ADB

ADB Working Paper Series on Regional Economic Integration

A Macroprudential Framework for Monitoring and Examining Financial Soundness

Lotte Schou-Zibell, Jose Ramon Albert, and Lei Lei Song

No. 43 | March 2010

Asian Development Bank

ADB Working Paper Series on Regional Economic Integration

A Macroprudential Framework for Monitoring and Examining Financial Soundness

Lotte Schou-Zibell,[+] Jose Ramon Albert,[++] and Lei Lei Song[+++]

No. 43 | March 2010

The authors would like to thank Iloila Lacson Tan for research assistance, Kevin Donahue for editorial assistance, and Adam Hersh—who served as a summer intern in 2009—for research assistance.

[+]Lotte Schou-Zibell is Senior Economist of the Central West Regional Department, Asian Development Bank, 6 ADB Avenue, Mandaluyong City, 1550 Metro Manila, Philippines. Tel +63 2 632 5245, Fax +63 2 636 2424, lschouzibell@adb.org

[++]Jose Ramon Albert is Senior Research Fellow at the Philippine Institute for Development Studies (PIDS), National Economic Development Authority (NEDA) Bldg., 106 Amorsolo St., Legaspi Village, Makati, Philippines. jalbert@mail.pids.gov.ph

[+++]Lei Lei Song is Senior Economist of the Office of Regional Economic Integration, Asian Development Bank, 6 ADB Avenue, Mandaluyong City, 1550 Metro Manila, Philippines. Tel +63 2 632 4000, Fax +63 2 636 2342, lsong@adb.org

Asian Development Bank

The ADB Working Paper Series on Regional Economic Integration focuses on topics relating to regional cooperation and integration in the areas of infrastructure and software, trade and investment, money and finance, and regional public goods. The series is a quick-disseminating, informal publication that seeks to provide information, generate discussion, and elicit comments. Working papers published under this series may subsequently be published elsewhere.

March 2010
Publication Stock No.

Contents

Figures

Abstract

This paper describes concepts and tools behind macroprudential monitoring, and the growing importance of macroprudential tools for assessing the stability of financial systems. This paper also employs a macroprudential approach in examining financial soundness and identifying its determinants. Using data from selected developing economies in Asia, South America, and Europe, as well as selected economies from the developed world, panel regressions are estimated to quantify the impacts of the major influences on key financial soundness indicators, including capital adequacy, asset quality, and earnings and profitability.

Keywords: Macroprudential, banks, banking crises, banking regulation, banking supervision, stress testing, early warning system

JEL Classifications: E44, E58, E65, G21, G28

1. Introduction

During the past few decades, the world has experienced various episodes of financial distress at the country, regional, and global levels. Consequently, the health and stability of financial systems has become a major topic of concern on the international policy agenda. While the onset of a crisis in any financial system can seem surprising, there may be signals of financial vulnerabilities in the system that could aid in the formulation and implementation of responses for preventing financial distress or mitigating the impact of their effects.

In the wake of the current global financial crisis, there has been widespread recognition for the need to (i) strengthen links among key components of a financial system, (ii) examine carefully how systemic risk varies over time, and (iii) study the robustness of that system when hit by shocks or systemic risk. Excessive risk-taking combined with a lack of prudential supervision and loose monetary policy is generally viewed as important contributors to the current financial crisis. While banks survive and prosper by accepting risks, the risks they take must be well managed. Central banks and regulators have a fundamental role in ensuring financial stability by monitoring the performance of banks and other institutions, but their collective actions were clearly not enough to prevent the crisis. The current global financial crisis, which has also become an economic crisis, has accentuated the importance of systematically introducing a macroprudential approach for assessing soundness in financial systems as well as in individual financial institutions. Regulators need to identify banks that do not manage their risks well. However, such monitoring should not only be concerned with the stability of individual institutions, but should also include a macroprudential orientation that comprises monitoring, regulation, and supervision to examine how risk is distributed across a financial system at any given point in time and identify and address how aggregate risk evolves over time. Although the need for a macroprudential approach has heightened over the past 15 years, the macroprudential toolbox is still in the process of development and its concepts are as complex as they are poorly understood. In addition, a macroprudential approach needs to be flexible to take into consideration the changing dynamics of the global financial system.

A macroprudential approach can be viewed as being two-dimensional—cross-sectional and time-dimensional—with implications for monitoring financial system soundness, the calibration of prudential tools,[1] and ultimately, the regulation and supervision of financial institutions. It provides a framework to monitor, examine and address risks to financial stability. One purpose for monitoring would be to aid in the early detection and timely recognition of financial vulnerabilities across financial instruments, financial markets, and financial institutions, thus alerting supervisory and regulatory authorities and the financial industry. Another would be to try to assess the likely consequences on financial stability and the risk of failure of individual institutions, which would be helpful for assisting financial market supervisors and regulators to formulate and implement remedial actions that allow businesses to adjust their strategies and limit significant real economic losses. Such a system-wide approach provides an analytical tool for linking macroeconomic development, risk-taking, and financial system stability.

[1] Existing prudential tools such as risk weighted capital requirements, as exemplified by Basel II, are already supposed to ensure that higher risks demand higher capital. The problem, however, was that regulators' measurement could be error prone.

Across economies, examinations have been undertaken of macroeconomic and financial soundness indicators (FSIs) that are useful for a macroprudential approach, especially for the purpose of regularly identifying coincidental and leading signals of financial vulnerability. Cross-country studies have also been carried out, but with difficulties owing to data issues (e.g., inherent differences in data sets, definitions of indicators, frequency and accuracy of data) and to the widely diverse stages of development of the financial systems being studied. FSIs are also mainly backward-looking indicators (as opposed to forward-looking). In addition, higher frequency data are generally more desirable to have for monitoring and evaluation of a financial system since higher frequency data can better foreshadow emerging vulnerabilities than the annual aggregate FSI data used here in this paper.[2] Capturing systemic risk through indicators and through supervision and regulation thus requires an assessment of financial stability using a range of approaches and indicators. It also requires the integration of the various perspectives of market participants—supervisors, regulators, rating agencies, risk managers, economists and many other stakeholders—to take a holistic view of the financial system.

Macroprudential monitoring—the focus of this paper—examines trends in the economy and the financial system as a whole that can impact financial stability and trigger large-scale financial crises. With larger institutions, greater competition across market segments, and the growing importance of capital markets, interrelationships among individual institutions and their products and markets need to be examined in the context of the risks that the largest institutions pose to the overall financial system. With microprudential stability being neither necessary nor sufficient for macro stability, macroprudential supervision and regulation is concerned with encouraging financial institutions to behave in a different way in instances when taking a risk that may be considered prudent behavior for a single institution could be destabilizing if the same risk were taken by a number of institutions.

Based on a survey of existing macroprudential literature and work programs at government and international institutions and organizations, the outline of the paper is as follows. Section two provides a conceptual approach of macroprudential monitoring, dimensions, objectives and components. Section three discusses measurement issues including identification and compilation of relevant data and information as well as limitations of a macroprudential approach. Section four describes analytical methods for understanding trends and patterns in macroprudential data, as well as practices in macroprudential monitoring. Section five discusses the data employed in this study compiled from selected developing economies in Asia, South America, and Europe, as well as selected economies from the developed world. Also discussed are a methodology for making sense of these macroprudential data, and the estimation results. Section six concludes with a discussion on challenges ahead and policy options—including developing a macroprudential approach to supervision that can complement and reinforce monetary policy while sustaining economic growth, coordinating between financial safety net players and fiscal authorities, communication strategies for policymakers, and the importance of both regional and international cooperation and coordination.

[2] The International Monetary Fund (IMF) is developing through its Data Link Project a set of timely and higher-frequency indicators for, at least initially, systemically important countries.

2. The Conceptual Approach of Macroprudential Monitoring: Dimensions, Objectives, and Components

Throughout history, financial crises have recurred, with episodes of acute financial instabilities increasingly prevalent at the close of the twentieth century.[3] Experience also suggests that there have been enormous financial costs to these crises, including direct assistance to affected firms, and indirect costs that result when institutions abuse government protections and take unproductive risks. In addition, there have also been sizable losses[4] in the real sector arising from financial crises in both industrial and emerging market economies. Given the recognized importance of economic growth to poverty reduction, economic losses ultimately result in setbacks to poverty reduction and other development targets. Consequently, in recent years, the international community has highlighted the need to strengthen safeguards against financial instability. One such safeguard is strengthening and calibrating the macroprudential orientation of monitoring financial soundness and regulating and supervising financial institutions.

2.1 Micro- and Macro-prudential Dimensions

Before delving into macroprudential monitoring, it is helpful to distinguish the macroprudential dimension from the microprudential.[5] The two differ in objective, focus, approach, view of risk, and in their calibration of tools (Table 1). The macroprudential dimension focuses on the financial system as a whole to limit the chances of system-wide distress and avoid significant losses in terms of real output. The microprudential dimension focuses on individual institutions to limit the likelihood of failure of individual institutions and protect consumers (investors and depositors) regardless of systemic consequences or impact on the overall economy. Microprudential supervision can thus fail to identify risks that emerge at the systemic level. The two approaches view risk differently: the macroprudential dimension considers risk to be endogenous since institutions can collectively affect economic transactions, while the microprudential dimension assumes risk to be exogenous since individual institutions will generally have little impact on the economy. Thus, the microprudential dimension examines individual institutions, products, and markets, while the macroprudential view looks at the interactions within the system as a whole and allows for endogeneity or feedback. The macroprudential dimension is also top-down in its calibration of prudential instruments,

---

[3] Kindleberger (1978) provides an account of financial instabilities and crises across history. According to Bordo et al. (2001), the frequency of financial instabilities has doubled since the end of the Bretton Woods international monetary order in 1973, afflicting either exchange rate and balance of payments problems or the banking system, or both simultaneously, through "twin crises" (Kaminsky and Reinhart 1999).

[4] Eichengreen (2004) point out that “the loss from the average or typical financial crisis is around 9% of gross domestic product (GDP) and the severe crisis, such as those of Argentina and Indonesia, caused output or GDP to fall over 20%, an economic loss higher than those [countries] incurred due to the Great Depression.” Hoggarth et al. (2001) estimate that cumulative output losses from a financial crisis can be as much as 30% of annual GDP. Much of this cost is evident through declines in household consumption (Barrell et al., 2006) and disproportionately affects the poor (Weller and Hersh, 2004). According to Chen and Ravallion (2001), the 1997/98 Asian financial crisis increased the number of people in the region living on less than USD1 per day by 22 million. Lustig (2000) as well as Lindgren, Garcia, and Saal (1996) note that developing economies have been particularly prone to financial instability.

[5] Borio (2003).

while the microprudential approach is bottom-up. Some differences may also reflect historical and institutional aspects, including whether prudential powers are located with central banks or divided among separate agencies.

There are also differences between macro- and micro-prudential approaches in how prudential tools should be calibrated. Cross-sectionally, the tools of macroprudential frameworks can be tailored to an individual institution's contribution to systemic risk. Tighter standards, for example, might be applied to institutions with larger contributions to systemic risk. This means that macroprudential tools—capital requirements, provisioning, and leverage ratios—may need to be calibrated for addressing common exposures and joint failures, as well as for addressing pro-cyclicality. Macroprudential regulation and supervision encourages an institution to behave in a different way if there were a risk that behavior normally considered prudent would undermine the financial system if followed by a number of institutions. For example, when an institution liquidates assets to reduce risk exposure in response to a negative shock to its portfolio, these asset sales drive down prices and lead to losses for other institutions, which in turn may seek to protect themselves by also liquidating assets. This is likely to trigger a spiral of asset price declines and portfolio liquidation as risks considered exogenous to any one institution become endogenous to the financial system.[6] Macroprudential tools can also be designed to build buffers in good economic times that can be used during bad times. Even the risk weighted capital requirement in Basel II is supposed to be supplemented (in Pillar 2) by variable minimum ratios dependent on the supervisors' judgments. In many cases, but perhaps few in developing economies, supervisors have required higher minimum ratios for some banks than others. This has in general, led to lower ratios for large banks—assumed to benefit from greater diversification—and higher ratios for small banks. Now the paradigm has shifted, with suggestions that the opposite may be more appropriate.

Table 1: Comparison between Macroprudential and Microprudential Monitoring[7]

	Macroprudential	**Microprudential**
Objective	Limit the likelihood of financial-system-wide distress and avoid significant losses in real output	Limit the likelihood of failure of individual institutions and protect consumers
Focus	Financial system as a whole	Individual institutions
View of Risk	Endogenous (risk is seen as dependent on collective actions)	Exogenous (risk is seen as independent of individual actions)
Calibration of Prudential Tools	Top-down (calibrated with respect to cross-sectional and time dimensional risks)	Bottom-up (calibrated with respect to risks incurred by individual institutions)

[6] Crockett (2009).

[7] Borio (2003).

Although it may seem as though the macro- and micro-prudential dimensions are compartmentalized, these two paradigms generally co-exist to varying degrees among regulatory and supervisory authorities. From a policy perspective, trade-offs clearly arise when focusing on either one dimension or the other. Therefore, it is important to find balance and synergy between the two dimensions in order to ensure lasting financial stability.

2.2 Objectives

The objective of macroprudential monitoring is to examine trends in the economy and the financial system as a whole that can impact financial stability and trigger large-scale financial crises. If individual institutions are well managed, and markets function efficiently and the infrastructure supporting the financial system is strong, then the incidence of financial stress is likely to be less frequent and the associated costs much lower. But the recurrence of financial market turmoil implies that institutions are not necessarily well managed, markets do not always function efficiently, and the supporting financial infrastructure has weaknesses.

Vulnerabilities in a financial system can build up over time and the system's operation depends on macroeconomic developments that affect individual institutions. It is important to take stock of the inter-relationship between financial markets and the real economy to better understand risk and the unfolding of financial stress. While each crisis may differ in detail, nearly all reflect a confluence of some underlying economic vulnerability and a specific crisis trigger. Commonly, risk contagion comes from exposures to the same source of risk factors. Exposure also tends to build up on the asset side of the balance sheets as opposed to the liability side.[8] However, the crisis trigger can be almost any event, including political turmoil, terms of trade shocks, contagion from other economies, or the collapse of the United States (US) subprime market that set off the unfolding of the financial and economic crisis in 2007.[9] It is also probably true that the longer the trigger is delayed, the more severe the crisis and perhaps also the more dramatic the trigger has to be to precipitate the crisis.

From a macroprudential view, focus should be placed on the major sectors and institutions of the financial system. Banking institutions are particularly relevant because of their specific function as suppliers of liquidity to the system and because the impact of financial stress at these institutions can have significant macroeconomic costs. Many economies have already ordered their priorities so that large financial institutions are subject to more rigorous monitoring than smaller institutions since the failure of the latter might be more easily absorbed without systemic implications. This, however, did not prevent such institutions from being the ones worst hit. A new view of systemically important institutions has emerged in the wake of the recent global financial crisis, which clearly demonstrated how tightly linked regulated and unregulated financial institutions are through markets and counterparty relationships, and how spillover effects from shocks can be transmitted through these linkages and interactions.

