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Mapping Financial Sector Vulnerability in a Non-Crisis Country

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Abstract

The forward-looking framework expounded in this paper links a qualitative evaluation of system-wide vulnerability (covering macro, sectoral, institutional, and systemic liquidity issues) with a quantitative assessment of the financial condition of significant financial institutions. Based on vulnerability criteria and judgmental stress tests, twelve indicators of soundness (measuring risk exposure, solvency, liquidity, profitability, and supervisory assessment) are developed. This holistic methodology can be used not only as an early warning/crisis-avoidance system to identify potential systemic problems—and problem institutions—requiring immediate attention, but also to pinpoint needed reforms in the legal, regulatory, and institutional infrastructure that can lessen the likelihood of a future crisis.

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I. Introduction

The recent experiences of a number of Asian countries in dealing with full-blown financial crises have led to an increased emphasis on the crucial two-way relationship between sound financial systems and the pursuit of sustainable macroeconomic and structural policies. While much of the response to date has concentrated on firefighting and crisis management, increasing attention is being paid by policymakers and regulators to revamping the international financial "architecture" and placing greater emphasis on crisis prevention measures. An important aspect of this work at the IMF is to develop operational procedures to carry out enhanced oversight of financial systems in the context of Article IV surveillance and Fund program work. As a contribution to this ongoing task, this paper draws on some of the earlier experiences in field testing a framework for financial system vulnerability assessment in *non/near-crisis* countries. It outlines a practical methodology to evaluate financial system soundness, complementing current Fund/MAE work in evolving a methodology for financial system stability assessment (FSSA).

A sound banking system may be defined as one in which most banks are solvent and are likely to remain so. Solvency is measured by the difference between a bank's balance sheet assets and liabilities (excluding capital and reserves). Soundness can then be assessed based on measures and projections of capitalization. There are well-known difficulties, however, in measuring solvency.[1] Solvency is also a static concept, characterizing the banking system at a given point in time, while the concept of soundness should encompass its dynamic

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[1]These include difficulties in valuing loans; problems in measuring and defining non-performing loans (NPLs) given difficulties in valuing and projecting uncertain future receipts; presence of off-balance sheet items that may involve losses; and problems in consolidating the balance sheets of subsidiaries and other related parties.

development and its susceptibility to shocks. In addition, insolvency is a lagged indicator of potential problems which may have started before the balance sheet data indicate solvency problems. The likelihood of remaining solvent will, inter alia, also depend on banks being profitable and well managed. At the level of individual banks, supervisors worldwide have evolved supplemental indicators to assist their analyses. Lindgren, Garcia, and Saal (1996) outline three potential approaches to assessing banking system unsoundness.

The **first**, a "**bottom-up approach**," estimates the probability of insolvency developing for each individual bank, based on a balance sheet model. Systemic stability concerns arise when the probability of insolvency becomes significant for a large proportion of total banking assets or when the probability increases substantially in any period in time. Among the problems noted with this approach are its reliance on bank specific data and that it may ignore key roles and interactions between banks (e.g., through interbank markets and payment systems). The **second**, an "**aggregative approach**," estimates the probability of systemic insolvency using aggregate banking sector data, and applies tests typically used in the case of an individual bank to a synthetic aggregate bank. Beyond the drawback of aggregation potentially masking problems in important segments of the banking system, the data series for an individual country may contain insufficient cases of systemic unsoundness for the approach to be predictive. The **third** method, a "**macro-economic approach**," relies on the fact that banks are derivative institutions, in that their health reflects the health of their customers, which in turn reflects that of the economy as a whole. The approach seeks to establish systematic relationships between economy-wide variables and indicators of soundness, and where bank-specific data are available, vulnerability criteria derived from macroeconomic risk

factors could be applied to individual banks to indicate their sensitivity to particular risks. This approach has much to recommend it, and the methodology outlined in this paper seeks to build on it by combining it with the other two.

The rest of the paper is organized as follows. Section II outlines a framework for a broad-based **qualitative evaluation** of financial system vulnerability by identifying macro, sectoral, institutional, and systemic liquidity risk factors that can be used to develop potential vulnerability criteria for a particular country. Drawing on this broad evaluation, Section III sets out the modalities of the **quantitative assessment** of the individual financial institutions. Inter alia, some key system-wide vulnerability criteria are used to identify banking system risk factors that are, in turn, incorporated into stress tests applied to individual bank data. Leading indicators of bank condition, such as illiquidity and risk factors evident from banks' balance sheet data, are used to augment the tests for prospective solvency of the banking system. Section IV deals with the **interpretation of the results**, the upshot of which is a table incorporating 12 indicators that can give an overall forward-looking picture of the extent of banking system fragility. Finally, Section V stylizes the type of **conclusions** to be drawn from the assessment in Sections II to IV. These can provide a framework for identifying potentially vulnerable institutions, as well as sources of vulnerability, in a manner that facilitates putting together a comprehensive program of reform. In addition, some preliminary **lessons learned** from field testing the methodology that can complement ongoing efforts to develop financial sector stability assessment techniques and early warning systems are included.

II. Qualitative Evaluation of Overall Financial System: Identifying Risk Factors and Deriving Vulnerability Criteria

In developing an approach that combines macroeconomic and micro-institutional considerations into an overall evaluation of the financial sector condition in a country, the areas that could entail risks for the soundness of the financial system and that need to be evaluated can be described under four categories as follows:

1. **Macroeconomic risk factors.** The focus is on the macroeconomic developments and exogenous shocks that could increase the vulnerability of the financial institutions. Some examples are: lending booms; asset price movements; deterioration in external balances; low or declining economic growth; level and volatility of exchange and interest rates; sectoral activity where most loans and loan collateral concentrate; and reliance of banks and corporate entities on short-term foreign borrowing.

2. **Sectoral indicators of financial system health**. Attention is directed to a set of potential fragility indicators that could develop into significant liquidity and solvency problems. Examples include: foreign exchange exposure of financial institutions; sectoral credit concentration; exposure to holdings of stocks and property; trends in the aggregate ratio of NPLs to total loans; aggregate risk-based capital adequacy; central bank provision of liquidity support to financial institutions; segmentation of interbank money markets; aggregate loan-deposit ratio; maturity and currency structure of bank assets and liabilities; trends in stock exchange prices and changes in credit ratings of banks; and aggregate average returns of financial institutions.

3. **Institutional and regulatory framework**. Here the focus is on identifying possible sources of weaknesses that fail to discourage excessive risk taking by financial institutions and contribute to weak capital bases that constrain their ability to absorb unexpected losses and shocks. In general, the degree of compliance with Basle Core Principles is also reviewed. Some of the sources of weaknesses are: (i) **disclosure, accounting and legal frameworks**, also including internal controls, supervisory capacity, and loan classification and provisioning rules; (ii) **prudential regulations**, including capital adequacy standards, limits against excessive risk-taking, rules and regulations on the control of systemic risks and payment and clearing systems, and regulatory framework for capital account that may impact the financial system; (iii) **incentive structures and safety nets**, including the existence and structure of deposit insurance, and licensing-exit policies; and (iv) the **structure of the financial system**.

