlements (BIS). 1999. *Market Liquidity: Research Findings and Selected Policy Implications*. CGFS Publications 11. Basel, Switzerland: Bank for International Settlements.
- . 2001. "Structural Aspects of Market Liquidity from a Financial Stability Perspective." A discussion note for a meeting of the Financial Stability Forum, Bank for International Settlements, Basel, Switzerland. Available at http://www.bis.org/publ/cgfs_note01.pdf.
- . 2005. "Real Estate Indicators and Financial Stability." BIS Paper 21, Bank for International Settlements, Basel, Switzerland.
- Bell, J., and D. Pain. 2000. "Leading Indicator Models of Banking Crises—A Critical Review." *Financial Stability Review* (Bank of England) 9 (December): 13–29.
- Berg, Andrew, and Eduardo Borensztein. 2004. "Assessing Early Warning Systems: How Have They Worked in Practice?" IMF Working Paper 04/52, International Monetary Fund, Washington, DC. Available at <http://www.imf.org/external/pubs/ft/wp/2004/wp0452.pdf>.
- Berg, Andrew, Eduardo Borensztein, Gian Maria Milesi-Ferretti, and Catherine Pattillo. 2000. "Anticipating Balance of Payments Crises—The Role of Early Warning Systems." IMF Occasional Paper 186, International Monetary Fund, Washington, DC.
- Berg, Andrew, and Rebecca N. Coke. 2004. "Autocorrelation-Corrected Standard Errors in Panel Probits: An Application to Currency Crisis Prediction." IMF Working Paper 04/39, International Monetary Fund, Washington, DC. Available at <http://www.imf.org/external/pubs/ft/wp/2004/wp0439.pdf>.
- Berg, Andrew, and Catherine Pattillo. 1999. "Predicting Currency Crises: The Indicators Approach and an Alternative." *Journal of International Money and Finance* 18(4): 561–86.
- Bongini, Paola, Luc Laeven, and Giovanni Majnoni. 2002. "How Good Is the Market at Assessing Bank Fragility? A Horse Race between Different Indicators." *Journal of Banking and Finance* 26(5): 1011–28.

- Borio, Claudio. 2003. "Towards a Macroprudential Framework for Financial Supervision and Regulation?" BIS Working Paper 128, Bank for International Settlements, Basel, Switzerland. Available at <http://www.bis.org/publ/work128.pdf>.
- Borio, Claudio, and Patrick McGuire. 2004. "Twin Peaks in Equity and Housing Prices?" In *BIS Quarterly Review: International Banking and Financial Market Developments*, ed. J. Bisignano, C. Borio, R. McCauley, E. Remolona, P. Turner, P. Van den Bergh, and W. White, 79–93. Basel, Switzerland: Bank for International Settlements. Available at http://www.bis.org/publ/qtrpdf/r_qt0403.pdf.
- Bussiere, Matthieu, and Marcel Fratzscher. 2002. "Towards a New Early Warning System of Financial Crises." European Central Bank Working Paper 145, European Central Bank, Frankfurt, Germany. Available at <http://www.ecb.int/pub/pdf/scpwps/ecbwp145.pdf>.
- Chan-Lau, Jorge A., Arnaud Jobert, and Janet Kong. 2004. "An Option-Based Approach to Bank Vulnerabilities in Emerging Markets." IMF Working Paper 04/33, International Monetary Fund, Washington, DC. Available at <http://www.imf.org/external/pubs/ft/wp/2004/wp0433.pdf>.
- Chang, Roberto, and Andres Velasco. 2001. "A Model of Financial Crises in Emerging Markets." *Quarterly Journal of Economics* 116(2): 489–517.
- Choi, Sang Rim, Dackeun Park, and Adrian E. Tschoegl. 1996. "Banks and the World's Major Banking Centers, 1990." *Review of World Economics* 132(4): 774–93.
- Cottarelli, Carlo, Giovanni Dell'Ariccia, and Ivanna Vladkova-Hollar. 2003. "Early Birds, Late Risers, and Sleeping Beauties: Bank Credit Growth to the Private Sector in Central and Eastern Europe and the Balkans." IMF Working Paper 03/213, International Monetary Fund, Washington, DC. Available at <http://www.imf.org/external/pubs/ft/wp/2003/wp03213.pdf>.
- Craig, R. Sean, and Venkataraman Sundararajan. 2004. "Using Financial Soundness Indicators to Assess Risks to Financial Stability." In *Challenges to Central Banking from Globalized Financial Systems*, ed. Piero C. Ugolini, Andrea Schaechter, and Mark R. Stone, chapter 14. Washington, DC: International Monetary Fund.