[8] In the recent global financial crisis imbalances were in several cases more on the liabilities side. It was for example Northern Rock's reliance on the wholesale markets that brought it down.

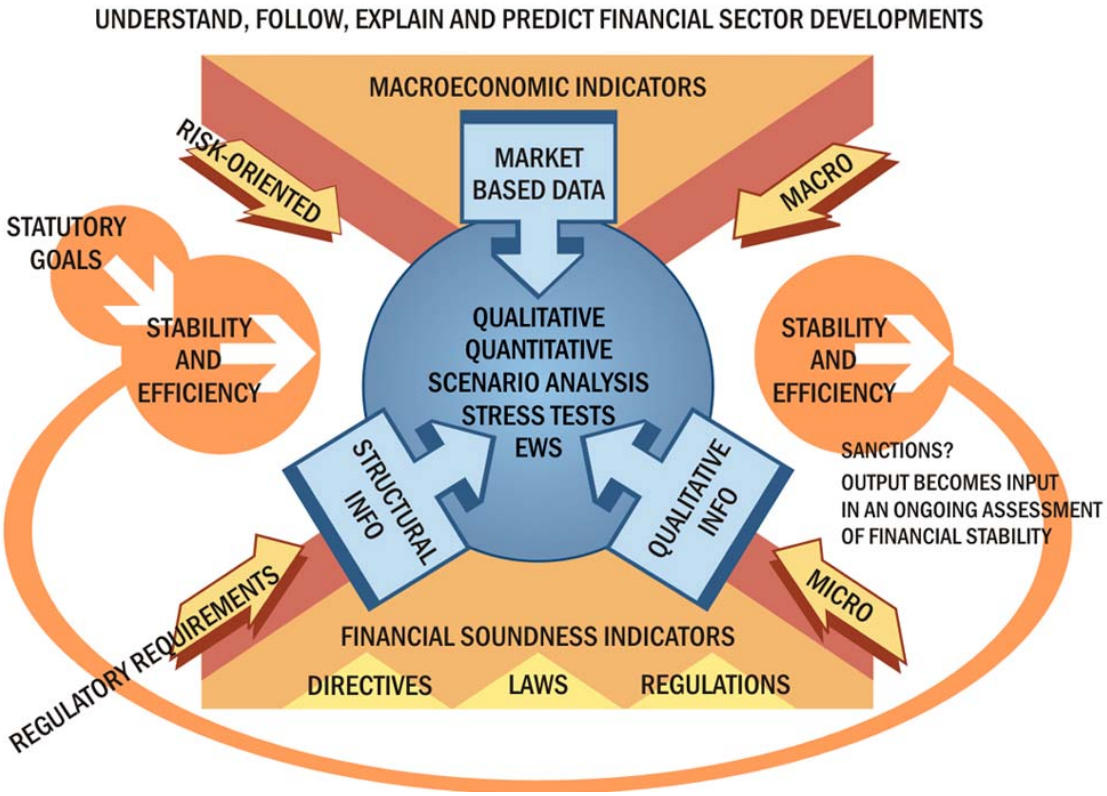
[9] Ghosh et al. (2009).

With the growing importance of financial markets for the provision of credit, the transfer of risk, and risk management, it is critical that financial markets continue to function smoothly under all circumstances. Increasing globalization, financial innovation, and the dispersal of risk have recently tested existing frameworks for monitoring the soundness of global financial markets. The onset of the recent global crisis suggests that although the economies most affected by the crisis probably had more developed analysis and were in the forefront of the development of so-called financial stability reporting, surveillance of financial markets has been rather weak. A systematic macroprudential approach can contribute to this process by providing a quantitative basis for qualitative assessments and policy discussions by financial supervisory authorities.

2.3 Components

The macroprudential approach includes monitoring and evaluating various indicators to provide a broad picture of the stability and efficiency of a financial system, and to identify potential future threats to systemic stability (Figure 1). These macroprudential components will be discussed in further detail below and include (i) FSIs, (ii) macroeconomic indicators, (iii) market based data, (iv) qualitative information, and (v) structural information. Quantitative analysis of macroprudential data can take the form of early warning systems (EWS), scenario analysis, or stress tests, all of which can help identify the factors that drive vulnerabilities in the financial system. While the benefits of quantitative work are promising, it is still in its infancy and can only be an element in a broader qualitative assessment of existing and potential financial vulnerabilities.

Figure 1: Components of a Macroprudential Framework



Source: ADB Staff.

Macroprudential monitoring has as its starting point the statutory goals common to most financial supervisory and regulatory authorities. These goals are essentially aimed at maintaining a stable and efficient financial system. While all financial institutions can be included in a macroprudential approach, in practice this approach has largely been applied to the banking system. This may be especially appropriate in emerging economies, which remain largely bank dominated despite substantial strides in capital market development. Banks also manage the intermediation of savings and supply liquidity to the financial system. If there is no functioning banking and payments system, then contributions to pensions, insurance, and savings schemes cannot be made, and temporary liquidity cannot be safely held. Another reason for the focus on the banking system is that of systemic risk, with contagion effects via the interbank market to the rest of the domestic financial sector, or to the entire global financial system as was the case in the recent crisis, causing major disruptions to global financial systems and the global real economy.

(i) FSIs are based on regulatory requirements such as directives, laws, and regulations. Key FSIs are generally in the form of ratios derivable from aggregated information contained in the balance sheets and profit and loss (income) statements of individual financial institutions. These indicators provide information on the current health of financial institutions and can prove helpful in identifying potential stability risks to the financial system that might be missed using only microprudential indicators and macroeconomic statistics. FSIs include data on so-called CAMELS indicators—measures of capital adequacy (e.g., risk-based capital ratio), asset quality (e.g., ratio of nonperforming loans relative to capital), management soundness (e.g., expense ratios), earnings and profitability (e.g., rate of returns on assets or equity), liquidity (e.g., central bank credit to financial institutions as a proportion of their capital or liabilities), and sensitivity to market risks (e.g., foreign exchange risks and interest rate risks). The IMF has identified a core set and an encouraged set of FSIs for macroprudential surveillance.[10] The core set of FSIs covers the banking sector to reflect its important role in financial systems as disruptions in the intermediation function of the banking system will negatively impact the investment financing that is needed in productive sectors of the economy. The encouraged set of FSIs includes additional indicators for the banking system as well as indicators for key nonfinancial sectors that can be a potential source of risk for banks and thereby serve as an aid in detecting banking sector vulnerabilities that lead to systemic stress.

(ii) Macroeconomic indicators are generally risk-oriented and leading indicators. These provide a broad picture of overall economic activity and financial circumstances. These indicators include measures of economic growth, balance of payments, inflation, and production. They suggest likely economic trends and, consequently, help evaluate whether prices and quantities in credit markets are consistent with such prospects. Inflation data, for instance, give evidence on the ease and tightness of monetary policy. Any discrepancy between data and policy may in itself offer a cause for concern of system vulnerabilities. Empirical studies have demonstrated that financial crises are likely to be preceded by some combination of sustained and above-normal rates of growth for credit, asset prices, and investment. In emerging economies, econometric models have also shown that overvalued exchange rates play a role in predicting crises and currency mismatches. Thus, it is important to monitor macroeconomic factors,

[10] IMF (2006).

especially those that affect the vulnerability of an economy to capital flow reversals and currency crises.

(iii) Market-based data convey market perceptions about the health of financial institutions and the degree of risk and financial system vulnerability. Examples of market-based data include yields and spreads of financial instruments, asset prices, external based creditworthiness and sovereign ratings, interest rates, exchange rates, and, in some markets, stock market volatility and distance to default. These data are forward-looking indicators of financial soundness and are typically continuously available. Given that the financial systems and banking structures of many economies are underdeveloped, market data may currently not play a significant role. However, monitoring market data, which can be expected to gain in importance as markets evolve, is encouraged whenever feasible as it conveys market perceptions about the health of banks.

(iv) Qualitative information, particularly detailed information, can supplement quantitative data in providing a picture of the soundness of a financial system. It can provide insights on risk behavior in financial operations, suggest reasons for entry barriers into financial markets, and provide a view of financial vulnerabilities. In particular, it is helpful to consider data on the (i) adequacy of institutional processes, (ii) legal infrastructure and regulatory frameworks that govern financial operations, (iii) standards and practices regarding accounting and disclosure, (iv) quality of monitoring and supervision of financial institutions, (v) incentive structures, and (vi) safety nets to account for overexposure to international financial markets. Examples could include compliance with Basel Core Principles, International Organization of Securities Commissions (IOSCO) core principles, and insurance core principles.[11] The challenge is to organize such qualitative information with informed judgment in light of current theory and an understanding of the past, as well as recent experiences of financial distress.

(v) Structural information is needed to provide an assessment of how a financial system works. Structural assessments are, for example, based on the structure of banks and their relative size, business strategy, ownership, concentration, and competitive situation. Data on ownership and market shares help identify institutions and sectors important to the entire financial system. For example, a rather narrow customer base for a bank would suggest a lack of competitiveness in the domestic market. A macroprudential approach might allow for more intensive monitoring of high-impact financial institutions.[12]

As mentioned above, FSIs are backward-looking indicators with respect to measures of soundness. Composite indices can be helpful in making sense of an indicator system. In particular, indices on the health of the financial system have been proposed for use by the IMF, which has developed a composite variance weighted Financial Stress Index for

[11] Reference can also be made to the World Bank's Reports on the Observance of Standards and Codes (ROSC).

[12] The Financial Services Authority of the United Kingdom (UK) adopted early on a more intensive supervision-based approach to focus on high-impact firms, key business outcomes, risks, model and strategy sustainability, technical capability of approved persons versus probity alone, sectoral and firm comparator analysis, liquidity and other specialist skills, more intensive information analysis on key risks, and assessments of remuneration policies and their impact on overall risk.

emerging economies.[13] A major aspect of such indices is to provide information on financial stability based on how the real economy and the financial sector interact, and to signal systemic stress in a more timely and effective fashion. For the period 1997–2008, the IMF index has managed to capture important episodes of financial stress. Another composite index,[14] the Financial Development and Strength Index, may be used to assess the interaction between financial development and financial stability, and to describe how this interaction influences levels and patterns of economic growth.

Taken together, these various sources of information provide valuable input into qualitative and quantitative assessments of the resilience of financial systems amid financial distress. There are at least two aspects of macroprudential monitoring to be considered: (i) technical identification and (ii) interpretation of indicators.[15] It is important not only to define the purposes for which individual indicators are to be used, but also to discuss the analytical framework within which they are interpreted. Using quantitative assessments—such as scenario analysis, stress tests, and EWS—as well as available qualitative and structural information, can help determine the link between FSIs and changes in macroeconomic and market-based indicators.

While the current study will focus on the banking system, regulated and unregulated financial institutions have become increasingly interlinked through markets and counterparty relationships, and the spillover effects from shocks can rapidly travel through these linkages and interactions as was the case during the recent financial crisis. For a long time, banking, insurance, and securities institutions covered the majority of financial intermediation. However, in recent years a wider range of institutions have come to play an increasingly important role in the functioning of the financial system in which more and more credit is intermediated through capital markets. As stated by Crockett (2009), "private pools of capital, such as hedge funds and private equity funds have, for example, grown enormously; money market mutual funds have come to raise and place increasing amounts of short-term funds; investment banks have greatly expanded their trading activities; and mortgage originators have been at the center of the creation of assets that underlie mortgage backed securities markets. Service providers such as clearing and settlement systems, credit-rating agencies, and auditing firms, have also come to play an increasingly important role in the efficient and secure distribution of credit. A new financial sector architecture will thus need to provide adequate macroprudential oversight of a much wider range of financial market participants than traditionally covered."

[13] According to Balakrishnan et al. (2009), the IMF index comprises information on the banking sector, securities markets, and foreign exchange markets. Indicators used in the construction of the index include the "beta" from the capital asset pricing model of a banking sector stock price index; TED spread, which is the difference between interest rates on interbank loans and short-term United States (US) government debt (T-bills); slope of the yield curve; corporate bond spreads; stock market returns and return volatility; and (time-varying) volatility of the effective exchange rate.

[14] The methodology behind the Financial Development and Strength Index is provided by the Centennial Group (2009).

[15] Bhattacharyay (2004).

3. Identification, Compilation, and Limitations of a Macroprudential Approach

A macroprudential approach can play an important role in identifying weaknesses in financial systems. Given the costs of a financial crisis, any measures to minimize the chances of its occurrence are useful. Early detection—and convincing policymakers to act on vulnerabilities once detected—will allow policymakers to put in place mitigating steps to avert the occurrence of a crisis or at least minimize the resulting losses. But for macroprudential monitoring to be fruitful, it has to be harmonious with the existing monitoring system of an economy, taking into account the data constraints faced by different economies. The various components also become more meaningful when compared both in a cross-sectional dimension and a time dimension.

Identifying and compiling the various components needed for a macroprudential approach can, however, be challenging both within individual economies and across economies. One such challenge is the identification of relevant data and information for assessing financial soundness and building effective watchdog systems that can signal vulnerabilities in a particular financial system. Indicators that are useful for predicting vulnerabilities in one country may not necessarily be useful for another because of differences in the stages of economic and financial development, including wide disparities in institutional and legal frameworks, the nature of financial markets, the array of financial instruments, and in the degrees of sophistication in monetary and financial data collection.

Concerns over the data required for a macroprudential approach include excessive delay, inaccuracy, inadequacy, or incompleteness of the data compiled. The major reasons behind these concerns include: (i) spread of data in various databases and institutions; (ii) non-availability or non-applicability of some indicators; (iii) incomparability of indicators over time owing to the absence of or changes in accounting and prudential standards; (iv) lack of transparency and problems in the disclosure of data; and (v) late, incomplete, and inaccurate replies from participating institutions and agencies. In addition, the current list of indicators currently being monitored—at the country, regional, and global levels—may potentially increase. In the wake of the current global financial crisis, empirical research and monitoring suggest data gaps exist in specific sectors and markets—such as the real estate, corporate, and household sectors; and nonbank financial institutions (NBFIs)—that are relevant to assessing the health of a financial system. The lack of regular and uniform reporting of FSIs for the banking sector has, for example, created a clear data gap and incomplete information on other financial institutions, including NBFIs. Analysis has also shown that some FSIs have performed better than others in identifying the buildup of financial stress or are better suited as leading indicators, while other FSIs are more useful in identifying financial resilience during a crisis.[16] Work is also under way to develop financial stress indicators as monitoring tools and summary statistics of financial stress.[17]

[16] Burgi-Schmelz (2009) and the Financial Stability Board (October 2009) have written on what has been achieved in recent years to strengthen the international collection and distribution of statistical information, and what should be done to further improve international cooperation and fill the gaps highlighted by the recent global financial crisis.