4. **Systemic liquidity arrangements** (including the design of central bank facilities and instruments, payments and settlement arrangements, foreign exchange management practices, and regulations for banks' liability and asset portfolio management) can have an important bearing on the system's resilience, particularly on its capability to cope with episodes of unsoundness when perceptions of counter-party risks change. Banks typically manage their liquidity positions by asset and/or liability management techniques through money and foreign exchange markets. The scope and effectiveness of these operations are critically dependent on the existence of liquid money markets and the ability of banks to access these funding sources. Thus, this part of the evaluation is directed at highlighting institutional arrangements for money markets that

affect depth and liquidity as well as measures that can hamper the capability of banks to manage liquidity, e.g., rigidities in the design of instruments; restrictions on asset and liability management (e.g., credit ceilings and interest rate restrictions); information deficiencies; and the insufficiency of collateral to secure both central bank and interbank lending operations.[2]

These four sets of indicators can be established for a given country in order to (1) develop a snapshot view of the extent of vulnerability of the overall financial system, and (2) identify qualitatively the various risk factors that could impact the health of the financial system in the country. Examples of such risk factors, in each of the four categories respectively, are weak property/stock prices and volatile interest and exchange rate movements; exposure to lending for stocks and property; weak loan classification and provisioning rules; and segmentation or other liquidity constraints in the interbank market.

III. Quantitative Bank-by-Bank Assessment of The Soundness of the Financial System

The next step in the methodology involves incorporating the risk factors identified from the qualitative evaluation above into basic solvency stress tests on bank-by-bank balance sheet data, in order to derive a quantitative forward-looking assessment of the solvency condition of banks. The condition of the financial system is then mapped and assessed using a full range of criteria of financial system soundness (nature of exposure of financial system to

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[2]More detailed lists for each of the four areas are provided in Appendix I, which includes samples of worksheets/questionnaires to facilitate the identification of vulnerability criteria.

risk, solvency condition, liquidity condition, profitability, and supervisory assessment). As banks may exhibit different degrees of vulnerability over time, the assessment of the current condition is augmented with an assessment of the outlook for individual banks, taking into account the various risk factors that may lead to further deterioration in the soundness of the financial institutions. Deciding on which vulnerabilities are most relevant in a particular country and how to translate them into stress-testing parameters is basically a judgmental exercise. The implications of this bank-by-bank analysis are then used to assess the soundness of the overall banking system by using the share of each institution in total bank assets (the "bottom-up approach"). The linkages between the broad qualitative evaluation in Section II and the quantitative bank-by-bank assessment in this section are graphically illustrated in Diagram 1 and Table 1. The following paragraphs explain in greater detail the various vulnerability criteria used in the approach.

A. High Exposure to Risk

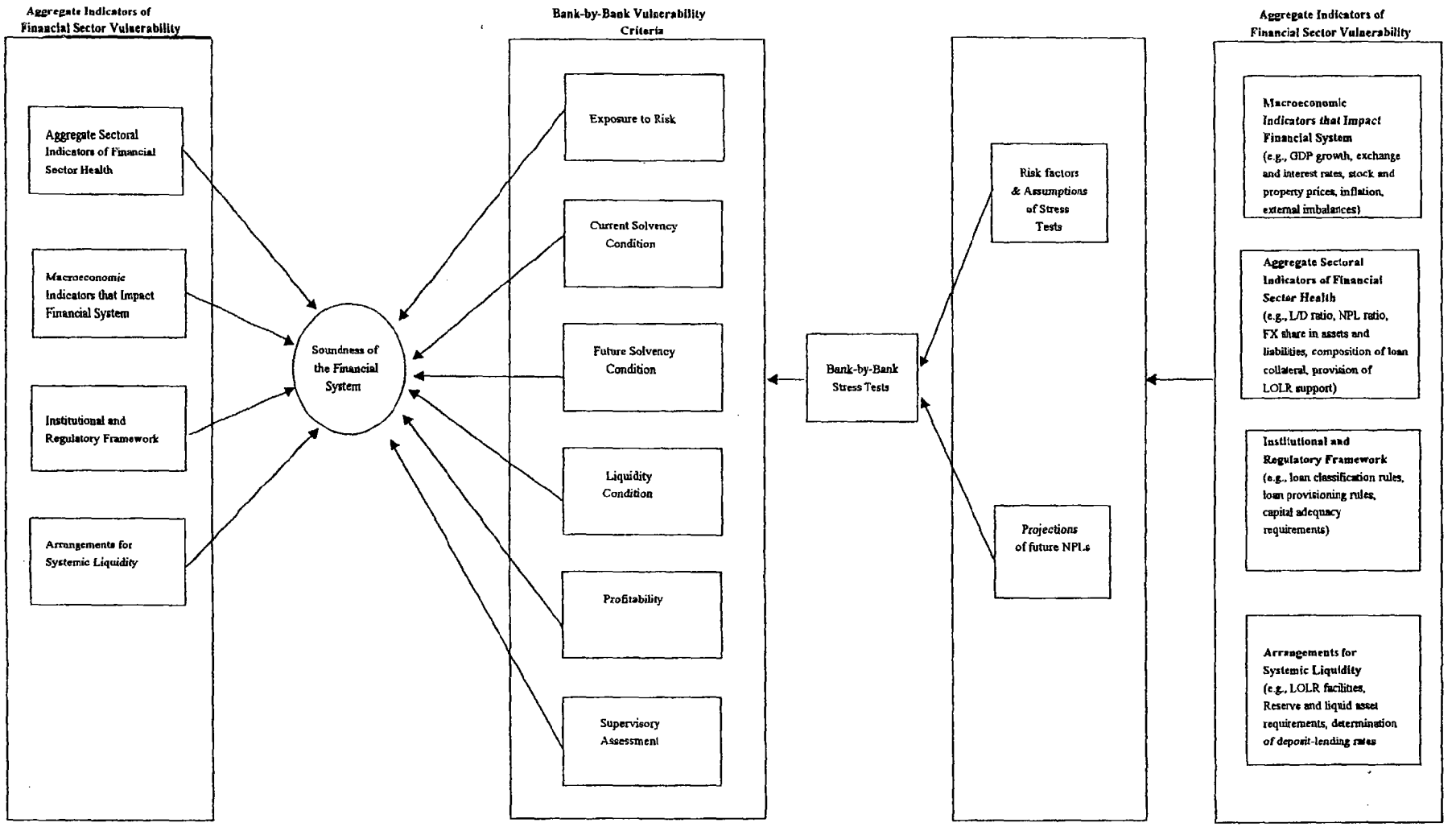
Some typical risks (credit, foreign exchange, liquidity, and market risks) faced by banks in the course of intermediation, and proxy measures and determinants of such risks, are illustrated in Table 1. Other things being equal, the greater a bank's exposure to risk, the greater is the degree of financial vulnerability.