- Das, Udaibir S., Nigel Davies, and Richard Podpiera. 2003. "Insurance and Issues in Financial Soundness." IMF Working Paper 03/138, International Monetary Fund, Washington, D.C. Available at <http://www.imf.org/external/pubs/ft/wp/2003/wp03138.pdf>.
- Debelle, Guy. 2004. "Household Debt and the Macroeconomy." In *BIS Quarterly Review: International Banking and Financial Market Developments*, ed. J. Bisignano, C. Borio, R. McCauley, E. Remolona, P. Turner, P. Van den Bergh, and W. White, 51–64. Basel, Switzerland: Bank for International Settlements. Available at http://www.bis.org/publ/qtrpdf/r_qt0403.pdf.
- Demirgüç-Kunt, Asli, and Enrica Detragiache. 1998. "The Determinants of Banking Crises in Developing and Developed Countries." *International Monetary Fund Staff Papers* 45(1): 81–109.
- De Nicoló, Gianni, Patrick Honohan, and Alain Ize. 2003. "Dollarization of the Banking System: Good or Bad?" IMF Working Paper 03/146, International Monetary Fund, Washington, D.C. Available at <http://www.imf.org/external/pubs/ft/wp/2003/wp03146.pdf>.

- Evanoff, D., and L. Wall. 2001. "Sub-Debt Yield Spreads as Bank Risk Measures." *Journal of Financial Services Research* 20: 121–45.
- Financial Stability Forum. 2000. *Report of the Working Group on Offshore Centres*. Basel, Switzerland: Financial Stability Forum. Available at http://www.fsforum.org/publications/OFC_Report_-_5_April_2000a.pdf.
- Gapen, Michael T., Dale F. Gray, Cheng Hoon Lim, and Yingbin Xiao. 2004. "The Contingent Claims Approach to Corporate Vulnerability Analysis: Estimating Default Risk and Economy-Wide Risk Transfer." IMF Working Paper 04/121, International Monetary Fund, Washington, DC. Available at <http://www.imf.org/external/pubs/ft/wp/2004/wp04121.pdf>.
- Garber, Peter M., Robin L. Lumsdaine, and Paolo Longato. 2001. *Deutsche Bank Alarm Clock: Descriptive Manual, Version 3*. Global Markets Research. London: Deutsche Bank.
- Ghosh, Atish R., Timothy D. Lane, Marianne Schulze-Ghattas, Ales Bulir, Javier Hamman, and Alexandros T. Mourmouras. 2002. "IMF-Supported Programs in Capital Account Crises: Design and Experience." Occasional Paper 210, International Monetary Fund, Washington, DC. Available at <http://www.imf.org/external/pubs/nft/op/210/index.htm>.
- Gourchin, Pierre-Olivier, Rodrigo Valdes, and Oscar Landerretche. 2001. "Lending Booms: Latin America and the World." National Bureau of Economic Research Working Paper No.8249, April 2001.
- Gray, Dale F., Robert C. Merton, and Zvi Bodie. 2003. "A New Framework for Analyzing and Managing Macrofinancial Risks of an Economy." Moody's MF Risk Working Paper 1-03, Moody's. Available at <http://www.moodys-mfrisk.com>.
- Gropp, Reint., Jukka Vesala, and Guiseppe Vulpes. 2002. "Equity and Bond Market Signals as Leading Indicators of Bank Fragility." European Central Bank Working Paper 150, European Central Bank, Frankfurt, Germany.
- Gulde, Anne-Marie, David Hoelscher, Alain Ize, David Marston, and Gianni De Nicoló. 2004. "Financial Stability in Dollarized Economies." IMF Occasional Paper 230 04/, International Monetary Fund, Washington, DC.
- Gunther, Jeffery W., Mark E. Levonian, and Robert R. Moore. 2001. "Can the Stock Market Tell Bank Supervisors Anything They Don't Already Know?" *Economic and Financial Review* (Federal Reserve Bank of Dallas) Issue QII (Second Quarter): 2–9.
- Hilbers, Paul L., Qin Lei, and Lisbeth S. Zacho. 2001. "Real Estate Market Developments and Financial Sector Soundness." IMF Working Paper 01/129, International Monetary Fund, Washington, DC. Available at <http://www.imf.org/external/pubs/ft/wp/2001/wp01129.pdf>.