[17] Monetary Authority of Singapore (2009).

Any empirical analysis of FSIs, however, has to consider constraints about timeliness and data quality. Errors in reporting one FSI, such as nonperforming loans (NPLs), are likely to impact other indicators, such as profitability indicators and capital ratios. Some FSIs are also weighted averages of indicators for individual banks in a country, which can lower their accuracy. In addition, the weighting of indicators by asset size involves an implicit assumption that small banks will not create systemic risk.

There are also measurement problems in both quantitative data and qualitative information. Poor banking supervision, which has been identified as a major contributing factor to the 1997/98 Asian financial crisis, is difficult to quantify while a qualitative assessment across countries may vary significantly. Other factors that are important in predicting a crisis yet are difficult to measure include the quality of corporate governance, independence of the national central bank, reliability of the legal system, political stability, and other institutional qualities.

Designing macroprudential instruments are also unlikely to be set fully according to a fixed rule and are likely to be accompanied by the use of discretion in the decision making process. But the use of discretion[18] also has its caveats. Discretion within a macroprudential decision-making process may render it less predictable than under a fixed rule leading to uncertainty about future regulatory requirements as well as less effective. It may also lead to a decision making process susceptible to regulatory capture and biased towards forbearance with policy makers unwilling to act promptly to head off problems. To design a macroprudential decision making process that is both more predictable and effective would require at least some qualitative objective such as maintaining as stable supply of financial intermediation services, a transparent process of analysis which underpins a well communicated decision making process. This is, however, easier said than done.

4. Analyzing and Interpreting Macroprudential Components

Although the various data components of a macroprudential approach are important for examining financial soundness, they have not been extensively analyzed empirically since a consistent time series, especially for FSIs, has been largely unavailable across economies. In addition, macroprudential data are mostly sector specific and thus do not necessarily quantify stability of the entire financial system. Measures of financial vulnerability and risk typically pertain to a single segment of the financial system. Despite such data limitations, there are several existing analytic methods that use a macroprudential approach to monitor economic and financial strengths and vulnerabilities. Analysis of macroprudential data entails understanding the linkages between macro developments in the economy and the financial system, as well as the exposure and soundness of financial institutions. Such an examination typically involves discovering emerging empirical patterns of financial health in advance. The potential impact of perceived vulnerabilities are gauged by observing overall patterns in the data, informed by past examples of systemic risk and a macroprudential framework to identify appropriate signals of vulnerability and distress.

[18] For a discussion on rules versus discretion in building a macroprudential regime, see Bank of England 2009.

4.1 Analysis of Macroprudential Data

An initial descriptive approach for examining FSIs can be to compute benchmarks or thresholds against current values of indicators that can be judged as being "out of line." Benchmarking can demonstrate how much an indicator deviates from an established mean. Benchmarks can include (i) running averages of indicators for an economy; (ii) historical averages of indicators for economies with previous crisis experience, wherein an average around the periods of crisis or periods immediately prior to the crisis could be used; (iii) prudential threshold values used by bank supervisory authorities or international financial institutions; (iv) average of an indicator for a peer group of economies with a strong financial system; (v) historical trigger points that have caused a financial crisis; and (vi) thresholds obtained from econometric and statistical models (e.g., EWS). Ideally, several benchmarks should be used for each indicator. The higher the number of indicators giving off signals during any given period indicates increased vulnerability for the financial system. Variations in the indicators may be due to inherent random variations or to special causes representing vulnerabilities that may need to be corrected through policy interventions. Such descriptive approaches are indicative of systemic vulnerabilities and may not necessarily reflect crisis periods.

Monitoring the stability of financial systems, even in the context of a macroprudential approach, does not by itself provide a means of estimating the impact of a potentially destabilizing event on financial systems or individual institutions since it does not explicitly consider the causal relationships among the different macroprudential data being monitored. Econometric methods provide a means to assess the likelihood of financial instability or vulnerability. Such calculations should include (i) trend analysis, which detects financial system vulnerability when there are major fluctuations in a particular indicator; (ii) stress testing, which gauges vulnerability by estimating the impact of a range of future shocks to the system on certain variables; (iii) examinations of linkages between macroeconomic and macrofinancial factors, which can be used to predict FSIs, such as loan losses and corporate leverage, or an (iv) EWS to estimate the probability that a crisis will occur.[19]

Although much work has been carried out in developing EWS, the empirical literature suggests that the predictive accuracy of EWS is quite limited,[20] especially for banking crises, in part due to the data issues discussed above, issues regarding econometric modeling specification, and the complexity of financial systems. The limited predictive powers of EWS is also partly due to the daunting challenges of predicting *ex ante* system vulnerabilities and examining *ex post* financial crises. Currency and banking crises, for example, are not precisely defined events but econometric models, whether parametric or nonparametric, must define crisis dates with respect to the data being

[19] An EWS model involves predicting either a banking crisis, currency crisis, stock market crisis, or debt crisis. Demirguc-Kunt and Detragiache (1999) used a multivariate logit model for predicting systemic bank crises in a large sample of developed and developing countries. The IMF Developing Country Studies Division uses an EWS based on a probit model for determining the probability of a crisis occurring within a 24-month forecast period. An alternative to such probability approaches are the nonparametric "signals" approaches, such as that developed by Kaminsky and Reinhart (1999), which extract signals from aggregate data.

[20] Berg et al. (2004) point out that EWS correctly predict most tranquil periods but fail to predict crises, while the percentage of false alarms is also high.

used.[21] The beginning of a crisis period may be easy to identify, but the time of crisis resolution is often difficult to precisely determine. EWS models inherently assume a static relationship between indicators and the risk of crisis, rather than allowing for a dynamic evolution of the financial structure throughout the course of the business cycle. In practice, historical experiences preceding financial instabilities vary considerably across economies, particularly between developed and developing economies. Moreover, development entails a fundamental transformation of a country's economic structure, suggesting that causal relationships are also not static. Econometric models, while often guided by economic theory, involve judgment on model specification, which often reflects what works best given the available data. Results of econometric methods may suggest that macroprudential data have weak statistical significance or might yield conflicting results with other methods. Nonparametric and parametric approaches have both been used, with empirical assessments[22] of these methods suggesting that nonparametric methods may be better suited for dealing with cross-country datasets.

As an additional instrument in the toolbox of macroprudential analysis, stress tests identify common vulnerabilities across financial institutions that could undermine the overall stability of a financial system. These tests quantitatively evaluate the impact of macroeconomic shocks on the financial system as a whole and on FSIs in particular. While designing scenarios that assume stresses to be large but plausible and then convincing authorities to use them may prove a challenge in itself, they provide forward-looking estimates of how the value of some FSIs change in response to exceptional developments in the underlying risk factors. The latter may be based on historical or hypothetical scenarios, or on simulations from macroeconomic forecasting models. A number of regulatory authorities have undertaken economy-specific stress tests, which is somewhat analogous to the value-at-risk assessments employed by financial institutions for self-regulation of capital reserve requirements under the Basel II framework for banking supervision. Unlike EWS models that attempt to exploit cross-country information to predict the likelihood of crisis in a given country, macro-level stress tests are tailored to the unique risk exposures, institutions, and economic structure of an individual country. The information from stress tests can help to identify weaknesses in data compilation, reporting systems, and risk management; and can ultimately contribute to a better understanding of the links between the financial system and the macro economy.

Despite the many merits of quantitative methods, the ability of statistical tools to identify crisis episodes or to take full account of country-specific factors is inherently limited by the often unique and diverse nature of financial crises and buildup of stress. Bearing in mind that future crisis episodes are likely to be very different from previous ones, consultations with policymakers, market participants, and academics can prove valuable

[21] Approaches to dating systemic banking crisis episodes follow closely on the work of Caprio and Klinglebiel (1996) and Caprio et al. (2005), which generated classifications based on assessments of national supervisory officials and other "expert" financial professionals and observable government interventions undertaken in response to periods of widespread banking distress. Over time, researchers made some refinements, but the basic approach to codifying a binary banking crisis indicator has remained. Kaminsky and Reinhart (1999), and Reinhart and Rogoff (2008) also largely follow Caprio et al. (2005), although they refined the frequency to monthly observations and identified a peak month. Laeven and Valencia (2008) recently updated the database of Caprio et al. (2005) through 2007, identifying 124 episodes between 1970 and 2007 using a similar methodology and adding some more qualitative accents to the indicator.

[22] Berg, Borensztein, and Pattillo (2004).

in complementing quantitative statistical tools. In addition, the application of experience-based "rules-of-thumb," educated guesses, intuitive judgments, common sense, and innovative thinking can help identify new sources of potential vulnerabilities.[23]

4.2 Macroprudential Monitoring

Although national central banks and supervisory agencies in many economies have long monitored and reported on issues relating to financial system stability, much of this work has not necessarily been carried out within a formal macroprudential approach to assess financial system soundness. In the wake of recent experiences of financial crisis and distress at the domestic, regional, and global levels, policymakers from individual economies and multilateral institutions have either begun or intensified work on macroprudential monitoring.

The IMF and the World Bank have carried out a Financial Sector Assessment Program (FSAP) as a regular part of IMF Article IV consultations to assist individual economies to (i) assess the stability of the financial system, including macroeconomic factors that could affect the performance of the system and conditions in the system that could affect the macroeconomy; (ii) assess the extent to which relevant financial sector standards, codes, and good practices are observed; (iii) assess the financial sector's reform and development needs. The World Bank uses FSAP and various risk-rating models in its lending decisions to determine the likelihood of default by its borrowers. The main areas covered in such risk-rating models are structural and macroeconomic indicators of economic performance and external vulnerability, external debt and its sustainability, political risk and policy performance, and history of debt service.

ADB also carries out regular assessments of vulnerability of its member economies to domestic or exogenous shocks using macroeconomic and policy performance indicators, financial market indicators, and qualitative assessments. ADB has established a Regional Early Warning System for the ASEAN+3 economies,[24] which is based on frequently collected macroeconomic and macrofinancial indicators. ADB's Regional EWS is designed to signal an impending financial crisis, such as a currency crisis or a banking crisis, and is based on parametric and nonparametric approaches. Continuing work on ADB's Regional EWS involves updating results based on the indicators' current levels and supporting the development of capacities in member economies for economy-specific EWS.

5. Empirical Macroprudential Analysis

When macroprudential data are gathered, it is important to examine trends and patterns to support formulation and implementation of evidence-based policies. In this section, we consider macroprudential panel data assembled from 59 economies covering the period 1993–2008. Although the panel data has a number of limitations, including missing data for some indicators over certain periods, the empirical analysis provided below provides

[23] Ghosh et al. (2009).

[24] The Regional Early Warning System is maintained by ADB's Office of Regional Economic Integration. ASEAN+3 comprises the 10 members of ASEAN plus the People's Republic of China, Republic of Korea, and Japan.

insights into important determinants of financial soundness in developing economies in Asia vis-à-vis counterparts in other continents and developed economies. In addition, this exercise is intended to enhance the future use and refinement of macroprudential data.

5.1 Data and Methodology

The collected macroprudential data (Appendix—Table 1) includes annual data for the period 1993–2008 from 41 emerging economies in Asia, Latin America, and Europe, as well as from 18 selected developed economies. The data was compiled from various sources, including the Centennial Group, Bankscope, Datastream of Thomson Financial, Bloomberg, the IMF's International Financial Statistics, and the World Bank's World Development Indicators. When multiple data sources are available for an indicator, preference is given to analyzing data sourced from the Centennial Group followed by data that has the most available records. Since the number of banks in each economy changes every year due to mergers, closures, and openings, economy-specific data on FSIs are not comparable across time. Neither can there be strict comparability across economies due to different accounting and prudential standards. For instance, indicators of asset quality, such as nonperforming loans or impaired loans, are subject to issues over incomparable definitions. Bankscope and Datastream data also may have self-selection and reporting biases since the data are dependent on whether or not institutions have provided a consolidated report for that year. Such data limitations partly account for heterogeneity across economies and across time.

The dynamics of change in the indicators, including episodes of financial vulnerabilities, can be studied carefully with the available panel data. Variation in the data over time may reflect how circumstances change with time, but these variations can also be inflated by the measurement and compilation issues described above. Very strong assumptions are required, whether one looks at country data or examines the panel data, to draw clear conclusions as sequencing in time does not necessarily reflect causation.

Benchmarking exercises can be performed on each indicator to assess volatilities. Any out-of-line behavior may suggest the need for some corrective policy action. Signals of financial vulnerabilities may be suggested by values beyond ±*2* for the estimated

$$Z_t = \frac{(X_t - \hat{\mu}_{t;5})}{\hat{\sigma}_{t;5}}$$

standardized unit of each FSI X_t at year t, using an estimated mean and standard deviation, $\hat{\mu}_{X;t;5}$ and $\hat{\sigma}_{X;t;5}$, respectively, generated from a moving span of 5 years. Changes in the spread of each FSI could also be assessed by determining how much the estimate of the variance changes across time. Consider, for instance, comparing the variance estimate at time t $\hat{\sigma}^2_{X;t;5}$ based on a moving span of 5 years as against some other estimate of the variance $\hat{\sigma}^2_{X;t;10}$ based on a longer span of 10 years or an alternative estimate $\hat{\sigma}^2_{X;t,\,peer}$ computed from a peer group of economies. The selected economies in the study were divided into four peer groups: developed economies, emerging Asia, emerging Europe, and emerging Latin America. It is well known that for a

given estimate $\hat{\sigma}^2$ of the variance σ^2, with an underlying ν degrees of freedom, the statistic $\frac{\nu\hat{\sigma}^2}{\hat{\sigma}^2}$ is known to have a χ^2_ν distribution. Also, given two independent chi-square statistics with m and n degrees of freedom, respectively, their ratio is known to have a F(m,n) distribution. In consequence, the ratios

$$\frac{4\hat{\sigma}^2_{X;t;5}}{9\hat{\sigma}^2_{X;t;10} - 4\hat{\sigma}^2_{X;t;5}}$$

and

$$\frac{4\hat{\sigma}^2_{X;t;5}}{\hat{\sigma}^2_{peer}}$$

can be compared with thresholds of their respective distributions, such as the 95th percentiles of an F(4,5) distribution and an χ^2_4 distribution, respectively. The signals extracted from the use of the latter ratio are likely to be greater than the former, owing to having more heterogeneity across countries rather than from comparisons of a country across time.