Among the most commonly used indicators to assess a bank's exposure to credit risk are the ratios of the bank's NPLs to its total loans and the loan-to-deposit ratio. An increase in a bank's **NPL ratio** would be an indication of a deterioration in the quality of its asset portfolio (e.g., as a result of a sharp deterioration in economic growth, adverse developments in interest and exchange rates, heavy exposure to sectors adversely affected by worsening

Table 1. Criteria and Indicators of Financial Sector Vulnerability

Vulnerability criteria	Indicator to assess condition	Measured by:	Affected by:	Variables affecting:
Exposure to Risk	Exposure to credit risk	Ratio of NPL to total loans	Sectoral and macroeconomic conditions and developments, and institutional and regulatory framework	- credit growth - property and stock prices - exchange and interest rate changes -economic growth - external sector balance - share of FX lending and borrowing in total bank assets and liabilities - deficiencies in prudential regulations against risk taking, supervision, incentive structures, accounting standards.
	Exposure to credit and maturity risk	Loan-deposit ratio		
	Exposure to market risk	Ratio of property sector related loans to total loans Ratio of share-related lending to total loans		
	Exposure to foreign exchange risk	Ratio of the bank's net open positions in foreign exchange to its capital		
Current Solvency Condition	Adjusted capital adequacy ratio	The ratio of a bank's total capital adjusted for provisioning deficiencies to its risk adjusted assets, also adjusted for the provisioning deficiency based on the bank's current balance sheet data	Sectoral and macroeconomic conditions and developments, and institutional and regulatory framework	- credit growth - property and stock prices - share of stock and property sector related lending in total loans - exchange and interest rate changes - economic growth - external sector balance - share of FX lending and borrowing in total bank assets and liabilities - loan classification, provisioning, and capital adequacy requirements
Future Solvency Condition	Adjusted capital adequacy ratio	The ratio of a bank's total capital adjusted for provisioning deficiencies to its risk adjusted assets, adjusted for provisioning deficiency based on future projection of NPLs under the assumptions on other elements of the bank's balance sheet and as a function of various macroeconomic and financial sector indicators (GDP growth, exchange rates, real interest rates, stock and property sector prices, inflation, external imbalances, share of property sector in total lending, FX exposure, etc)		
Liquidity Condition	LOLR support	Month-to-month trends in an institution's access to LOLR facility (as a ratio of total central bank LOLR support in that month or as a ratio of bank's capital)	Sectoral conditions and developments; institutional and regulatory framework; and monetary policy operations and instruments	- financial condition of the institutions - rigidities and shortcomings in monetary policy operations and instruments (such as high, unremunerated reserve and liquid asset requirements, and restrictions on banks' lending and deposit rates) that reduce banks' ability to manage their liquidity -shortcomings in public disclosure rules
	Noncompliance with prudential liquidity requirements	Deficiencies in an institution's statutory reserve and/or liquid asset requirements (actual versus required ratios)		
	Composite liquidity indicator incorporating noncompliance with liquidity requirements and access to LOLR facility	Comparison of a bank's actual reserve and liquid asset holdings with its effective borrowing (through LOLR facility and noncompliance with prudential regulations), measured in relation to eligible liabilities		
Profitability	Return on assets	Ratio of a bank's net profits (losses) to its assets	Sectoral and macroeconomic conditions and developments, institutional and regulatory framework	- economic growth - interest and exchange rate developments - changes in provisioning requirements - rigidities in lending and deposit rates, etc.
Supervisory assessment	CAMEL Ratings			
	Supervisory authority's "watch list"			

Diagram 1. Alternative Approaches to Diagnosing Financial System Vulnerability



economic conditions, and deficiencies in the prudential and supervisory framework and incentive systems that result in risky lending). A high NPL ratio would thus signal heavy exposure to credit risk and low profitability, as well as capital impairment, since greater provisioning would need to be made against the loans that are nonperforming. The **loan-to-deposit ratio** of a bank measures the degree of leverage and the extent the bank is relying on "nontraditional" sources of funding. When times are good, a bank will often maximize the leveraging of its balance sheet, increasing its loan-to-deposit ratio by seeking less traditional, perhaps more volatile, funding sources. A bank with a high ratio would be subject to greater maturity risk, and is particularly likely to incur losses and suffer capital erosion when economic conditions deteriorate, as borrowers become increasingly unable to repay their loans and investors withdraw their deposits.[3] Under such economic conditions, those banks that rely on less traditional funding sources often find themselves in severe need of liquidity, all the more so if their perceived financial condition is also declining.

Exposure to market risk can also be a source of financial vulnerability. One indicator to assess such exposure is **the share of property sector and stock market lending to total loans**.[4] Such lending generally carries higher risk compared with the other parts of the loan book because of the inherent volatility in property and stock markets, and in the case of property related lending, the tendency of developers to use high levels of leverage. Banks may be exposed to property or share sectors also indirectly through the use of property and shares

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[3]Banks with good standing may also have high loan-to-deposit ratios, reflecting their ability to source cheaper wholesale funds overseas and their good quality, saleable loans.

[4]Market risks could also arise from other types of asset concentration, such as holdings of bonds or securities that are marked-to-market.

as major sources of collateral. This indirect effect may need to be taken into account in the treatment of collateral and thus in stress testing bank's capital condition.

Another significant source of market risk for banks is their **foreign currency exposure**. Such risks may manifest themselves in losses associated with changes in exchange rates when such exposure is not hedged, in particular where high differentials between domestic and foreign interest rates in the context of pegged or tightly managed exchange rate regimes may create incentives for excessive foreign borrowing by banks (on-lent to individuals with little foreign exchange earning potential) in an environment with a relatively liberalized capital account and/or insufficiently tight prudential and supervisory frameworks. One way to incorporate foreign exchange rate risk is to examine the extent to which banks' net open foreign currency positions as a ratio of their capital exceeds what is permitted by formal open position limits. Subject to data availability, an alternative way is to separate banks' foreign currency denominated assets and liabilities from their local currency counterparts and evaluate the impact of exchange rate changes on bank balance sheets.[5]

The extent of a bank's vulnerability to risk exposure could be reduced if the bank were to set aside adequate provisions against the possibility of impaired loans and to accumulate sufficient capital to withstand adverse conditions arising from such risks. Accordingly, to ensure an adequate degree of rigor, the assessment of financial vulnerability based on risk exposure must be done with solvency tests that evaluate the financial condition of a bank after adjustments for such provisioning deficiencies are made (see below).

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[5]A similar analysis could be done to separate banks' assets and liabilities sensitive to interest rates and to evaluate the impact of a given change in interest rates on bank balance sheets.

B. Solvency Condition and Stress Testing

Solvency is reflected in the positive net worth of a bank, as measured by the difference between the assets and liabilities (excluding capital and reserves) in its balance sheet. The solvency of a bank, therefore, can be measured in terms of the bank's capitalization which can in turn be measured by the capital adequacy ratio, or the ratio of total bank capital (sum of tier 1 and tier 2 capital)[6] to its risk-weighted assets reported in a bank's balance sheet data. Insolvency results when the bank's net worth is negative.