- Houben, Aerd, Jan Kakes, and Garry Schinasi. 2004. "Toward a Framework for Safeguarding Financial Stability." IMF Working Paper 04/101, International Monetary Fund, Washington, DC. Available at <http://www.imf.org/external/pubs/ft/wp/2004/wp04101.pdf>.
- International Association of Insurance Supervisors (IAIS). 2000. "On Solvency, Solvency Assessment, and Actuarial Issues." IAIS Issues Paper, International Association of Insurance Supervisors, Basel, Switzerland.

- . 2002. “Principles on Capital Adequacy and Solvency.” IAIS Principles No. 5, International Association of Insurance Supervisors, Basel, Switzerland.
- International Monetary Fund (IMF). 2000. “Offshore Financial Centers.” IMF Background Paper, International Monetary Fund, Washington, DC.
- . 2002a. “Assessing Sustainability.” International Monetary Fund, Washington, DC. Available at <http://www.imf.org/external/np/pdr/sus/2002/eng/052802.pdf>.
- . 2002b. “Early Warning Systems Models: The Next Steps Forward.” In *Global Financial Stability Report*, chapter 4. Washington, DC: International Monetary Fund. Available at <http://www.imf.org/External/Pubs/FT/GFSR/2002/01/pdf/chp4and5.pdf>.
- . 2003a. *Annual Report on Exchange Arrangements and Exchange Restrictions*. Washington, DC: International Monetary Fund.
- . 2003b. *Financial Soundness Indicators*. Washington, DC: International Monetary Fund. Available at <http://www.imf.org/external/np/sta/fsi/eng/2003/051403.pdf>.
- . 2003c. “Financial Soundness Indicators.” Background Paper, International Monetary Fund, Washington, DC. Available at <http://www.imf.org/external/np/sta/fsi/eng/2003/051403bp.pdf>.
- . 2003d. *Trade Finance in Financial Crises: Assessment of Key Issues*. Washington, DC: International Monetary Fund. Available at <http://www.imf.org/external/np/pdr/cr/2003/eng/120903.pdf>.
- . 2004a. *Annual Report on Exchange Arrangements and Exchange Restrictions*. International Monetary Fund, Washington, DC.
- . 2004b. *Compilation Guide on Financial Soundness Indicators*. Washington, DC: International Monetary Fund. Available at <http://www.imf.org/external/np/sta/fsi/eng/2004/guide/index.htm>.
- . 2004c. “Offshore Financial Centers: The Assessment Program—An Update.” International Monetary Fund, Washington, DC. Available at <http://www.imf.org/external/np/mfd/2004/eng/031204.pdf>.
- . 2004d. *Global Financial Stability Report* (April). Washington, DC: International Monetary Fund.
- . 2004e. *Global Financial Stability Report* (September). Washington, DC: International Monetary Fund.
- . 2005. “Household Balance Sheets.” In *Global Financial Stability Report*, chapter 3. Washington, DC: International Monetary Fund.
- International Monetary Fund, and World Bank. 2002a. *Experience with the Assessments of the IOSCO Objectives and Principles of Securities Regulation under the Financial Sector Assessment Program*. Washington, DC: International Monetary Fund. Available at <http://www.imf.org/external/np/mae/IOSCO/2002/eng/041802.pdf>.
- . 2002b. *Implementation of the Basel Core Principles for Effective Banking Supervision, Experiences, Influences, and Perspectives*. Washington, DC: International Monetary Fund. Available at <http://www.imf.org/external/np/mae/bcore/2002/092302.pdf>.
- Ishii, Shogo, Karl Habermeier, Jorge Iván Canales-Kriljenko, Bernard Laurens, John Leimone, and Judit Vadasz. 2002. “Capital Account Liberalization and Financial Sector Stability.” IMF Occasional Paper 211, International Monetary Fund, Washington, DC. Available at <http://www.imf.org/external/pubs/nft/op/211/index.htm>.

- Jagtiani, Julapa, Kolari James, Catherine Lemieux, and Hwan Shin. 2003. "Early Warning Models for Bank Supervision: Simpler Could Be Better." *Federal Reserve Bank of Chicago Economic Perspectives* 27(3): 49–60.
- Kamin, Steven, John Schindler, and Shawna Samuel. 2001. "The Contribution of Domestic and External Factors to Emerging Market Devaluation Crises: An Early Warning Systems Approach." International Finance Working Paper 711, Board of Governors of the Federal Reserve System, Washington, DC.
- Kaminsky, Graciela. 1999. "Currency and Banking Crises—The Early Warnings of Distress." IMF Working Paper 99/178, International Monetary Fund, Washington, DC. Available at <http://www.imf.org/external/pubs/ft/wp/1999/wp99178.pdf>.