To determine the relative importance of macroprudential data in summarizing features of financial soundness and the correlations of the data with each other, it can be useful to utilize factor analysis, which is a multivariate statistical method used to reduce a number of indicators into latent composite indices called factors. These factors account for the patterns of correlation among all of the original indicators and are relatively independent of one another. The degree of correlation between the original indicator and the final factor score is called a factor loading. Inspection of these loadings reveals the extent to which each of the original indicators contributes to the meaning of each of the factors. Therefore, to give an interpretation to a factor it is necessary to first identify what among the original indicators loads highly (> 0.5) onto a factor. Once the indicators that load highly on a particular factor have been identified, the group of indicators then provides a sense of what the factor means. Rotation of the factors is also often employed to improve the interpretation of the resulting factors. With complete (or pseudo-complete) panel data available, composite indices may even be generated with such statistical methods to give a full picture of the financial sector of an economy that may not be seen when one looks at each indicator separately. The factor analysis results may also help identify key FSIs and their relationships with other FSIs. Key FSIs can be examined in terms of historical trends and unusual behavior, whether on the economy level or across peer groups of economies.

It is also possible to investigate the effects of various macroeconomic variables on key FSIs using panel regression fixed effects models:

$$y_{i,t} = \alpha + \mu_i + \mathbf{X}_{it}\boldsymbol{\beta} + \varepsilon_{i,t}$$

for *i* = 1, 2, … 59 countries, *t* = 1993, 1994, … 2009, $\mathbf{X}_{it}$ is the ith observation on K explanatory variables, μ_i represents country-heterogeneity effects, and $\varepsilon_{i,t}$ is a model error term. Panel regression models allow us to determine the key macroeconomic variables that underlie movements in FSI and estimate changes in FSI given a unit change in some macroeconomic factor, *ceteris paribus*. The use of fixed effects regression allows us to control for omitted macroeconomic variables that differ among

countries but are constant over time. An underlying assumption in such models is that the model error does not display autocorrelation. When there is suspicion that this assumption is untenable, variants on these "static" panel regression models have to be employed, such as dynamic panel regression models[25] that include a lagged dependent variable on the right-hand side of the equation, e.g.,

$$y_{i,t} = \alpha + \lambda y_{i,t-1} + \mu_i + \mathbf{X}_{it}\boldsymbol{\beta} + \varepsilon_{i,t}$$

which also controls for unobserved heterogeneity. The indicators of macroeconomic developments and market indicators that were used for the study included real GDP growth rate,[26] inflation rate,[27] change in lending rate, domestic credit provided by the banking sector as a percentage of GDP (as a proxy measure of credit expansion),[28] the business cycle (proxied by the unemployment rate), and Moody's sovereign long-term debt foreign currency ratings. Previous studies[29] suggest that these macroeconomic factors and the qualitative information help explain variations in key FSIs. While other factors may also be important determinants of FSIs, the model specification employed is constrained by data availability. In addition, when multicollinearity is present (i.e., if some explanatory variables are correlated), it is challenging to determine the individual contribution of each explanatory variable to the FSI that is being explained since the effects of the explanatory variables are overlapping. Estimated regression coefficients may have unexpected signs and may be very imprecise. To address multicollinearity problems in regression models, it is common practice to either use transformations on the variables, which leads to a loss of ability to intuitively interpret the meaning of the variables, or to simply remove at least one of the explanatory variables that has a weaker relationship with the dependent variable. The challenge in formulating models is having results that provide rich insights about relationships among the variables given the available data.

---

[25] Arellano and Bond (1991) introduced a Generalized Method of Moments estimator for this dynamic panel regression. The estimator uses lags t-1 and deeper of levels of the dependent variable and endogenous variables as instruments for the equation in first differences. The method has the advantage of allowing for the modeling of various factors as endogenously determined.

[26] Low or declining growth, sector slumps, and recessions can weaken the debt servicing capacity of domestic borrowers and lead to an increase in credit risk resulting in a negative impact on financial institutions' portfolios and profitability margins, and a reduction in their cash flows and reserves. On the other hand, increasing economic growth signals heightened investment and market confidence, which are associated with higher income and profitability for banks.

[27] Babihuga (2007) and Podpiera (2006) show varying relationships between inflation and nonperforming loans (NPL), and inflation and return on assets (ROA). According to Demirguc-Kunt and Detragiache (1997), high inflation is associated with "macroeconomic mismanagement" that leaves the banking system vulnerable. Another explanation is provided by Evans et al. (2000) suggesting that higher inflation reduces the collateral value of loans, while lower inflation reduces the nominal income of banks thereby affecting their liquidity. A significant and rapid reduction in the rate of inflation could, however, lead to lower nominal income and cash flows thereby adversely affecting the liquidity and solvency of financial institutions.

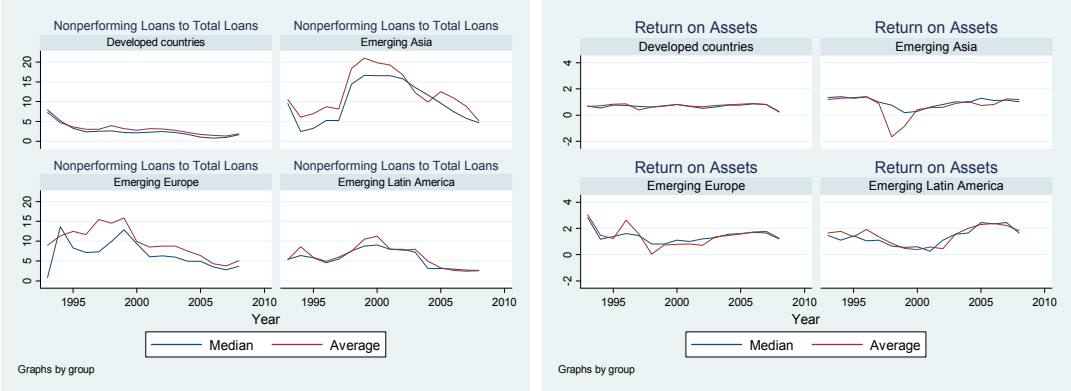
[28] A sudden surge in bank lending creates financial vulnerability as credit quality deteriorates and risk increases. According to Evans et al. (2000), sharp swings in bank credit are an indication of poor loan assessment and quality. In fact, many studies have revealed that banking crises are caused by over-optimism in credit creation (Kaminsky and Reinhart, 1999; Gavin and Hausmann, 1996).

[29] Babihuga (2007), Podpiera (2006), Goldstein and Turner (1996), Demirguc-Kunt and Huizinga (1999), and Demirguc-Kunt and Detragiache (1997).

5.2 Descriptive Analysis and Panel Regression Estimation Results

The historical performance of the ratio of banks' NPLs to gross loans[30] as well as trends in banks' return on assets (ROAs)[31] across four peer groups are shown in Figure 2. In emerging Asia, the ratio of NPLs to total loans sharply increased in the aftermath of the 1997/98 financial crises. On average, about 18% of loans in emerging Asia were nonperforming in 1998. This rate was nearly twice that of Latin America (7.4%) and five times that of the developed economies (3.9%) in the same year. However, the data on NPLs as a percentage of total loans shows that the situation in emerging Asia has since recovered. Meanwhile, banks in emerging Asia appeared to suffer a tremendous deterioration in their ROAs as a result of the 1997/98 financial crisis, reaching a low point of –1.8% in 1998. In 1994, at the onset of the Mexican financial crisis, Latin America experienced a decrease in ROAs from 1993 levels. While Latin America has experienced fluctuations in banking profitability, the region's banks have generally exceeded the performance of emerging Asia and the developed economies across the entire period 1993 to 2008. This can be partly explained by the elevated spreads between deposit and lending rates in Latin America.

Figure 2: Cross-Country Averages of Selected FSIs in Developed Countries, Emerging Asia, Europe, and Latin America (1993–2008): (i) Ratio of NPLs to Total Gross Loans and (ii) Banks' ROAs



Source: ADB staff calculations

Results of the benchmarking exercises for each FSI (Appendix—Table 2) illustrate the complex nature of the financial health of economies. Analysis of FSIs can reveal insights about vulnerabilities in the financial sector even though FSIs do not always have to serve as early warning signals of a crisis. However, most FSIs listed below managed to positively identify crisis periods in Argentina, Brazil, People's Republic of China, Colombia, Indonesia, Republic of Korea, Japan, Malaysia, Mexico, Philippines, Thailand,

[30] The ratio of NPLs to gross loans is a common measure of the asset quality of banks. High levels of NPLs imply banking fragility since borrowers are not able to pay their loans and/or banks are not able to collect them (Podpiera, 2006). This ratio is a backward-looking indicator since it can only be observed after it has occurred.

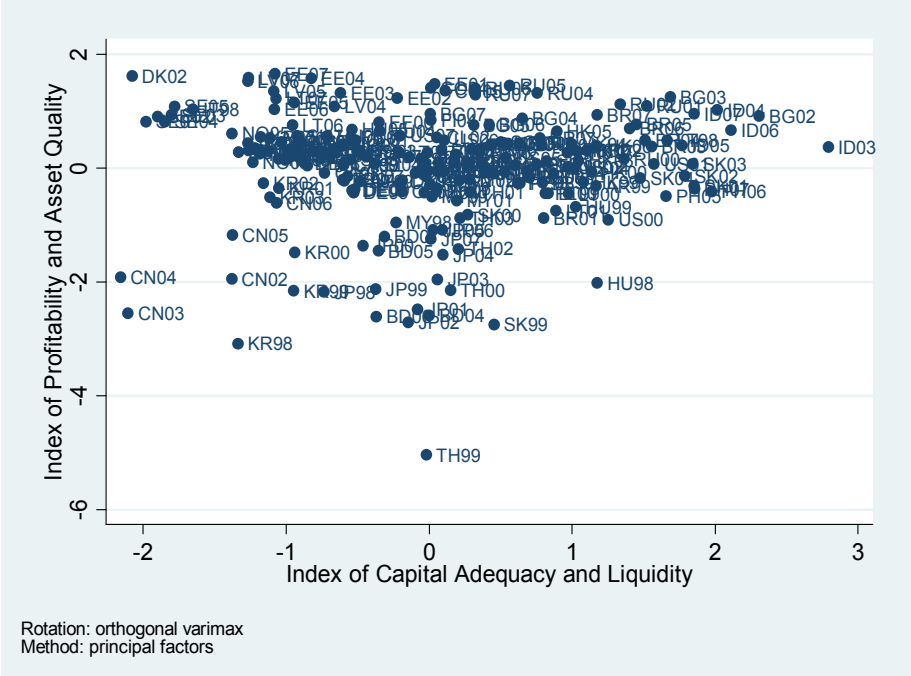
[31] The ratio of net income to total asset or ROAs reflects banking profitability and the efficiency of the bank utilizing its assets (IMF, 2006; Evans et al. 2000). A higher ROA value implies better performance.

UK, US, and Viet Nam. These FSIs include banks' ROAs, return on equity, ratio of equity to total assets, Z score, ratio of regulatory capital to risk-weighted assets, ratio of NPLs to total loans, ratio of customer deposits to total loans, ratio of credit to bank deposits, average daily turnover ratio in securities, interest rate spread, ratio of personnel expenses to noninterest expenses, ratio of liquid assets to short-term liabilities, ratio of (broad and core) liquid assets to total assets, ratio of non-interest expense to gross income, and ratio of interest margin to gross income. Some FSIs successfully identified crisis periods of developed economies, while others were successful in identifying crises in developing economies.

Appendix—Table 3 shows that there is significant correlation among some of the FSIs as well as, between some FSIs and their lags, which suggests it is important to monitor FSIs. In addition, FSIs can provide redundant information about financial health and vulnerabilities. Consequently, it is also important to make use of data reduction tools on the available macroprudential data. Results of a factor analysis provided composite indices that suggest the importance of indicators of capital adequacy[32] and liquidity, as well as profitability. The first composite index from the rotated factor analysis may be interpreted to represent an economy's ability to meet its obligations and demand for funds since the following FSI ratios are loading high on the index: regulatory capital to risk-weighted assets, bank credit to bank deposits, capital to assets, customer deposits to total (non-interbank) loans, and various liquidity indicators. The second index—largely comprising ratios of ROAs and return on equity, and indicators on nonperforming loans—shows the importance of profitability and asset quality in monitoring financial soundness. The third index also shows the importance of assessing the earnings of economies, specifically, the ratios of interest margins to gross income, and noninterest expenses to gross income. Outlier behavior can be observed for some economies, such as Thailand in 1999 and Indonesia in 2003, in the first two indices (Figure 3), which may be indicative of financial vulnerabilities.

[32] Capital adequacy and the availability of capital determine how robust financial institutions' balance sheets are to shocks and are primary indicators in assessing the degree of financial fragility in the banking sector. An adverse trend in aggregate risk-based capital ratios (i.e., the ratio of capital to risk-adjusted assets) may signal increased risk exposure and possible capital adequacy problems. According to the Basel Accord, a bank's own funds must account for at least 8% of the risk-weighted value of its assets and off-balance sheet activities.

Figure 3: Behavior of Economies—Indices of Capital Adequacy and Liquidity, and Profitability and Asset Quality



Source: ADB Staff Calculations

Appendix—Table 5 provides descriptive statistics for the key FSIs and non-FSIs used in a panel regression analysis of selected key FSIs. As the table shows, the variables are dispersed across economies and over time. For the key FSIs to be explained, the standard deviation is larger "between" than "within," demonstrating the considerable amount of diversity among economies.

Determinants of capital adequacy are shown in Appendix—Table 6 and are based on panel regression models of the ratio for customer deposits to total loans. Capital adequacy, as was noted in the empirical factor analysis results, correlates positively with liquidity. The immediate past of customer deposits has a strong positive association with its current value. This relationship is displayed across regions, with a 1.0% change in the previous year expected to yield about a 0.4%–0.75% change in the current year, *ceteris paribus*. Domestic credit provided by the banking sector, which serves as a proxy indicator of lending booms, is found to have a positive relationship with capital adequacy, especially in Europe and Latin America. As expected, significant changes in bank lending rates, which reflect economic instability, are negatively associated with customer deposits. Economic growth, as expected, is negatively correlated with capital adequacy since a low or declining growth rate, or recession, can reduce cash flows and reserves. The relationship is found to be strong particularly in developed economies and in emerging Europe. As expected, a considerable increase in lending rate is negatively associated with capital adequacy. Domestic credit provided by the banking sector also displays a positive association with customer deposits, especially in emerging Europe and Latin America.

Appendix—Table 7 presents factors that explain asset quality, specifically, the ratio of banks' NPLs to total loans. GDP per capita is, as expected, negatively associated with NPLs, at least in the short-term. This relationship is particularly strong in developed economies and emerging Europe. Inflation shows a negative relationship with NPLs in developed economies, *ceteris paribus*, but a positive relationship in emerging Latin America. There appears to be some evidence that the business cycle, as proxied by the unemployment rate, shows a positive relationship to NPLs, but only in Emerging Europe. Asset quality should be monitored closely, as a 1.0 % change in the ratio of NPLs to total loans is associated with 0.36% change in the next period's value. While the empirical results from the regression models are limited by model specification and data availability, they show diversity in the relationships between FSIs and the macro economy, and also suggest that these relationships depend on the stage of development of an individual economy. The strong dependence of the current value of an FSI to its immediate past performance also ultimately suggests the importance of macroprudential monitoring.