To assess the degree of capitalization, a bank's capital adequacy ratio at a given point in time can be compared with the Basle recommended minimum capital adequacy ratio for credit risk, that is, 8 percent (tier 1 and tier 2 capital) of risk-weighted assets, and at least 4 percent tier 1 capital.[7] However, in computing the capital adequacy ratio of a bank, care should be exercised to ensure that (1) the balance sheet data are on a consolidated basis, or at least that they include the activities of bank branches and subsidiaries, to avoid underestimation of the level of a bank's risk assets; (2) banks' off-balance sheet commitments (contingent liabilities) that may expose them to additional risks are taken into account; and (3) loan classification and provisioning standards for NPLs conform with international best practices to avoid the risk of inadequate provisions. Where prudential and supervisory

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[6]Tier 1 capital consists of paid-up capital (common stock) and disclosed reserves, while tier 2 capital consists of undisclosed, revaluation, and general loan-loss reserves, some subordinated debt, and hybrid debt instruments.

[7]A higher ratio may be appropriate for emerging market economies to make allowance for higher risks that may be involved.

standards do not comply with best practices, adjustment to such standards could reveal further deterioration in the solvency condition of banks.

Initial stress tests can then be performed in order to measure the sensitivity of the bank's solvency to stricter loan classification and provisioning standards (see Box 1). Sensitivity of the institution's capital base could also be evaluated with respect to various other risk factors (as identified in Section II) or hypothetical scenarios regarding its exposure to various types of risk, including for example, risks resulting from changes in exchange and interest rates, or in stock market or property prices. Such stress tests are useful in assessing the overall impact of a number of different simulations (including, perhaps, best and worst case scenarios) on the capital base of the institutions. In many cases, results may turn out to be not far from the actual situation in view of the potential measurement errors or other deficiencies in official bank-by-bank data and of the backward-looking (lagged) nature of the loan classification and provisioning rules. Moreover, deterioration of macroeconomic and banking sector conditions may take some time to be fully reflected in the balance sheets of the institutions, which means that the condition of the banking system measured by solvency condition based on the most recent balance sheet data would be a backward-looking indicator of soundness. The stress tests to assess the current condition should therefore be complemented with a forward-looking analysis of the outlook for the system in the light of vulnerability and risk factors.

Based on the results of these stress tests, banks can be classified into three groups as potentially "solvent and adequately capitalized (or strong)," "solvent but undercapitalized (or weak)," and "insolvent (or serious)" to form a basis for identifying those institutions

BOX 1. STRESS TESTING

Stress testing to identify events or influences that could greatly impact banks is a key component of a bank's assessment of its capital position (see Report on the Working Group on Quantitative Issues, Institute of International Finance (1996)). The main objectives of stress testing are to identify and, if possible, quantify hidden hazards which may be overlooked and which may turn out to be crucial in stressful situations; to evaluate the capacity of the bank's capital to absorb potential large losses; and to identify steps the bank can take to reduce its risk and conserve capital (see Mori, Moshawa, and Shimizu (1995)). In particular, stress tests examine the overall sensitivity of an institution's capital base to adverse market movements or hypothetical worst-case scenarios regarding banks' exposure to various types of risk (see Dimson and Marsh (1997)).

A number of stress tests to evaluate the sensitivity of individual financial institutions' capital base to a variety of risk factors may be identified from the macroeconomic evaluation of the financial system. Identifying the appropriate risk factors, however, may be a difficult exercise, as unforseen movements in economic variables may occur. Deciding on which vulnerabilities are most relevant in a particular country's financial system and how to translate them into stress-testing parameters is thus a judgmental exercise. Examples of possible stress tests include:

(i) Deviation from internationally accepted regulatory and supervisory standards: Correcting for such deviations involves measuring the sensitivity of a bank's solvency to the stricter loan classification and provisioning standards, including: use of consolidated data to assess capital situation, use of off-balance sheet commitments in provisioning,[10] and application of appropriate loan classification and provisioning rules and percentages to balance sheet data. The capital adequacy ratio for each institution could then be calculated by adjusting its total capital and risk-adjusted assets with the provisioning deficiency that would arise, assuming that the actual specific provisions held by the institution fall short of the provisions that would be required according to internationally accepted classification and provisioning rules.

(ii) Exposure to market risks: Banks may be exposed to stock market and property sectors not only through their lending to these sectors, but also through their reliance on property and shares as major sources of collateral. When property and shares make up the bulk of collateral, and no provisioning is required against the uncollateralized portion of loans, adverse developments in these sectors may reduce the value of collateral, and thus banks' capital position may be overstated. Banks' capital and thus the capitalization need for each institution could be stress tested against alternative scenarios for collateral value in light of the uncertainties about the prices of property and shares.

(iii) Further deterioration in macroeconomic and banking sector indicators: Such development highlights the need to measure the impact on bank capital of a potential future deterioration in asset quality, as a result, for example, of adverse movements in exchange and interest rates, economic growth, and other relevant factors. In order to estimate this impact, projections can be made regarding the evolution of the NPLs of the financial institutions. Such projections could be based on an extrapolation of past trends given the evolution of the NPLs in previous months, or alternatively on simple econometric techniques that recognize the various risk factors identified at the aggregate macro-based assessment.[11] Because actual NPLs could be affected by the interaction of additional macroeconomic and financial data that cannot be included in the empirical analyses for the lack of adequate time series data, relying solely on the estimated NPLs from this analysis may risk under or overestimating the actual NPLs. Accordingly, it may be more preferable to use the results of the estimations in combination with judgements derived from the evaluation in Section II of this paper.

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[10]The incorporation of off-balance sheet items is in general limited by the availability of adequate information on the amount and riskiness of such obligations. In the absence of such information, one simple way to adjust for such items is to allow for a given percentage of total loan portfolio (e.g., same percentage applied to general provisions) to be set aside as provisioning against potential losses on these items.

[11]For example, by using time series data, aggregate NPLs of financial institutions can be regressed on a range of macroeconomic and financial indicators, including nominal and/or real exchange rates and interest rates, economic growth, inflation performance, external balance, the share of short-term and foreign currency liabilities of the banking institutions, stock market prices, activity in the sectors where most banking loans are concentrated, the share of broad property sector or stock related lending in total loans, debt-equity ratio of nonfinancial firms, etc. See models of early warning indicators of financial fragility for the idea underlying this approach (e.g., Gonzalez-Hermosillo, Pazarbasioglu and Billings (1997)).

that require more focused attention in subsequent restructuring efforts. Finally, under each alternative simulation, the corresponding capital shortfall to meet the Basle minimum capital requirement could be calculated for individual banks, which could then be used in estimating recapitalization need for the banking system as a whole; this figure also provides an indication of potential fiscal cost to the extent that private sector capital is not forthcoming and the state has to become involved in recapitalization.