- Kaminsky, Graciela, Saul Lizondo, and Carmen Reinhart. 1998. "Leading Indicators of Currency Crises." *IMF Staff Papers* 45: 1–48.
- Kaminsky, Graciela, and Carmen Reinhart. 1999. "The Twin Crises: The Causes of Banking and Balance-of-Payments Problems." *American Economic Review* 89(3): 473–500.
- Krainer, John, and Jose. A. Lopez. 2003. "How Might Financial Market Information Be Used for Supervisory Purposes?" *Economic Review*, Federal Reserve Bank of San Francisco, 29–45.
- Krugman, Paul. 1979. "A Model of Balance-of-Payments Crises." *Journal of Money, Credit, and Banking* 11(3): 311–25.
- Levine, Ross. 2003. More on Finance and Growth: More Finance, More Growth? *Federal Reserve Bank of St. Louis Review* (July/August): 31–46. Available at <http://research.stlouisfed.org/publications/review/03/07/Levine.pdf>.
- Merton, Robert C. 1974. "On the Pricing of Corporate Debt: The Risk Structure of Interest Rates." *Journal of Finance* 29: 449–70.
- Miles, Colin. 2002. "Large Complex Financial Institutions (LCFIs): Issues to Be Considered in the Financial Sector Assessment Program." MAE Operational Paper 02/3, International Monetary Fund, Monetary and Exchange Department, Washington, DC.
- Morales, R. Armando, and Liliana Schumacher. 2003. "Market Volatility as a Financial Soundness Indicator: An Application to Israel." IMF Working Paper 03/47, International Monetary Fund, Washington, DC. Available at <http://www.imf.org/external/pubs/ft/wp/2003/wp0347.pdf>.
- Obstfeld, Maurice. 1996. "Models of Currency Crises with Self-Fulfilling Features." CEPR Discussion Paper 1315, Center For Economic Policy Research, Washington, DC.
- Pomerleano, Michael. 1998. "The East Asia Crisis and Corporate Finances: The Untold Micro Story." World Bank Working Paper 1990, World Bank Group, Washington, DC.
- Rajan, Raghuram G., and Luigi Zingales. 1998. "Financial Dependence and Growth." *American Economic Review* 88(3): 559–86.
- Roy, Amlan. 2001. "Emerging Markets Risk Indicator (EMRI)." In *Global Emerging Markets Strategy*. London: Credit Suisse First Bank.
- Sahajwala, Ranjana, and Paul Van den Berg. 2000. "Supervisory Risk Assessment and Early Warning Systems." Basel Committee on Banking Supervision Working Paper 2, Bank for International Settlements, Basel, Switzerland.

- Schnatz, Bernd. 1998. "Macroeconomic Determinants of Currency Turbulences in Emerging Markets." Discussion Paper 3/98, Economic Research Group of the Deutsche Bundesbank, Frankfurt, Germany.
- Schinasi, Gary J. 2004. "Defining Financial Stability." IMF Working Paper 04/187, World Bank Group, Washington, DC. Available at <http://www.imf.org/external/pubs/ft/wp/2004/wp04187.pdf>.
- Sundararajan, Venkataraman, Charles Enoch, Armida San José, Paul Hilbers, Russell Krueger, Marina Moretti, and Graham Slack. 2003. "Financial Soundness Indicators: Analytical Aspects and Country Practices." IMF Occasional Paper 212, International Monetary Fund, Washington, DC. Available at <http://www.imf.org/external/pubs/nft/op/212/index.htm>.
- Sundararajan, Venkataraman, and Luca Errico. 2002. "Islamic Financial Institutions and Products in the Global Financial System: Key Issues in Risk Management and Challenges Ahead." IMF Working Paper 02/192, International Monetary Fund, Washington, DC.
- Tschoegl, Adrian E. 2000. "International Banking Centers, Geography, and Foreign Banks." *Financial Markets, Institutions and Instruments* 9, No. 1 (February): 1–32. Available at <http://www.ingenta.com/journals/browse/bpl/fmii>.
- Williamson, John, and Molly Mahar. 1998. "A Survey of Financial Liberalization." *Essays in International Finance* (Princeton University) 211 (November). Available at http://www.princeton.edu/~ies/IES_Essays/E211.pdf.
- Wong, Jim, and Laurence Fung. 2002. *Liquidity of the Hong Kong Stock Market since the Asian Financial Crisis*. Basel, Switzerland: Bank for International Settlements. Available at <http://www.bis.org/cgfs/conf/mar02n.pdf>.