6. Challenges Ahead and Policy Options

6.1 Developing a Macroprudential Approach to Supervision that can Complement and Reinforce Monetary Policy in Sustaining Economic Growth

The macroprudential approach to supervision should complement and reinforce monetary policy in sustaining economic growth. Maintaining medium- to long-term price stability is usually considered to be the overarching objective of monetary policy. Price stability in general promotes financial stability by anchoring inflationary expectations, which reduces the risk of deflation and helps stabilize economic activity. Monetary policy has been particularly relevant amid the current crisis in stabilizing financial sectors around the world. On the other hand, a sound financial system can contribute to price stability and macroeconomic stability by facilitating the transmission of monetary policy actions and cushioning the impact of macroeconomic shocks through the financial sector. In addition, a stable and sound financial system decreases the incidence of financial stress and crisis, and leads to less disruption to economic activity, which contributes to price stability. In the aftermath of the current global economic crisis, many policymakers and commentators have suggested that central banks should pay more attention to the financial sector and financial excess, and possibly, where such is not already the case, take on financial stability as a statutory objective or guiding principle. But it is also true that those who have recognized this have by no means been immune to the crisis.

There may be a trade-off between price and financial stability in certain circumstances, as shown by the recent financial crisis. High growth and low inflation and interest rates in recent decades, which has come to be known as the "Great Moderation," created an environment encouraging increased risk-taking and more leveraging, which subsequently lead to the asset bubbles that underlay the recent crisis. In this environment, policymakers are facing a trade-off between future financial stability and present price stability. The first half of 2008 also created another dilemma for central banks in many economies as inflation around the world rose due to high oil and

commodity prices, while at the same time financial stability was in jeopardy as major economies were experiencing a credit crunch due to the bursting of the housing bubble in the US. In this environment, maintaining price stability would have aggravated financial instability.[33]

According to Tinbergen's principle[34] relating the number of instruments to the number of policy objectives, monetary policy tools may not be useful in targeting financial stability. Policymakers need additional tools other than the interest rate, particularly when there are trade-offs between policy objectives. Interest rate policy may be too powerful and blunt to address financial stability. Factors affecting financial stability, such as asset price bubbles, may require a major change in the interest rate, which would cause material damage to other parts of the economy. The empirical results in the previous section suggest, in the light of the importance of capital adequacy and profitability indicators, that macroprudential policy tools—such as capital adequacy requirements, additional capital buffers for banks, guidance regarding leverage ratios, and liquidity management of financial institutions—may be more appropriate. However, applying additional capital requirements for macroeconomic reasons that are not directly related to individual financial institutions is not a straightforward process and would have feedback effects on interest rates and thus monetary policy. However, while there is a growing consensus that monetary policy may also have a role to play in maintaining financial stability by leaning against asset bubbles,[35] the rapid expansion of central bank balance sheets—resulting from their intervention on behalf of individual systemically important institutions that were under particular liquidity stress—risks compromising price stability. It is important to recognize that policies have to evolve, and depend on data.

The rapid buildup of central bank balance sheets came about as a result of both standard and innovative tools used to supply liquidity. Central banks acting in their traditional role as lender of last resort had to adapt radically to (i) lend at longer maturities, (ii) accept lower quality collateral, and (iii) lend to investment banks. In addition, price stability can be compromised by expanded balance sheets as (i) large excess reserves can result in rapid credit growth and inflationary pressure, (ii) certain assets can be hard to use for monetary policy and liquidity management, (iii) a reliance on quantitative tools might make it difficult to judge the stance of monetary policy, and (iv) losses and quasi-fiscal operations can lead to political pressures that undermine central bank independence.[36]

[33] Many central banks also ignored inflation when it was high but did not ignore it when it was low for structural reasons and when tight monetary policy may have been the better option.

[34] Tinbergen's principle states that to attain a given number of independent policy objectives, there must be at least an equal number of instruments. The principle is concerned with the existence and location of a solution to the system. It does not assert that any given set of policy responses will, in fact, lead to that solution. To assert this, it is necessary to investigate the stability properties of a dynamic system.

[35] William R. White, 2009; Howard Davies, 2009: and Janet Yellen, 2009.

[36] Cottarelli and Vinals, 2009.

6.2 Coordination between Financial Safety Net Players and Fiscal Authorities, and Communication Strategies for Policymakers

In addition to the technical difficulties of identifying vulnerabilities lies the challenge for any EWS, scenario analysis, or stress test: persuading policymakers to act upon vulnerabilities once they have been identified. For this, a deep understanding of the nature of financial vulnerabilities and ultimately of systemic risk is needed. Financial safety net players and fiscal authorities thus need to engage policymakers in clear and well calibrated communication that is established by comprehensive evidence that is carefully weighed and analyzed. Such analysis would include not only a description of the underlying sources of financial vulnerability, but also the shocks that may cause the vulnerability to unwind, and how these shocks can be transmitted across sectors, markets, and economies. Early warnings would also need to be accompanied by a clear set of policy options that emphasize the trade-offs between addressing different types of risks and underscore the need for not only national policy coordination but also regional and international policy coordination.[37] Fragility in the financial sector can also have spillover effects on consumer and investor confidence, capital flows, public finances, and financial intermediation.

To achieve this, there is the necessity for close co-ordination and co-operation among financial safety net players, fiscal authorities, and policy makers. This in turn stems from the possibility of conflicting mandates which could undermine the effectiveness of handling financial vulnerabilities and especially when the need to handle bank failures arises. Although the precise mechanisms of coordination will depend on each respective economies institutional set-up, there should be a clearly articulated division of powers and responsibilities agreed upon by the participants to prevent, as much as possible, the unproductive overlapping and duplication of activities.

6.3 Regional and Global Coordination and Cooperation

This crisis that first unraveled in mid-2007 proved once again that coordination and cooperation are mandatory at the national, regional, and global levels when responding to systemic failure. Reform proposals and detailed action plans have emerged in various global forums. Thus far they focus on building global standards in regulation, strengthening cross-border supervision, and enhancing market transparency. They also call for an effective global mechanism for crisis prevention and management. However, there are huge gaps between declarations of reform policies and their actual implementation. Proper crisis management is also contingent on data, and making sense of data.

Additional cooperation is required to ensure regional and global financial stability. To strengthen financial systems with appropriate macroprudential oversight and extend supervision over a wider set of market segments and institutions, especially those deemed systemically important, policymakers from around the region and globe will need to work together. It is also important that Asia actively participates in the reform process to ensure that the new financial architecture matches the needs of globalized finance with the region's financial development agenda.

[37] Ghosh et al., 2009.

In addition to systematically introducing a macroprudential approach to the supervisory framework, ASEAN+3 encourages greater cooperation in monitoring and surveillance. One positive example of regional cooperation is the expansion and multilateralization of the ASEAN+3 reserve pool, which is also known as the Chiang Mai Initiative. This initiative includes the establishment an independent regional surveillance mechanism to support the reserve pooling mechanism. This will initially involve expanding current ADB and ASEAN Secretariat work that objectively monitors economic performance and assesses financial vulnerabilities. The negotiated institutional structure approved by the 13 members of ASEAN+3 could provide the basis for future rules-based regional institutions.

To further strengthen cooperation and to ensure regional and global financial stability, ADB also supports the establishment of a high-level Asian Financial Stability Dialogue which would include officials from finance ministries and central banks, and other financial regulators and supervisors. The Asian Financial Stability Dialogue could coordinate supervisory and regulatory developments as well as monitor potential financial vulnerabilities through the use of objective EWS and other similar mechanisms of empirical analysis, as well as engage the private sector in financial market development.

In going forward, lessons could also be drawn from Europe's response to the current situation where several new EU institutions have been established for systemic risk. These include two new pillars of the EU framework: (ii) the European Systemic Risk Board (ESRB) which is macro-prudential in focus; and (ii) the European System of Financial Supervisors (ESFS) which is micro-prudential in focus. The new EU institutions will coordinate with both international institutions, such as the IMF and the FSB, as well as coordinate with national institutions.

7. Appendix

Table 1: List of Indicators Compiled and Examined

Indicator	Description	Data Source	Remarks
FSIs			
cenbrcrwar	Regulatory capital to risk weighted capital	CG	Capital Adequacy indicator
imfbcar	Regulatory Tier 1 capital to risk weighted assets	IFS	Capital Adequacy indicator
cenbzscore	Return on Assets plus capital asset ratio divided by the standard deviation of asset returns	CG	Asset Quality indicator; inversely proportional to probability of insolvency
cenbnpltlr	Bank Nonperforming Loans to Total (Gross) Loans	CG	Asset Quality indicator; available also from IFS (imfbnpltl) , WDI (wdibnpltgl) BS (bsnpltgl)
cenbroa	Return on Assets	CG	Earnings and profitability indicator; available also from BS (bsroa) and IFS (imfbra)
cenbroe	Return on Equity	CG	Earnings and profitability indicator; available also from IFS (imfbroe), BS (bsroe) and DS (dsbroe)
cenimgir	Interest margin to gross income	CG	Earnings and profitability indicator; available also from BS (bsimgi)
cenniegir	Noninterest expenses to gross income	CG	Earnings and profitability indicator; indicator; available also from BS (bsnegi)
bsclata	Liquid assets to total assets (liquid asset ratio)	BS	Liquidity Indicator; used core liquid assets
bsblata	Liquid assets to total assets (liquid asset ratio)	BS	Liquidity Indicator; used broad liquid assets
cenbcbdr	bank private credit to bank deposits	CG	Liquidity Indicator
cenlastl	Liquid assets to total short term liabilities	CG	Liquidity Indicator; used core liquid assets; available also available from BS (bsclast)
cenbcar	Capital to assets ratio	CG	Deposit Takers Indicator; Available also from IFS (imfbca), WDI (wdibca), and BS (bsca)
bstigi	Trading income to total income	BS	Deposit Takers Indicator
bspene	Personnel expenses to noninterest expenses	BS	Deposit Takers Indicator

Indicator	Description	Data Source	Remarks
wdiis	Spread between reference lending and deposit rates	WDI	Deposit Takers Indicator
cenbcdtlr	Customer deposits to total (noninterbank) loans	CG	Deposit Takers Indicator ; Available also from BS (bscdtnl)
wdisttr	Average daily turnover ratio in the securities market	WDI	Market Liquidity Indicator
cennpler	NPL to Equity	CG	Other FSIs; Available also from BS (bsnple)
cenetar	Equity to Asset	CG	Other FSIs; Available also from BS (bsea)
bsnplc	NPL to Capital	BS	Other FSIs
Non-FSIs			
wdigdppcpppcon	GDP per capita	WDI	Macroeconomic Indicator; ln PPP (constant 2005 international $) terms
wdigdpgrowth	Real GDP growth rate	WDI	Macroeconomic Indicator
wdigdscons	Gross domestic savings (constant LCU)	WDI	Macroeconomic Indicator
wdiunem	Unemployment rate	WDI	Macroeconomic Indicator; % of total labor force
ifsimports	Imports, cif (average for the year)	IFS	In Million USD
ifsinf	Inflation	IFS	Available also from WDI (wdiinfcpi)
wdimqmgdp	Money and quasi money (M2)	WDI	Monetary Indicator; as % of GDP.
wdimqmg	Money and quasi money growth	WDI	Monetary Indicator; Annual %
ifstrlg	Total reserves less gold	IFS	Monetary Indicator
ifsrflfa	Ratio Foreign Liabilities to Foreign Assets	IFS	Monetary Indicator
ifsrri	Ratio of Total Reserves to Imports	IFS	Monetary Indicator
Ifslr	Lending Rate	IFS	Monetary Indicator
jedhrstr	JEDH_IFS_Ratio ST External Debt_Reserves	IFS	Monetary Indicator
wdidcbs	Domestic credit provided by banking sector	WDI	Monetary Indicator; As % of GDP
wdirir	real interest rate	WDI	Monetary Indicator
wdireeri	WDI_Real effective exchange rate index	WDI	(2000 = 100)
ticpi	Corruption Perception Index	Transparency. org	Qualitative (Governance) Indicator
sovratings	Sovereign Long Term Debt Foreign Currency Ratings	Moody's	Market Indicator

Note: This list is only a partial list of all the indicators being compiled. It does not include other macroprudential indicators (with few records across economies and across the years).