C. Liquidity Tests

While conducting solvency and stress tests as outlined above is essential in assessing banking system soundness, solvency may be a lagging indicator of a bank's financial condition. Although insolvency normally precedes illiquidity, problems may first become evident through illiquidity. Weak or potentially insolvent institutions typically incur difficulties in raising new liabilities which are manifested in increased funding costs and segmentation in interbank market. In extreme cases, and as funding options narrow, this difficulty could eventually manifest itself in noncompliance with prudential or regulatory limits, such as statutory reserve (SRR) or liquid asset requirements (LAR), coupled with excessive and protracted reliance on central bank refinancing or lending.[8]

In such circumstances, illiquidity could be used as a leading indicator of potential solvency problems, particularly when liquidity problems occur on a persistent basis. The

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[8]However, financial institutions may incur difficulty in attracting deposits or accessing funds through the interbank market even when their financial condition is not weak. This may happen, e.g., when deficiencies in disclosure standards result in a lack of adequate and accurate information and uncertainty about the financial condition of banks, and cause surplus institutions to be reluctant to recycle their liquidity. More broadly, illiquidity could occur as a consequence of rigidities in the design of monetary instruments, insufficient collateral, and portfolio constraints on asset/liability management practices of banks.

trends in the extent of total liquidity support by the central bank—whether on a formal basis through collateralized borrowing from a lender-of-last-resort (LOLR) facility or through effective overdraft vis-à-vis required reserve holdings or breaching of liquid asset requirements—in itself may suggest that the central bank had been replacing funds lost by weak institutions that are no longer able to obtain funds from the interbank market because of market concerns over their solvency. Accordingly, liquidity condition could be assessed by a composite measure, which incorporates these elements, that is, access to central bank liquidity support and compliance with required regulatory ratios.[9] Bank-by-bank examination of the developments in a given bank's recourse to the central bank may help identify those institutions that are potentially insolvent, although their balance sheet data at that time may suggest otherwise. Simultaneous observation of illiquidity and low capital ratio would in turn reinforce the assessment of weak financial condition.

D. Profitability

In addition to being sufficiently well-capitalized and liquid, the likelihood of banks remaining solvent and viable would also depend on their profitability. Profitable banks can make required provisions to withstand adverse conditions, add to their capital, and build investor confidence by paying attractive dividends, while those producing losses deplete

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[9]One such measure compares a bank's holdings of liquid assets to the funds it has borrowed from the central bank, measured in relation to its eligible liabilities for the regulatory ratios:

$$L = \frac{(LAR + SRR + Surplus\ on\ LAR + Surplus\ on\ SRR) - LOLR\ \ Support}{Eligible\ Liabilities}$$

A negative value for this ratio would be seen as an indication of illiquidity. Moreover, the lower the ratio, the more serious would be the institution's liquidity condition.

capital. The profitability of banks (measured in this case by the ratio of net profits to assets (ROA)) can be used to complement the solvency and liquidity tests in assessing the overall soundness of the institutions. A low ratio, as well as a declining trend in this ratio may signal problems regarding the profitability of a given financial institution.

E. Supervisory Assessment

Many countries make a full-scale evaluation of the condition of a bank by constructing a CAMEL rating (a measure of the relative soundness of a bank, calculated on a 1–5 scale, with the best rating being 1). This rating assesses Capital adequacy, the quality of Assets, the adequacy of Management and a system of internal controls, Earnings, and Liquidity. In some countries, the supervisory authority may also maintain a "watch list," classifying financial institutions under "primary" or "secondary" watch categories based on a number of criteria, including capital adequacy, CAMEL ratings, and degree and frequency of access to central bank liquidity support facilities. These qualitative assessments, which are generally based on on-site inspections, can be used to complement the quantitative assessment of financial condition. Where available, assessments by rating agencies or market assessments revealed through share prices of individual banks may provide additional information on market perceptions of the health of these institutions.

IV. Interpretation of the Results and Overall Assessment of Banking System Soundness

Once the analyses of the current and future condition of the banks within the banking system are completed, the results can be summarized in the form of a table which presents 12

indicators of financial condition that can be applied to individual banks according to the various criteria that are used to evaluate financial vulnerability (see Table 2 for an illustration). These indicators fall under the following five broad categories:

- **risk exposure** (as measured by the NPL ratio, loan-to-deposit ratio, share of property and share-related lending in total loans, and net foreign exchange exposure);
- **solvency condition** (as measured by capital adequacy ratios in the current and future periods—the latter based on best judgment stress tests and NPL projections);
- **liquidity problems** (as measured by access to central bank LOLR facilities, noncompliance with required prudential ratios, or a composite liquidity indicator);
- **profitability** (as measured by the return on bank assets); and
- **supervisory assessment** (based on CAMEL ratings and supervisors' watch list).

These 12 measurement indicators could be classified as "red" warning indicators in situations where they fall below what could be regarded as a "threshold" norm.[10] Conversely, the indicators would be "green lights" if well above the threshold and "orange" if

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[10]For example, the "threshold" norm occurs when loan-to-deposit ratio exceeds 90 percent; the NPL ratio exceeds 5 percent; the ratio of property sector or stock-related lending is high (e.g., when exposure exceeds 20 percent of capital plus provisions or 30 percent of total loans); net foreign exchange exposure exceeds the legally required open position limits (if any); the capital adequacy ratio falls short of the 8 percent minimum Basle total capital requirement; the bank borrowed from the central bank in excess of a certain amount, say, 50 percent of capital; the composite liquidity measure is negative or low; return on assets of the bank is negative or very low; CAMEL ratings exceed 3, or when the bank is included in the supervisory watch list. The critical threshold levels of these indicators, however, are judgmental and depend in part on the risk aversion of the supervisor or policymaker undertaking the evaluation and in part on other factors, including the severity of economic conditions and risk characteristics of the country (e.g., more stringent standards for developing countries).

Table 2. A Hypothetical Illustration of Diagnosis of Vulnerable Financial Institutions

Vulnerability Criteria →	Exposure to Risk				Solvency Condition		Liquidity Condition			Profitability (ROA)	Supervisory Assessment		# of red lights	Share in Total System Assets
Financial Institution 1	L/D Ratio (%)	NPL Ratio (%)	Property/share loans to total loans (%)	Net FX exposure to capital (%)	Current C/A ratio (%)	Projected C/A ratio (%)	LOLR support to bank capital (%)	Compliance with SRR or LAR (Y/N)	Liquidity indicator (%)	Net profits to assets (%)	Camel rating (1-5)	Watch list (Y/N)		
FI-1	59	17.0	35.0	20	7.5	5.0	60	N	-30.0	1.1	3	Y	8	10.2
FI-2	115	10.0	40.0	26	9.0	6.5	65	N	-12.0	1.2	4	Y	10	5.7
FI-3	130	14.2	30.5	15	6.5	2.5	120	N	-20.5	0.4	3	Y	10	2.5
FI-4	80	6.5	25.0	20	8.3	7.0	--	Y	10.0	1.2	2	N	2	13.0
FI-5	88	15.9	55.0	45	8.2	6.0	100	Y	-5.0	0.7	3	Y	8	8.7
FI-6	120	6.1	25.0	30	7.8	6.9	49	N	11.3	1.4	4	Y	8	5.0
FI-7	95	17.2	50.6	35	5.7	2.0	130	Y	12.0	-0.3	4	Y	10	4.0
FI-8	110	10.4	45.0	30	9.6	6.0	40	Y	15.6	1.3	3	N	5	3.7
FI-9	80	4.9	20.3	20	8.3	8.0	55	Y	10.4	0.5	2	N	2	8.3
FI-10	103	5.3	20.0	18	8.7	6.5	130	N	5.1	1.0	3	Y	7	5.5
FI-11	85	4.0	25.5	20	10.5	8.2	--	Y	20.5	2.0	2	N	--	4.1
FI-12	124	9.3	45.0	27	13.5	7.0	--	Y	15.0	1.8	3	N	5	6.4
FI-13	95	45.0	50.9	40	2.3	-3.2	--	N	7.5	-2.1	4	Y	11	6.6
FI-14	60	5.3	25.3	30	8.9	7.5	55	Y	12.0	1.1	2	N	4	4.0
FI-15	85	4.5	29.5	20	9.0	7.5	--	Y	15.0	0.9	3	N	3	6.5
FI-16	98	25.0	47.0	24	4.0	-2.0	45	N	-17.5	-0.5	4	Y	10	5.8
# banks with red lights	9	13	9	8	6	14	8	7	7	7	5	9	5 # banks with ≥9 red lights	-
as % of total # banks (16)	56%	81%	56%	50%	37%	87%	50%	44%	44%	44%	31%	56%	31%	24.6% of system assets