Table 2: List of Economies Displaying Vulnerability Signals According to Selected FSIs

Indicator	F Test	Chi –Square Test
Regulatory capital to risk weighted capital	Belgium (2008-2009), Poland (2008)	Argentina(2001[a;c]; 2002[b]; 2003), Belgium (2008-2009), Brazil (2004), Bulgaria (2003-2006), People's Republic of China (2003-2008), Finland (2003-2008), Indonesia (2002-2003; 2009), Japan (2001; 2006), Pakistan (2001), Romania (2001-2002; 2008), Serbia (2009), Singapore (2002; 2007), Slovakia (2006-2007), Sweden (2002-2006), Turkey (2003-2008), Venezuela (2005-2008)
Regulatory Tier 1 capital to risk weighted assets	Poland (2008)	Brazil (2003-2004), Bulgaria (2002-2006), People's Republic of China (2006-2007), Finland (2003-2008), Japan (2006), Romania (2007-2008), Singapore (2007), Slovakia (2002-2003; 2006-2007), Sweden (2002), Turkey (2004-2008), Venezuela (2005-2007)
Return on Assets plus capital asset ratio divided by the standard deviation of asset returns		Australia (2002-2007), Bosnia & Herzegovina (1999-2000), Bulgaria (2001), Chile (2002-2003), People's Republic of China (2003-2007), Colombia (1999-2000; 2006), Ecuador (2001-2002); Estonia (2004 -2007), Finland (2001-2004, 2006-2007), Greece (2006-2007), Hong Kong (1997-2000, 2005 -2007), Japan (1997-1998), Korea (1997-2000), Lithuania (2007), Mexico (1997-1998), Netherlands (1998), Peru (2006 -2007), Philippines (2000; 2002 -2007), Singapore (1997-1998), Slovakia (2007), Slovenia (1997-1998), Sri Lanka (2001-2003), Sweden (1999-2003), Thailand (1997[a], 1998[b], 1999), Ukraine (2003)
Bank Nonperforming Loans to Total (Gross) Loans	Peru (2007), Spain (2008), Denmark (2008), Hungary (2009), USA (2008)	Argentina (2005-2008), Bangladesh (2000-2001), Bosnia & Herzegovina (2001), Bulgaria (2003-2004), Cambodia (2003-2005), People's Republic of China (1999; 2006-2007), Ecuador (1997; 1999-2004), Hong Kong (1999-2001; 2003-2007), Indonesia (2000-2006), Italy (2000; 2002-2003), Japan (2003-2007), Lithuania (2000), Malaysia (1998[b]), Peru (2007-2009), Poland (2006-2008), Romania (2001-2003), Serbia (1999; 2003-2009), Singapore (2001-2008), Spain (2008-2009), Thailand (2002-2003), Turkey (2004-2005), USA (2009), Ukraine (1999-2000; 2006-2009), Venezuela (1998) Viet Nam (2008)
Return on Assets	Bangladesh (2008), Canada (2006), France (2008)	Argentina (2002[b]; 2003-2007), Bangladesh (2007-2008), Belgium (2008), Bulgaria (1999), Cambodia (2006-2007), Colombia (1999-2001; 2009), Ecuador (2001); Hong Kong (1997-2004), Indonesia (1998[b];1999[c];

Indicator	F Test	Chi –Square Test
		2000-2005), Japan (2003-2006), Latvia (1997-1998; 2008-2009), Lithuania (1997); Myanmar (1997); Norway (2003), Pakistan (1997; 2005), Russia (1998-2000; 2002), Serbia (2006-2008), Singapore (1997-2000), Thailand (1997[a], 1998[b], 1999-2003), Turkey (2001-2005), UK (2008), USA (2008), Ukraine (1998; 2009), Venezuela (1997-2000; 2007-2008)
Return on Equity	Latvia (2009), Netherlands (2008), Ukraine (2009), Canada (2006), France (2008)	Argentina (2002[b]; 2003-2007), Bangladesh (1997; 2006-2008), Belgium (2000-2002;2004;2008-2009), Bulgaria (1998-2001), Colombia (1998[a]; 1999-2001; 2009), Finland (1998-2001); France (1997); Japan (1998-2006), Korea(1998[b]; 1999; 2001-2002), Latvia (2008-2009), Lithuania (1997-1999), Netherlands (2008), Pakistan (1997; 2004-2005), Serbia (2006); Slovakia (2003), Sweden (1997); Taipei (2006), Thailand (1998[b]; 1999-2003), Turkey (2001-2005), UK (2001-2003), Ukraine (1997-1999; 2009), Venezuela (1997-2000)
Interest margin to gross income	Canada (2008), Italy (2002-2003), Netherlands (2008), Slovakia(2002), Belgium (2008), Sri Lanka (2005-2006)	Argentina (2004-2005); Bhutan (1998-1999); Brazil (2005-2006); Bulgaria (1997-2001), Cambodia (2001-2003), Canada (2008), Chile (1997-2001; 2004; 2007-2008); Ecuador (1999-2003), Hong Kong (1998-2001; 2007-2008); Indonesia (1997[a]; 1998[b]; 1999[c]; 2000-2003); Italy (2002-2006), Lao PDR (2006-2008); Netherlands (2008), Norway (1997-2006), Philippines (2005), Poland (2007-2008), Serbia (1999-2001; 2008), Singapore (2007-2008), Slovakia (2002-2008), Sweden (2007), Taipei (2004; 2008)
Noninterest expenses to gross income	Canada (2008), Austria (2008), Hong Kong (2002), Singapore (2006), USA (2007*)	Argentina (2006-2007); Bangladesh (2008), Bulgaria (1997-1998); Cambodia (1999-2002; 2004-2005), Canada (2008), Chile (1997-2001; 2004-2008), Denmark (1997-1998), Ecuador (1999-2005), Hong Kong (2001; 2008), Indonesia (1998[b]; 1999[c]; 2000-2003), Italy (2002-2006), Japan (1999-2001), Lao PDR (2006-2008), Netherlands (2008), Norway (1997-2009; 2002-2007), Pakistan (2005), Romania (2008), Russia (1998-2002), Singapore (1999-2000), Slovakia (1999-2008), Sweden (1997-1998); Thailand (1997[a], 1998[b], 1999)

Indicator	F Test	Chi –Square Test
Liquid assets to total assets (using core liquid assets)	France (2005), Netherlands (2007), Pakistan (2003-2004), Taipei (2006)	Austria (1998-1999), Bangladesh (2004-2005), Belgium (2006-2007), Brunei Darussalam (1998-2003; 2006), Canada (1997), People's Republic of China (1997, 1998a, 1999-2000; 2008), Denmark (2001-2002), Ecuador (2008), Estonia (1998), Finland (2002-2006), France (2004-2007), Germany (2008), Greece (2000-2006; 2008), Latvia (1997-1999), Netherlands (2006-2007), Peru (1998-1999), Philippines (2006-2008), Serbia (2001-2007), Singapore (2002-2007), UK (2000; 2008), Venezuela (2003-2007), Viet Nam (1999-2002)
Liquid assets to total assets (using broad liquid assets)	Australia (2006), Belgium (2004), Serbia (2003-2004), Singapore (2006), Germany (2008), Hong Kong (2005), France (2008)	Argentina (2005); Australia (1997-1998; 2002-2007), Belgium (2000-2006), Brunei Darussalam (1998; 2003), Bulgaria (2000); Canada (1997); Chile (2002), People's Republic of China (1997-1998; 2008), Colombia (2000-2001), Denmark (2001-2002), Finland (1997), France (2008), Indonesia (1999[c]; 2000-2002, 2004-2006), Japan (2008), Latvia (1997-2000); Philippines (2005-2007), Poland (1997-1998), Serbia (2001-2007), Singapore (2002-2007), Spain (1999), Turkey (1998-2004, 2006-2008), Venezuela (1997-1998; 2004-2006), Viet Nam (2008)
Bank private credit to bank deposits		Argentina (2005), Bhutan (2008), Bosnia & Herzegovina (2001-2004), Brazil (1998), Cambodia (2008), Canada (2007-2008), Colombia (2001-2004, 2007-2008), Croatia (1997-1998), Denmark (2000-2003, 2005-2006), Ecuador (1999-2003),Estonia (1997); Finland (2005-2007), Indonesia (1999[c]; 2000- 002, 2005), Italy (1997-2002), Korea (2007-2008), Latvia (2006-2008), Lithuania (2006, 2008), Mexico (1997; 1998[a]), Serbia (2003-2005), Slovenia (2007), Sri Lanka (1997-1998), Sweden (2002-2004), Thailand (1999-2003), UK (1997); Ukraine (1998-2000; 2008), Viet Nam(1999; 2003-2006)
Liquid assets to total short term liabilities	Philippines (2004), UK (2004)	Argentina (2005), Australia (1998-2000; 2007), Bangladesh (2008), Brazil (1999[b]), Bulgaria (2005-2006), Chile (2004-2008), Denmark (1997-1998; 2001), Ecuador (200--2003), Estonia (2005-2008), France (2008), Hong Kong (1997-2005), Italy (2001-2007), Latvia (1998-2000; 2005-2007), Pakistan (2000; 2002-2006), Serbia (2001-2004), Sri Lanka (1997-1999), Sweden (2001; 2007-2008), Taipei (2004-2008), Thailand (2007), Turkey (1999), UK (2008), Viet Nam (1998-1999)

Indicator	F Test	Chi –Square Test
Capital to assets ratio		Bosnia & Herzegovina (2005), Bulgaria (2005-2008), Croatia (2008), Ecuador (2001-2002), Finland (2003-2008), Indonesia (2001-2005), Japan (2001), Mexico (2008-2009), Pakistan (2006-2009), Serbia (2006-2009), Spain (2002), Turkey (2003-2005), UK (2002-2006), Ukraine (2003), Venezuela (2006-2009)
Personnel expenses to noninterest expenses	Denmark (2003-2005), Bangladesh (2007)	Argentina (2005; 2008), Australia (2004), Belgium (1999-2002), Brunei Darussalam (2003), Bulgaria (2002-2005), People's Republic of China (2003-2005), Colombia (2000), Denmark (2001-2008), Ecuador (2003), Estonia (1998), Hong Kong (2003-2007), India (2008), Indonesia (1997a, 1998b, 1999c, 2001-2002), Korea (2000-2002), Latvia (1998), Mexico (2001-2002), Netherlands (1998-1999; 2008), Norway (1997-1999), Peru (1998), Poland (1997; 1999-2000), Romania (2008), Russia (2007-2008), Serbia (2003-2007), Singapore (2000), Slovakia (1999), Taipei (2005-2007), Turkey (2008), Ukraine (2000-2001), Viet Nam (1997[a];1998-1999)
Spread between reference lending and deposit rates		Argentina (2004-2006), Brazil (2001-2003; 2006-2007), Bulgaria (1998-2001), Cambodia (2003-2005), Croatia (1997), Denmark (1997-1998), Ecuador (2000), Hong Kong (1998; 2000-2007), Indonesia (1997[a]; 1999[b]; 1999[c]; 2000-2002; 2004-2006), Lao PDR (2002-2003; 2005-2007), Mexico (1999[b;c]); Netherlands (1997; 1999-2004), Peru (1997-1998); Romania (2007), Russia (1999-2000; 2002-2004), Serbia (2005); Sri Lanka (2004-2005; 2007), Ukraine (2002-2006)
Customer deposits to total (noninterbank) loans	Colombia (2002), Ecuador (2003)	Argentina (2003-2008), Belgium (2005; 2007-2008), Bhutan (1997-2008), Brazil (2000-2001); Bulgaria (1998; 2000; 2004-2005), Cambodia (2002; 2008), Canada (2004, 2007-2008), Denmark (2000-2003), Hong Kong (2004-2008), Indonesia (1999[c]; 2000-2002; 2004-2006), Italy (1998-1999), Japan (2002-2005), Lao PDR (2003-2008), Myanmar (2007-2008), Romania (2002-2006, 2008), Singapore(2006), Sri Lanka (1997-1998), Turkey (2001-2007), Ukraine (1997-2001), Venezuela (1997-1999; 2005-2007)

Indicator	F Test	Chi –Square Test
Average daily turnover ratio in the securities market		Argentina (2002[b]; 2004-2007), Belgium (2002-2006), Brazil (1997; 2001-2003, 2008), People's Republic of China (1997; 1998[a]), France (1999), Germany (1999), Greece (2003), Hungary (2007), India (2006), Korea (1999; 2001-2002, 2004-2006), Lithuania (2008), Netherlands (2001-2002), Pakistan (1999-2008), Slovakia (2002-2006), Turkey (2007-2008), UK (2007[a]), USA (2000-2005), Venezuela (1999-2001)
Nonperforming Loans to Equity	Slovenia (2005-2006)	Argentina (2006-2008), Bangladesh (1997-1998; 2004-2008), Bulgaria (2000), People's Republic of China (2004-2008), Ecuador (1997; 1999-2003), France (2001), Germany (2004; 2006-2008), Indonesia (2000-2002); Italy (2000-2007), Japan (2000-2007), Pakistan(1999-2005), Poland (2006-2007), Serbia (1999; 2003-2008), Singapore (2005-2007), Slovakia (1999-2004), Slovenia (2005-2007), Turkey (2005), Ukraine (2008), Viet Nam (2008)
Equity to Asset	Indonesia (2002), Denmark (2002)	Belgium (2000-2002), Bosnia & Herzegovina (2001-2003), Brunei Darussalam (1998-1999), Bulgaria (1997-1999), Cambodia (1999-2005), Chile (2005-2008), Colombia (1999), Denmark (2008), Ecuador (2000-2008), Finland (2008), Hong Kong (1998-2007), Indonesia (1998[b], 1999[c], 2000-2002), Lao PDR (2006-2008) Netherlands (1997; 2000-2001; 2004-2007), Norway (1997); Poland (1997-1999; 2004-2007), Romania (2000; 2005-2007), Serbia (2003-2004, 2008), Thailand (1997[a]), Ukraine (1998; 2000; 2002); Venezuela (1998-1999)
Nonperforming Loans to Capital		Canada (1997-1999), People's Republic of China (2005-2006), France (2008), Germany (2008), Hong Kong (2003), Indonesia (2007-2008), Italy (2004-2007), Japan (2004-2007), Lithuania (2001-2002), Poland (2008), Romania (2006-2007), Slovakia (2003-2006), Spain (1998), Taipei (2004), Thailand (2001-2002), Turkey (2007), UK (1999-2002), Ukraine (2004-2005)

Note: According to Laeven and Valencia (2008), on certain years, countries experienced the start of systemic banking crisis ([a]), currency crisis ([b]), and default dates for debt crisis ([c]).

Table 3: Correlation among FSIs and their Lags

		L1.		L1.		L1.		L1.		L1.		L1.
	Regulatory capital to riskweighted capital	**Regulatory capital to riskweighted capital**	**Regulatory Tier 1 capital to risk weighted assets**	**Regulatory Tier 1 capital to risk weighted assets**	**Return on Assets plus capital asset ratio divided by the standard deviation of asset returns**	**Return on Assets plus capital asset ratio divided by the standard deviation of asset returns**	**Bank Nonperforming Loans to Total (Gross) Loans**	**Bank Nonperforming Loans to Total (Gross) Loans**	**Return on Assets**	**Return on Assets**	**Return on Equity**	**Return on Equity**
Regulatory capital to risk weighted capital												
--.	1.000											
L1.	0.951	1.000										
Regulatory Tier 1 capital to risk weighted assets												
--.	0.987	0.949	1.000									
L1.	0.953	0.993	0.952	1.000								
Return on Assets plus capital asset ratio divided by the standard deviation of asset returns												
--.	-0.033	-0.044	-0.013	-0.035	1.000							
L1.	-0.148	-0.135	-0.126	-0.121	0.825	1.000						
Bank Nonperforming Loans to total (gross) Loans												
--.	0.095	0.035	0.074	0.035	-0.139	-0.073	1.000					
L1.	0.138	0.077	0.118	0.073	-0.121	-0.069	0.915	1.000				
Return on Assets												
--.	0.646	0.653	0.650	0.655	0.286	0.238	-0.152	-0.101	1.000			
L1.	0.486	0.505	0.493	0.509	0.340	0.308	-0.146	-0.178	0.888	1.000		
Return on Equity												
--.	0.446	0.456	0.450	0.459	0.348	0.282	-0.279	-0.214	0.876	0.807	1.000	
L1.	0.335	0.373	0.351	0.376	0.383	0.354	-0.269	-0.282	0.773	0.916	0.852	1.000