1/ Stress test results are incorporated here; the current C/A ratio ideally should be based on bringing loan classification and provisioning rules to best international standards; for many countries this in itself could be regarded as a stress test. The projected C/A ratio incorporates judgementally the risk parameters impacting on the future level of NPLs. The numbers reported here are purely hypothetical, generated for illustration purposes.

approaching it. The result, in terms of the number of "red" lights for each bank, would in turn provide a broad-based assessment of financial condition. The usefulness of this "traffic light" methodology is twofold.

First, it can help **identify the financially vulnerable banks in the system** by scoring the number of vulnerability criteria that each individual bank transgresses. If a bank transgresses all or most of the criteria used, this would indicate that the bank is potentially very vulnerable. This, in turn, is helpful in grouping the banks into the categories of "serious," "weak," and "strong" and forming a "watch list" of those banks that require more focused attention in subsequent rehabilitation efforts. The degree of a bank's vulnerability according to each of the criteria could also help identify particular sources of weakness for that bank. Moreover, by using the market share of each bank in total system assets, it is possible to obtain an overall assessment of the vulnerability of the financial system in the country, and thus the risk of a systemic banking crisis.[11]

Second, the methodology may also be helpful in **identifying the potential areas of vulnerability in a given financial system**. For example, failure of liquidity tests by many banks that happen to pass most of the other tests of vulnerability may suggest that liquidity problems have been caused by factors other than the soundness of the financial institutions (e.g., by rigidities in market arrangements and instruments of monetary policy that reduce the

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[11]This approach assigns equal weight to all indicators in arriving at an overall view of systemic vulnerability. In cases when the story told by the various indicators is more mixed, some judgement would have to be used in interpreting the results in terms of implications for systemic vulnerability. In some cases, the conjunction of different factors (e.g., large foreign currency exposure of banks in light of other factors such as macroeconomic imbalances) may increase systemic vulnerability. In any event, the approach would be useful to identify the sources of vulnerability for each institution, as well as the system as a whole (see below).

ability of the financial institutions to manage their liquidity). High loan-to-deposit ratios by most institutions can also be symptomatic of structural vulnerability in the corporate sector, as reflected in highly leveraged balance sheets and inherent shortcomings in the financial markets structure (e.g., underdeveloped stock and bond markets, or deficiencies in the corporate ownership structure, or a culture that favors dependence on highly leveraged sources of financing from banks). This information could in turn be helpful in identifying the particular areas that require most attention in subsequent financial reform efforts. Of course, the greater the number of criteria according to which most banks in the system appear vulnerable, the more serious would be the severity of unsoundness of the system as a whole.

Finally, if potential systemic problems are revealed, the framework can also produce estimates of cost of filling the "hole" arising from capitalization shortfalls, and possible implications for use of public funds, if such funds cannot be generated by the private sector.

V. Conclusions and Some Policy Lessons

The combined qualitative and quantitative framework outlined for assessing the health of a financial system and its potential vulnerabilities is essentially one of mapping the system against derived indicators of risk and resilience. It is important to underscore that the method *of using bank-by-bank data is crucial to identifying vulnerable institutions, which may have a* systemic role in the financial system. While release of individual bank data can present legal problems for some national regulatory agencies, without individual bank data it would be impossible to assess the degree of systemic risk. **Second,** some vulnerability indicators may have different meanings depending on the structure of the financial system (e.g., where there

are specialized mortgage institutions, one would normally expect the share of property lending in total bank loans to be low). **Third**, in inferring sources of vulnerability and hence potential priorities for reform, an inherent caution is warranted in interpreting simulation exercises and stress tests often underpinned by tentative assumptions and forecasts. Nevertheless, as the framework attempts to combine both qualitative and quantitative analyses, results may be sufficiently rigorous and significant to at least flag the need for improved vigilance, if not immediate action. In this context, the approach can point a range of preemptive steps and other structural reform measures that need to be addressed.

Preemptive reform could help avoid an immediate or near-term financial sector crisis, and where warranted, may require: (1) prompt resolution action to address problem banks whether through merger, conservatorship or closure; (2) strengthening the regulatory framework governing prudential rules and practices to cover issues such as inadequate provisioning rules and lack of enforcement of limits against excessive risk taking; improving the treatment of exemptions to prudential rules; enhancing disclosure and reporting arrangements, including consolidation of subsidiaries and contingent liabilities; and increasing the frequency of off-site inspection with improved focus on loan quality and liquidity; (3) urging banks to take preemptive steps to recapitalize and build solvency strength in expectation of increasing NPLs; and (4) identifying circumstances and conditions under which it may be appropriate to use public funds for bank recapitalization.

Further structural reforms identified from the analyses could lessen the likelihood of a crisis in the future. Such reforms could include improvements in enabling legislation and related institutional strengthening, for example, to ensure the capability of the regulatory

authorities to take prompt corrective action, and undertake a comprehensive restructuring strategy where needed, including failure resolution; to reduce potential central bank moral hazard; and to promote market discipline. Such changes would aim at giving the central bank or supervisory agency greater independence in bank regulation and foster an appropriate balance between the price and financial stability objectives of the central bank, while strengthening accountability. The approach could also identify reform measures to improve money and capital market arrangements, strengthen the payment system, and remove rigidities which affect banks' abilities to manage assets and liabilities with minimal official intervention.

While it is not feasible for confidentiality reasons to reveal country-specific details on the outcome of the relatively limited field testing of this framework, a number of **generic lessons** are salutary and worth mentioning in the context of defining or further refining a methodology for financial system stability assessment in non- or near-crisis countries.

- Criteria for stress testing balance sheets of individual institutions need to be presented as hypothetical simulations in order to balance the "alarmist" versus "warning" approach in making an assessment of a financial system in a country that is not yet in a financial crisis; in this context, it is essential that the regulatory authorities take ownership of criteria used and the outcome of stress tests.
- In projecting future solvency conditions of financial institutions based on NPL predictions, due regard should be given to the "hammock effect" (see Ingves and Lind (1997)), that is, the possibility, based on professional evaluation of future asset quality and likely macro or sectoral economic improvements, that some banks' apparently poor condition may be temporary.