		L1.		L1.		L1.		L1.		L1.		L1.
	Regulatory capital to riskweighted capital	**Regulatory capital to riskweighted capital**	**Regulatory Tier 1 capital to risk weighted assets**	**Regulatory Tier 1 capital to risk weighted assets**	**Return on Assets plus capital asset ratio divided by the standard deviation of asset returns**	**Return on Assets plus capital asset ratio divided by the standard deviation of asset returns**	**Bank Nonperforming Loans to Total (Gross) Loans**	**Bank Nonperforming Loans to Total (Gross) Loans**	**Return on Assets**	**Return on Assets**	**Return on Equity**	**Return on Equity**
Interest margin to gross income												
--.	-0.198	-0.251	-0.182	-0.216	0.297	0.258	0.063	0.028	0.005	0.101	0.063	0.164
L1.	-0.254	-0.296	-0.256	-0.284	0.228	0.299	0.054	0.044	0.024	0.112	0.005	0.091
Noninterest expenses to gross income												
--.	-0.138	-0.130	-0.143	-0.122	-0.451	-0.386	0.211	0.174	-0.345	-0.386	-0.377	-0.365
L1.	-0.184	-0.222	-0.198	-0.222	-0.447	-0.399	0.207	0.233	-0.347	-0.439	-0.486	-0.505
Liquid asset ratio (using core liquid assets)												
--.	0.634	0.608	0.636	0.617	0.297	0.266	0.345	0.403	0.571	0.405	0.434	0.326
L1.	0.617	0.636	0.630	0.648	0.294	0.241	0.238	0.294	0.610	0.445	0.458	0.358
Liquid asset ratio (using broad liquid assets)												
--.	0.677	0.651	0.676	0.659	0.236	0.198	0.282	0.308	0.589	0.466	0.457	0.352
L1.	0.680	0.693	0.690	0.701	0.167	0.153	0.270	0.277	0.620	0.483	0.468	0.363
bank private credit to bank deposits												
--.	-0.475	-0.465	-0.441	-0.442	0.114	0.172	-0.316	-0.350	-0.107	-0.053	0.086	0.088
L1.	-0.429	-0.406	-0.405	-0.388	0.094	0.218	-0.089	-0.088	-0.155	-0.094	-0.003	0.019
Liquid assets to total short term liabilities												
--.	-0.075	-0.045	-0.031	-0.007	0.323	0.383	-0.176	-0.186	0.078	0.096	0.108	0.137
L1.	-0.045	-0.023	0.000	0.024	0.323	0.406	-0.164	-0.170	0.140	0.103	0.103	0.125

		L1.		L1.		L1.		L1.		L1.		L1.
	Regulatory capital to riskweighted capital	**Regulatory capital to riskweighted capital**	**Regulatory Tier 1 capital to risk weighted assets**	**Regulatory Tier 1 capital to risk weighted assets**	**Return on Assets plus capital asset ratio divided by the standard deviation of asset returns**	**Return on Assets plus capital asset ratio divided by the standard deviation of asset returns**	**Bank Nonperforming Loans to Total (Gross) Loans**	**Bank Nonperforming Loans to Total (Gross) Loans**	**Return on Assets**	**Return on Assets**	**Return on Equity**	**Return on Equity**
Capital to assets ratio												
--.	0.739	0.733	0.729	0.735	0.193	0.130	-0.077	-0.027	0.811	0.660	0.571	0.501
L1.	0.715	0.747	0.715	0.750	0.234	0.188	-0.110	-0.072	0.841	0.712	0.615	0.562
Trading income to total income												
--.	0.162	0.132	0.157	0.140	0.034	0.033	0.402	0.371	-0.025	-0.028	-0.053	-0.070
L1.	0.168	0.203	0.160	0.208	0.000	0.055	0.393	0.317	0.062	0.142	-0.028	0.080
Personnel expenses to noninterest expenses												
--.	0.207	0.224	0.214	0.231	0.514	0.493	-0.083	-0.055	0.489	0.482	0.592	0.576
L1.	0.255	0.290	0.260	0.298	0.466	0.508	-0.064	-0.027	0.564	0.538	0.622	0.610
Spread between reference lending and deposit rates												
--.	0.582	0.539	0.585	0.548	0.168	0.089	0.186	0.213	0.625	0.488	0.421	0.355
L1.	0.576	0.525	0.572	0.533	0.100	0.089	0.188	0.184	0.565	0.435	0.360	0.295
Customer deposits to total (noninterbank) loans												
--.	0.408	0.399	0.394	0.393	-0.031	-0.074	0.203	0.240	0.021	0.007	-0.123	-0.092
L1.	0.455	0.448	0.443	0.441	-0.048	-0.134	0.138	0.180	0.110	0.059	-0.010	-0.032
Average daily turnover ratio in the securities market												
--.	-0.428	-0.457	-0.429	-0.462	-0.258	-0.246	-0.158	-0.103	-0.489	-0.534	-0.341	-0.442
L1.	-0.385	-0.373	-0.381	-0.379	-0.292	-0.280	-0.150	-0.142	-0.458	-0.448	-0.310	-0.329

		L1.		L1.		L1.		L1.		L1.		L1.
	Regulatory capital to riskweighted capital	Regulatory capital to riskweighted capital	Regulatory Tier 1 capital to risk weighted assets	Regulatory Tier 1 capital to risk weighted assets	Return on Assets plus capital asset ratio divided by the standard deviation of asset returns	Return on Assets plus capital asset ratio divided by the standard deviation of asset returns	Bank Nonperforming Loans to Total (Gross) Loans	Bank Nonperforming Loans to Total (Gross) Loans	Return on Assets	Return on Assets	Return on Equity	Return on Equity
NPL to Equity												
--.	-0.332	-0.347	-0.342	-0.355	-0.276	-0.222	0.595	0.508	-0.619	-0.546	-0.746	-0.646
L1.	-0.426	-0.459	-0.439	-0.468	-0.167	-0.120	0.528	0.575	-0.573	-0.502	-0.606	-0.536
Equity to Asset												
--.	0.528	0.504	0.538	0.516	0.062	0.057	0.258	0.220	0.557	0.525	0.389	0.386
L1.	0.516	0.490	0.528	0.505	0.151	0.060	0.215	0.182	0.489	0.501	0.393	0.394
NPL to Capital												
--.	0.479	0.406	0.485	0.410	0.032	-0.047	0.174	0.114	0.345	0.366	0.363	0.315
L1.	0.526	0.476	0.563	0.480	0.058	-0.010	0.126	0.169	0.389	0.341	0.377	0.326

		L1.		L1.		L1.		L1.		L1.		L1.
	Interest margin to gross income	Interest margin to gross income	Non-interest expenses to gross income	Non-interest expenses to gross income	Liquid asset ratio (using core liquid assets)	Liquid asset ratio (using core liquid assets)	Liquid asset ratio (using broad liquid assets)	Liquid asset ratio (using broad liquid assets)	bank private credit to bank deposits	bank private credit to bank deposits	Liquid assets to total short term liabilities	Liquid assets to total short term liabilities
Interest margin to gross income												
--.	1.000											
L1.	0.445	1.000										

		L1.		L1.		L1.		L1.		L1.		L1.
	Interest margin to gross income	**Interest margin to gross income**	**Non-interest expenses to gross income**	**Non-interest expenses to gross income**	**Liquid asset ratio (using core liquid assets)**	**Liquid asset ratio (using core liquid assets)**	**Liquid asset ratio (using broad liquid assets)**	**Liquid asset ratio (using broad liquid assets)**	**bank private credit to bank deposits**	**bank private credit to bank deposits**	**Liquid assets to total short term liabilities**	**Liquid assets to total short term liabilities**
Noninterest expenses to gross income												
--.	0.370	-0.162	1.000									
L1.	-0.055	0.398	0.298	1.000								
Liquid asset ratio (using core liquid assets)												
--.	-0.048	-0.112	-0.224	-0.241	1.000							
L1.	-0.049	-0.172	-0.146	-0.251	0.941	1.000						
Liquid asset ratio (using broad liquid assets)												
--.	-0.100	-0.077	-0.304	-0.310	0.830	0.778	1.000					
L1.	-0.112	-0.093	-0.212	-0.268	0.784	0.805	0.957	1.000				
bank private credit to bank deposits												
--.	0.191	0.163	0.016	-0.006	-0.438	-0.377	-0.491	-0.458	1.000			
L1.	0.162	0.144	0.043	0.045	-0.338	-0.280	-0.387	-0.353	0.805	1.000		
Liquid Assets to Short-Term Liabilities												
--.	0.231	-0.123	0.032	-0.355	0.051	0.170	0.051	0.079	0.429	0.409	1.000	
L1.	0.190	0.259	-0.143	0.019	0.105	0.200	0.086	0.137	0.430	0.429	0.656	1.000
Capital to assets ratio												
--.	-0.175	-0.197	-0.229	-0.269	0.638	0.675	0.561	0.577	-0.239	-0.229	0.134	0.161
L1.	-0.145	-0.158	-0.265	-0.318	0.635	0.687	0.593	0.620	-0.205	-0.201	0.176	0.211

		L1.		L1.		L1.		L1.		L1.		L1.
	Interest margin to gross income	Interest margin to gross income	Non-interest expenses to gross income	Non-interest expenses to gross income	Liquid asset ratio (using core liquid assets)	Liquid asset ratio (using core liquid assets)	Liquid asset ratio (using broad liquid assets)	Liquid asset ratio (using broad liquid assets)	bank private credit to bank deposits	bank private credit to bank deposits	Liquid assets to total short term liabilities	Liquid assets to total short term liabilities
Trading income to total income												
--.	0.095	0.003	0.030	0.051	0.200	0.114	0.239	0.163	-0.233	-0.083	0.183	0.116
L1.	0.022	0.145	-0.005	0.012	0.178	0.145	0.224	0.225	-0.235	-0.052	0.087	0.186
Personnel expenses to noninterest expenses												
--.	0.018	-0.186	-0.292	-0.495	0.391	0.397	0.288	0.248	0.313	0.291	0.440	0.359
L1.	0.042	-0.039	-0.247	-0.370	0.400	0.410	0.281	0.280	0.289	0.298	0.431	0.431
Spread between reference lending and deposit rates												
--.	-0.063	-0.046	-0.305	-0.239	0.584	0.578	0.613	0.591	-0.133	-0.065	0.281	0.321
L1.	-0.051	-0.064	-0.192	-0.241	0.536	0.567	0.551	0.570	-0.117	-0.051	0.304	0.308
Customer deposits to total (noninterbank) loans												
--.	-0.086	-0.049	-0.061	-0.047	0.359	0.294	0.451	0.395	-0.893	-0.725	-0.248	-0.254
L1.	-0.095	-0.071	-0.082	-0.070	0.390	0.344	0.516	0.482	-0.877	-0.820	-0.274	-0.280
Average daily turnover ratio in the securities market												
--.	-0.242	-0.127	0.137	0.263	-0.528	-0.542	-0.575	-0.553	0.300	0.204	-0.197	-0.183
L1.	-0.193	-0.212	0.254	0.188	-0.529	-0.517	-0.579	-0.529	0.317	0.242	-0.137	-0.173
NPL to Equity												
--.	0.031	0.165	0.310	0.461	-0.230	-0.284	-0.206	-0.207	-0.228	-0.035	-0.358	-0.314
L1.	0.170	0.140	0.280	0.286	-0.187	-0.249	-0.204	-0.241	-0.227	-0.071	-0.300	-0.355

		L1.		L1.		L1.		L1.		L1.		L1.
	Interest margin to gross income	Interest margin to gross income	Non-interest expenses to gross income	Non-interest expenses to gross income	Liquid asset ratio (using core liquid assets)	Liquid asset ratio (using core liquid assets)	Liquid asset ratio (using broad liquid assets)	Liquid asset ratio (using broad liquid assets)	bank private credit to bank deposits	bank private credit to bank deposits	Liquid assets to total short term liabilities	Liquid assets to total short term liabilities
Equity to Asset												
--.	-0.183	0.051	-0.273	-0.051	0.520	0.518	0.455	0.463	-0.211	-0.172	0.101	0.215
L1.	-0.172	-0.274	-0.329	-0.352	0.524	0.508	0.476	0.405	-0.165	-0.119	0.196	0.137
NPL to Capital												
--.	0.028	0.040	-0.105	-0.131	0.282	0.267	0.445	0.475	-0.190	-0.171	-0.167	-0.161
L1.	0.064	0.039	-0.110	-0.123	0.374	0.310	0.500	0.502	-0.209	-0.188	-0.176	-0.178

		L1.		L1.		L1.		L1.		L1.		L1.
	Capital to assets ratio	Capital to assets ratio	Trading income to total income	Trading income to total income	Personnel expenses to noninterest expenses	Personnel expenses to noninterest expenses	Spread between reference lending and desposit rates	Spread between reference lending and desposit rates	bank private credit to bank	bank private credit to bank	Average daily turnover ratio in the securities market	Average daily turnover ratio in the securities market
Capital to assets ratio												
--.	1.000											
L1.	0.966	1.000										
Bstigi												
--.	0.073	0.052	1.000									
L1.	0.153	0.148	0.550	1.000								

	L1.		L1.		L1.		L1.		L1.		L1.	
Personnel expenses to noninterest expenses												
--.	0.424	0.435	0.154	0.108	1.000							
L1.	0.489	0.510	0.191	0.241	0.909	1.000						
Spread between reference lending and deposit rates												
--.	0.651	0.631	0.150	0.183	0.450	0.474	1.000					
L1.	0.645	0.621	0.071	0.116	0.385	0.395	0.887	1.000				
Customer deposits to total (noninterbank) loans												
--.	0.133	0.124	0.338	0.336	-0.359	-0.330	0.064	0.046	1.000			
L1.	0.166	0.159	0.272	0.269	-0.346	-0.331	0.081	0.066	0.959	1.000		
Average daily turnover ratio in the securities market												
--.	-0.428	-0.487	-0.151	-0.285	-0.131	-0.215	-0.481	-0.452	-0.323	-0.309	1.000	
L1.	-0.348	-0.412	-0.243	-0.140	-0.092	-0.176	-0.470	-0.416	-0.338	-0.327	0.851	1.000
NPL to Equity												
--.	-0.540	-0.555	0.087	0.015	-0.632	-0.622	-0.325	-0.298	0.208	0.099	0.115	0.042
L1.	-0.555	-0.594	-0.061	0.027	-0.516	-0.550	-0.335	-0.323	0.207	0.133	0.081	0.102
Equity to Asset												
--.	0.578	0.571	0.416	0.588	0.293	0.449	0.557	0.484	0.213	0.210	-0.438	-0.422
L1.	0.544	0.544	0.432	0.411	0.432	0.382	0.532	0.451	0.205	0.185	-0.439	-0.402

	L1.		L1.		L1.		L1.		L1.		L1.	
NPL to Capital												
--.	0.125	0.154	-0.077	0.037	0.089	0.089	0.187	0.205	0.194	0.251	-0.156	-0.150
L1.	0.150	0.162	-0.042	-0.007	0.114	0.112	0.207	0.159	0.214	0.275	-0.168	-0.165