- A high level of ongoing central bank liquidity support for individual financial institutions, notwithstanding apparent good solvency ratios, is an important leading indicator of future solvency problems and needs to be given due weight in a quantitative assessment of health.
- The Basle Core Principles (some of which, like capital adequacy ratios and loan classification and provisioning rules, also require further work, especially as regards their suitability for conditions in emerging markets or developing countries), are bare minimum, necessary requirements for good banking supervision compliance and do not at all provide an assurance of financial system soundness.
- In the context of addressing potential banking system problems, adequate attention must be given to ensure development of efficient money and capital markets and robust payment systems; capital market development is particularly important in systems that exhibit vulnerability in the form of high dependency of corporate entities on bank financing, as manifested in high loans to deposits and loans to GDP ratios.
- While this methodology is presented as one possible prototype to be used in strengthening financial system oversight in the context of IMF surveillance of member countries, it can equally be used by member countries to carry out self-assessment of weaknesses in a financial system. Indeed the methodology is also as applicable to systems in crisis as to non- or near-crisis situations.

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APPENDIX I

Worksheets: Identification of System Vulnerabilities at an Aggregate and Qualitative Level

Indicator	Situation in country	Implications for financial system fragility 1/
A. Selected Macroeconomic Factors That May Impact the Financial System		
Low or declining aggregate growth		Significant potential slowdown in economic activity may weaken the debt service capacity of domestic borrowers and contribute to increasing credit risk and nonperforming loans.
A slump in sectors in which the financial system's loans are concentrated		Weak activity in the sectors where most loans are concentrated and a likely fall in the associated prices would increase financial system vulnerability, which could have an immediate effect on the quality of asset portfolios, cash flows and reserves.
Movements in exchange rates and interest rates		The more volatile the rates, the higher is the interest and exchange rate risk. A sharp depreciation of the exchange rate could put significant pressure on companies and banks with large unhedged foreign exchange exposure.
The level of domestic interest rates		High real interest rates could contribute to an increase in nonperforming loans of the banking system as borrowers become increasingly unable to repay loans.
Contagion effects		Financial sector problems experienced in the neighbor countries may cause turbulence in domestic financial markets, which could directly (through a negative perception about the soundness of the domestic financial institutions) or indirectly (through higher interest and exchange rates) increase financial system vulnerability.
Liberalization and deregulation		Liberalization of the domestic financial system not accompanied by a strengthening of prudential and regulatory standards would make the system vulnerable to an excessive build up of liabilities and risky assets following deregulation.
Real exchange rate misalignments		If large, misalignments may foreshadow a need for major adjustment, which may in turn put pressure on the financial system, directly by changing the value of assets or indirectly through possible effects on the real economy.
Lending booms		Such booms have usually preceded severe financial sector problems with rapid expansion usually associated with a deterioration in loan quality. There is significant risk that with economic slowdown and decline in the activity and prices of the sectors where most lending concentrates, such loans may quickly become nonperforming.
Bank loans to GDP ratio		A high loan to GDP ratio may signal that the private sector is heavily leveraged. An increase in this ratio may also be symptomatic of the structural vulnerability in the corporate sector and the lack of other sources of financing, reflecting in part the level of development of stock and bond markets and the corporate management culture.
Asset price bubbles		Asset price bubbles resulting from inflationary policies may be followed by a sharp decline in asset prices as policies are tightened, which may cause financial stress, especially through the associated decline in the value of bank loans and loan collateral that backs these loans.
A rise in the current account deficit/GDP		Large current account deficits could be a warning indicators of a potential currency crisis with its adverse direct implications for the financial system which is heavily exposed to foreign exchange and/or short term labilities, or indirectly through an accompanying slump in economic activity and high interest rates following the crisis.
Directed lending and investment		Portfolio restrictions that effectively channel credit to specific sectors or activities based on non-market criteria often lead to inefficient allocation of resources and negatively affect the solvency of the financial institutions.
Volatility in inflation		An increase in volatility of inflation may raise portfolio risk and erode the financial institutions' information base.
Government recourse to the banking system and other quasi fiscal imbalances		Increased government recourse to the banking system creates inflationary pressures with adverse effects on the financial system. Plans for financial system restructuring including recapitalization should also be taken into account in this assessment.
B. Sectoral Indicators of Financial System Health		
Central bank credit to banks and other financial institutions		May reflect market segmentation and severe liquidity problems in the financial system; also subjects the central bank to credit risk if these loans are uncollateralized.
Segmentation in the interbank market		High dispersion in interbank rates may signal that some institutions are viewed as risky. Changes in interbank limits or unwillingness to lend to others may indicate serious concerns about the soundness of these institutions.

Worksheets: Identification of System Vulnerabilities at an Aggregate and Qualitative Level

Indicator	Situation in country	Implications for financial system fragility 1/
Yields offered by any institution that is significantly above others		High yields may signal problems in these institutions and/or difficulty in their raising funds to sustain their excessive lending commitments.
Sectoral credit concentration		A large concentration of credit in a given sector increases vulnerability of the financial system to the level of activity and profitability in that sector.
The ratio of deposits to M2		Decline in this ratio may signal a loss of confidence and liquidity problems in the banking system.
Loan to deposit ratio		A high ratio may be indicative of the extent banks rely on nontraditional sources of funding. It may suggest greater maturity risk as economic conditions deteriorate and banks experience a low level of liquidity to respond to shocks. It may also be indicative of structural vulnerabilities in the corporate sector and the lack of other sources of financing, reflecting in part the level of development of stock and bond markets, or weaknesses in the ownership structure in the corporate sector.
The maturity structure of banks' liabilities		*A major shortening in the maturity structure may involve a larger liquidity risk.* It could also reflect uncertainty of depositors and other creditors on the long-term viability of the financial institutions.
High unremunerated reserve requirements		This may contribute to large spreads between lending and deposit rates and financial disintermediation that might affect liquidity and profitability of the institutions. They may also encourage a rise of near-banks and offshore banks and off-balance sheet operations outside the official regulatory network.
Foreign currency denominated loans to domestic borrowers		A large increase in these loans to local borrowers without significant foreign currency cash flow may signal significant credit risk.
The stock exchange prices of financial institutions' shares		The sharp fall in these prices relative to average stock prices may signal adverse market perceptions regarding the health of these institutions.
The ratings of local financial institutions elaborated by international rating agencies		This may signal negative market perceptions at the international level.
Aggregate risk-based capital ratio		A low ratio or a declining trend in this ratio may signal an increased risk exposure and possible capital inadequacy problems.
Aggregate ratio of nonperforming loans to total loans		An increasing trend in this ratio may signal a deterioration in asset quality of banks with their consequent implications for cash flows, net incomes, and solvency.
Aggregate average returns		A declining trend in this ratio may signal problems regarding the profitability of financial institutions.
The rate of expansion in the number of banks and other financial institutions		Overly rapid expansion may indicate relaxed licensing requirements and a gap in supervisory capacity. Unchanged number, however, may also suggest the existence of certain barriers to entry and lack of competition in the financial system.
C. Elements of the Assessment of the Institutional and Regulatory Framework for the Financial System		
Structure of the financial system		Connections between commercial banks and finance companies through subsidiary or parent company relationship could make the financial system vulnerable to problems that may arise in one particular sector of the system.
Incentive structures		
Existence of explicit/implicit government guarantees		The further the government guarantees are extended down the chain of large depositors, the greater is the degree of moral hazard.
Track record of the authorities		Could increase the degree of moral hazard and reduce the market discipline on financial institutions.
Licencing and exit policies		A credible exit policy for problem banks, with the supervisory authority having the power to withdraw bank licenses, close banks, and be able to initiate their liquidation in the case of insolvency, and which are in violation of regulations or other practices is necessary for the maintenance of a sound and competitive banking system.

Worksheets: Identification of System Vulnerabilities at an Aggregate and Qualitative Level

Indicator	Situation in country	Implications for financial system fragility 1/
Regulations and practices regarding the LOLR facilities		The proper role of LOLR facilities is to provide promptly, temporary support to illiquid but solvent institutions, typically at a penalty rate and against collateral, and to deny support to insolvent banks. LOLR facilities that provide liquidity without adequate collateral, at subsidized interest rates, and that are accessible to unsound institutions could have large monetary effects and adverse influence on bank soundness and cost of resolution.
Public disclosure, accounting, and legal frameworks		
Loan classification criteria		These regulations must be in line with international best practices for the accuracy of financial system data and most prudential ratios. The lack of, inadequate, or unenforced, standards may contribute to a lack of transparency with respect to solvency and profitability of financial institutions.
Provisioning rules and percentages		These regulations must be in line with international best practices for the accuracy of financial system data and most prudential ratios. The lack of inadequate, or unenforced, standards may contribute to a lack of transparency with respect to solvency and profitability of financial institutions.
Criteria for collateral		Due attention should be given to cash flow analysis as well as collateral. If most loans are collateralized by assets that are not marked to market, corrections in their prices may devalue collateral and leave large portion of loans exposed to risks.
Limits for interest accruals		Where loans are not serviced on due dates, accrual of interest income needs to be suspended and income accrued be reversed for meaningful capital standards.
Rules against "evergreening"		Practice of "evergreening" may lead to a further deterioration of bank portfolios, with the risk of increasing the amount of nonperforming loans in the system.
Tax treatment of loan provisions		Nondeductibility of loan-loss provisions may be a factor behind insufficient or delayed provisioning.
Regulations and practices regarding accounting standards for information compilation		Envisaged exceptions and allowances for particular features of the domestic environment may cause a deviation from the internationally accepted standards, and encourage bank managers to adopt imprudent positions.
Disclosure requirements		Absence of adequate disclosure requirements would hinder effective monitoring of financial systems and early diagnosis of potential problems.
Legal authority and capacity of supervisors to implement prudential regulations, to close, penalize, prescribe remedial action		Supervisory authority should have sufficient powers and autonomy to carry out its functions; lack of autonomy and capacity may lead to supervisory forbearance which may exacerbate banking problems. Infrequent and inadequate inspections would risk insufficient monitoring of financial institutions.
Ability of supervisory authority to supervise on a consolidated basis		Absence of bank-by-bank data on consolidated basis may overstate the financial position, particularly when activities of banks subsidiaries involve losses.
Legal and regulatory infrastructure and supervisory oversight for securities, derivatives, insurance markets, other financial contracts		Adequate legislation and supervisory structure is needed for these activities to ensure implementation of licensing standards, enforcement of contracts, information disclosure requirements, and risky practices that may impair the functioning of these markets with their systemic implications.
Prudential Regulations		
Adequacy of capital standards		Lack of regulations that envisage capital adequacy of at least the Basle minimum of 8% may fail to encourage institutions to maintain adequate capital that increase their vulnerability to adverse shocks. Reported capital adequacy ratios may be overstated if there are deficiencies in the prevailing provisioning and classification rules.
Adequacy of limits on excessive risk taking		
Limits on sectoral lending concentration		These limits may help reduce excessive concentration of credit in particular sectors and thus reduce the vulnerability of the financial system to adverse developments in these sectors.
Limits on lending to insiders		Limits on lending to insiders would help reduce incentives to extend large loans to connected parties that often become uncollectible and contribute to large losses.

Worksheets: Identification of System Vulnerabilities at an Aggregate and Qualitative Level

Indicator	Situation in country	Implications for financial system fragility 1/
Limits on large and single borrower loans		Existence of such limits is a favorable development, provided they are effected.
Limits on net foreign exchange exposure		Existence and enforceability of such limits would reduce the vulnerability to exchange rate fluctuations by preventing excessive exposure to foreign exchange risk.
Regulatory framework for the capital account that may impact the financial system		The application of established prudential norms may have effect of limiting capital movements. Similarly, regulations of lending capital movements may have implications for financial system soundness. Such regulations should be examined and monitored regularly to assess the implications of capital account liberalization or controls on the soundness of the financial institutions.
Operational efficiency and risk management arrangement in the payment system		Existence of an effective wholesale and retail system, where the central bank does not carry the risk in the payment system, strengthens financial system resilience.
D. Systemic Liquidity Arrangements		
Instrument design		
Reserve averaging		Averaging of reserve maintenance provides scope for liquidity management and intertemporal arbitrage. This flexibility is especially important where money markets are thin or weaknesses in clearing and settlement arrangements exist.
Captive markets for securities		Rigid arrangements where binding preempt the prospects for secondary trading as a source of liquidity management.
Restrictions on asset and liability management		
Portfolio restrictions on assets/ liabilities		Restrictions on the capabilities of banks to price portfolios based on risks that limit or direct asset acquisition, or inhibitions to asset liability management, including those that impact on accessing foreign exchange liquidity, generally reduce flexibility in raising liquidity to meet demands for outflows.
Rate structure of central bank facilities vis-à-vis market		If mispriced and below market, the rate structure can inhibit the development of money markets.
Market information		
Regular publication on financial conditions of counterparts		Absence of regular and reliable information on counterparts reduces the ability to assess credit risks. Greater transparency in this regard strengthens confidence and resilience.
Market information on liquidity condition		Information on the supply and availability of liquidity in the system can help banks in deciding whether liquidity demands likely to be high or low in the future. Central banks have published this information as an aggregate level of settlement funds daily and as a running average of actual reserves vis-à-vis required levels for the maintenance period.
Collateral arrangements for interbank and LOLR lending		
Restrictions on asset pledging, if any		If these exist they constrain the abilities of banks to mobilize liquidity through collateralized operations, e.g., repos.
Adequacy of securities		Interbank placements are easily affected by perceived credit risk of the borrower bank. On the other hand the availability of self-liquidating third-party paper, (e.g., acceptances or government securities repayment is based on the issuer and the borrowing bank is only a secondary source of repayment).

Note: These worksheets build on guidelines that were developed during 1997 as part of the IMF staff efforts to develop operational procedures for enhanced oversight of financial systems.

1/ The comments presently inserted in this column are intended to provide guidance in assessing the situation in a given country as would be summarized in the preceding column. The actual assessment could indicate a positive (+) or negative (–) trend for each indicator in the first column.