NPL to Equity	NPL to Equity	NPL to Equity	Equity to Asset	Equity to Asset	NPL to Capital	NPL to Capital
--.	1.000					
L1.	0.777	1.000				
Equity to Asset						
--.	-0.275	-0.388	1.000			
L1.	-0.302	-0.332	0.766	1.000		
NPL to Capital						
--.	0.013	-0.049	0.157	0.153	1.000	
L1.	-0.030	-0.030	0.154	0.161	0.792	1.000

Table 4: Loadings of Rotated Factors and Unique Variances of FSIs resulting from a Factor Analysis[38] of Available FSIs

Variable	Factor1	Factor2	Factor3	Uniqueness
Regulatory capital to risk weighted capital	0.7955	0.3206	0.1017	0.254
Regulatory Tier 1 capital to risk weighted assets	0.758	0.3451	0.1064	0.295
Return on assets plus capital asset ratio divided by the standard deviation of asset returns	-0.2104	0.2161	-0.1613	0.883
Bank Nonperforming Loans to Total (Gross) Loans	0.2446	-0.5247	-0.0617	0.661
Return on Assets	0.297	0.7917	-0.1268	0.2689
Return on Equity	0.0921	0.7754	-0.139	0.3709
Interest margin to gross income	-0.0295	0.0343	0.9366	0.1208
Noninterest expenses to gross income	0.0026	-0.1169	0.9578	0.0689
Liquid assets to total assets (liquid asset ratio)	0.5784	0.1354	-0.1752	0.6164
Liquid assets to total assets (liquid asset ratio)	0.7392	0.0858	-0.1536	0.4226
bank private credit to bank deposits	-0.6715	0.3689	0.0546	0.41
Liquid assets to total short term liabilities	0.0134	0.4408	-0.0179	0.8052
Capital to assets ratio	0.6224	0.3984	-0.0366	0.4526
Personnel expenses to noninterest expenses	0.0283	0.4053	-0.036	0.8336
Spread between reference lending and deposit rates	0.4001	0.0769	-0.0192	0.8337
Customer deposits to total (noninterbank) loans	0.7072	-0.3293	-0.0614	0.3877
Average daily turnover ratio in the securities market	-0.3517	-0.208	0.0355	0.8318
NPL to Equity	-0.0784	-0.695	-0.0807	0.5044
Equity to Asset	0.3585	0.3922	-0.1036	0.7069
NPL to Capital	0.298	0.0388	-0.054	0.9067

[38] Three unrotated factors were already explaining nearly eighty percent of the total variation in the FSIs.

Table 5: Descriptive Statistics for Economy-level key FSIs and non-FSIs, 1993-2008

Variable	Mean	Standard Deviation			Number of Observations	Number of Economies
		Overall	Between	Within		
Customer deposits to total (noninterbank) loans	118.0766	79.76567	51.00061	61.84559	890	58
Bank Nonperforming Loans to Total (Gross) Loans	7.559694	9.222772	8.905672	6.679523	817	58
Liquid assets to total assets (liquid asset ratio)	0.311362	0.150589	0.117302	0.10018	836	57
Return on Assets	0.990821	1.796567	1.093451	1.574462	894	57
Real GDP growth rate	4.21241	5.206988	2.561884	4.584035	865	58
Inflation	27.16876	204.6201	64.61827	194.208	885	15.8036
D.Lending Rate	-3.76209	54.62469	13.1682	52.86622	736	55
L.Domestic credit provided by banking sector	75.15958	57.82877	55.0562	17.96437	845	58
GDP per capita	15626.74	12672.36	12581.07	2230.017	867	58
Stock volatility	552.2126	1062.587	706.0482	786.5039	759	54
Unemployment Rate	8.209395	4.333872	5.077867	2.104174	709	56

Table 6: Determinants of Capital Adequacy
(as measured by Bank Customer Deposits to Total Loans)

Variables	Fixed Effects	Dynamic Model				
	All economies	All economies	Developed Economies	Emerging Asia	Emerging Europe	Emerging Latin America
L.Bank Customer Deposits to Total Loans	0.6721**	0.3592***	0.7376***	0.5682***	0.4199***	0.5894***
	(0.09)	(0.03)	(0.07)	(0.07)	(0.06)	(0.07)
Return on Assets	100.0000	120.0000***	-9.9140	180.0000***	88.8732**	120.0000***
	(34.07)	(10.36)	(17.03)	(25.08)	(29.23)	(19.52)
L. Return on Assets	-65.0000	-26.0000*	4.7890	-140.0000***	-25.0000	-97.0000***
	(26.63)	(10.67)	(16.70)	(27.94)	(25.34)	(23.05)
Real GDP growth rate	-0.3655	-0.5107*	-0.1383	0.0720	-0.0455	-0.4505
	(0.18)	(0.26)	(0.71)	(0.62)	(0.61)	(0.51)
D.Lending Rate	-0.0970	-0.2175*	0.4416	-1.3364	0.0944	-0.2885
	(0.11)	(0.10)	(1.04)	(0.79)	(0.13)	(0.21)
L.Domestic credit provided by banking sector	0.0597	0.3754***	-0.0046	-0.0106	0.3632*	0.4756*
	(0.11)	(0.07)	(0.09)	(0.11)	(0.15)	(0.23)
GDP per capita	-0.0017	-0.0024*	0.0011	0.0001	-0.0015	-0.0045
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Stock volatility	-0.0026	-0.0015	-0.0012	-0.0082	-0.0023	-0.0048*
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
CONSTANT	51.1234	56.3561***	-9.9655	38.0238*	58.8786**	57.4520
	(19.92)	(14.49)	(51.56)	(15.79)	(19.41)	(32.00)
Observations	527	474	152	109	122	91
Number of Groups	48	48	16	10	14	8
Number of Instruments		113	99	96	111	91

Note: Standard errors in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%; Time dummies included but not reported.

Table 7: Determinants of Bank Nonperforming Loans to Total Loans

Variables	Fixed Effects	Dynamic Model				
	All economies	All economies	Developed Economies	Emerging Asia	Emerging Europe	Emerging Latin America
L.Bank Nonperforming Loans to Total (Gross) Loans	0.5374***	0.4249***	0.1632**	0.4695***	0.4833***	0.0802
	(0.02)	(0.03)	(0.05)	(0.10)	(0.05)	(0.11)
Return on Assets	-1.3103**	-1.5044***	-0.3710**	-2.2293***	-1.7236***	-0.8237***
	(0.19)	(0.15)	(0.13)	(0.40)	(0.42)	(0.20)
L. Return on Assets	0.1197	0.1976	0.0840	0.7297*	-0.2257	-0.4834
	(0.35)	(0.13)	(0.13)	(0.30)	(0.35)	(0.26)
Real GDP growth rate	-0.3204*	-0.5009***	-0.4385***	-0.1335	-0.7502***	-0.1491
	(0.07)	(0.07)	(0.05)	(0.24)	(0.19)	(0.08)
Inflation	0.0017	0.0119	-0.3687***	-0.2368	0.0028	0.1456***
	(0.01)	(0.02)	(0.07)	(0.17)	(0.03)	(0.03)
L.Domestic credit provided by banking sector	0.0094	0.0590**	0.0142**	0.0166	0.0323	-0.0493
	(0.01)	(0.02)	(0.00)	(0.04)	(0.05)	(0.06)
Unemployment rate	0.0342	-0.2753*	-0.0201	0.1964	-0.1375	0.0400
	(0.02)	(0.13)	(0.06)	(0.43)	(0.23)	(0.16)
CONSTANT	51.1234	56.3561**	-9.9655***	38.0238	58.8786	57.4520*
	(19.92)	(14.49)	(51.56)	(15.79)	(19.41)	(32.00)
Observations	527	474	152	109	122	91
Number of Groups	48	48	16	10	14	8
Number of Instruments		113	99	96	111	91

References

Ades, A, R. Masih and D. Tenengauzer. 1999. A Look Through the Rear View Mirror. *GS Watch* September. New York, US: Goldman Sachs.

Albertazzi, U. and L. Gambacorta. 2009. Forthcoming. Bank Profitability and the Business Cycle. *Journal of Financial Stability*.

Allen, L. and A. Saunders. 2003. A Survey of Cyclical Effects in Credit Risk Measurement Models. *BIS Working Paper* No. 126. Geneva, Switzerland: Bank for International Settlements.

Alves, I. 2005. Sectoral Fragility: Factors and Dynamics. Investigating the Relationship between the Financial and Real Economy. *BIS Working Paper* No. 22. Geneva, Switzerland: Bank for International Settlements.

Arellano, M. and S. Bond. 1991. Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations. *Review of Economic Studies.* Vol. 58. pp. 277–297.

Asian Development Bank (ADB). 2005. *Early Warning Systems for Financial Crises: Application to East Asia*. New York, US: Palgrave McMillian.

Avouyi-Dovi, S. and J. Matheron. 2005. Interactions Between Business Cycles, Financial Cycles And Monetary Policy: Stylized Facts. *BIS Working Paper* No. 22. Geneva, Switzerland: Bank for International Settlements.

Babihuga, R. 2007. Macroeconomic and Financial Soundness Indicators: An Empirical Investigation. *IMF Working Paper* 115. Washington DC, US: International Monetary Fund.

Balakrishnan, R., S. Danninger, S. Elekdag and I. Tytell. 2009. How Linkages Fuel the Fire: The Transmission of Financial Stress from Advanced to Emerging Economies. *World Economic Outlook*. April. Washington DC, US: International Monetary Fund Research Department.

Bank of England. 2009. The Role of Macroprudential Policy. *A Discussion Paper*. November. London, UK. Bank of England.

Barrell, R. E., P. Davis, and O. Pomerantz. 2006. Costs of Financial Instability, Household-Sector Balance Sheets, and Consumption. *Journal of Financial Stability*. Vol. 2. pp. 194–216.

Berg, A., E. Borensztein and C. A. Pattillo. 2004. Assessing Early Warning Systems: How Have They Worked in Practice? *IMF Working Paper* No. 04/52. Washington DC, US: International Monetary Fund.

Bhattacharyay, B. 2004. A Quantitative Framework for Macroprudential-Financial Soundness Analysis for Monitoring Economic and Financial Vulnerability. November. Unpublished.

Bordo, M., B. Eichengreen, D. Klingebiel and M. S. Martinez-Peria. 2001. Is the Crisis Problem Growing More Severe? *Economic Policy*. Vol. 32. pp. 51–82.

Borio, C. and P. Lowe. 2002a. Asset Prices, Financial and Monetary Stability: Exploring the Nexus. *BIS Working Paper* No. 114. Geneva, Switzerland: Bank for International Settlements.

Borio, C. and P. Lowe. 2002b. Assessing the Risk of Banking Crises. *BIS Quarterly Review*. December. pp. 43–54.

Borio, C. 2003. Towards A Macroprudential Framework for Financial Supervision and Regulation? *BIS Working Paper* No. 128. Geneva, Switzerland: Bank for International Settlements.

Borio, C. 2004. Market Distress and Vanishing Liquidity: Anatomy and Policy Options. *BIS Working Paper* No. 158. Geneva, Switzerland: Bank for International Settlements.

Borio, C. 2007. Change and Constancy in The Financial System: Implications for Financial Distress and Policy. *BIS Working Paper* No. 237. Geneva, Switzerland: Bank for International Settlements.

Borio, C. and I. Shim. 2007. What Can (Macro-)Prudential Policy Do to Support Monetary Policy? *BIS Working Paper* No. 242. Geneva, Switzerland: Bank for International Settlements.

Borio, C. and M. Drehmann. 2009. Assessing the Risk of Banking Crises–Revisited. *BIS Quarterly Review*. March. pp. 29–46.

Bowles, S. 2003. *Microeconomics: Behavior, Institutions, and Evolution*. Princeton, US: Princeton University Press.

Boyd, J., G. De Nicolò and E. Loukoianova. 2009. Banking Crises and Crisis Dating: Theory and Evidence. *IMF Working Paper* No. 09/141. Washington DC, US: International Monetary Fund.

Bussiere, M. and M. Fratzscher. 2006. Towards A New Early Warning System Of Financial Crises. *Journal of International Money and Finance*. Vol. 25 (6). pp. 953–973.

Calvo, G. 2005. Crises in Emerging Market Economies: A Global Perspective. *NBER Working Paper* No. 11305. Cambridge, US: National Bureau for Economic Research.

Caprio, G. and D. Klingebiel. 1996. Bank Insolvencies: Cross-Country Experience. *Policy Research Working Paper* No.1620. Washington DC, US: World Bank.

Caprio, G., D. Klingebiel, L. Laeven and G. Noguera. 2005. Appendix: Banking Crisis Database. In Patrick Honohan and Luc Laeven (eds.). *Systemic Financial Crises: Containment and Resolution.* Cambridge, UK: Cambridge University Press.

Centennial Group. 2009. The 2009 Centennial Index of Financial Development and Strength Measuring & Comparing Financial System Attributes Across Countries & Time: Introduction & Methodology. Washington DC, US: The Centennial Group.

Chen, S. and M. Ravallion. 2001. How Did the World's Poorest Fare in the 1990s? *Review of Income and Wealth*. Vol. 47 (3). pp. 283–300.

Čihák, M. and K. Schaeck. 2007. How Well Do Aggregate Bank Ratios Identify Banking problems? *IMF Working Paper* No. 07/275*.* Washington DC, US: International Monetary Fund.

Cottarelli, C. and J. Vinals. 2009. Looking Ahead. *Finance and Development*. September. Washington DC, US: International Monetary Fund.

Coudert, V. and M. Gex. 2008. Does Risk Aversion Drive Financial Crises? Testing the Predictive Power of Empirical Indicators. *Journal of Empirical Finance*. Vol. 15 (2). pp. 167–184.

Crockett, A. 2009. Rebuilding the Financial Architecture. *Finance and Development.* Washington DC, US: International Monetary Fund.

Crotty, J. 2007. If Financial Market Competition Is So Intense, Why Are Financial Firm Profits So High? Reflections on the Current 'Golden Age' of Finance. *Political Economy Research Institute Working Paper* No. 134*.* Amherst, US: University of Massachusetts.

Davis, E. Philip and D. Karim. 2008. Comparing Early Warning Systems for Banking Crises. *Journal of Financial Stability*. Vol. 4 (2). pp. 89–120.

DeLong, J. Bradford, A. Shleifer, L. Summers, and R. Waldman. 1990. Noise Trader Risk in Financial Markets. *Journal of Political Economy.* Vol. 98 (4). pp. 703–738.

Demirgüç-Kunt, A. and E. Detragiache. 1997. The Determinants of Banking Crises: Evidence from Industrial and Developing Countries. *World Bank Policy Research Working Paper Series* No. 1828*.* Washington DC, US: World Bank.

Demirgüç-Kunt, A. and E. Detragiache. 1999. Monitoring Banking Sector Fragility: A Multivariate Logit Approach. *IMF Working Paper* No. 99/147. Washington DC, US: International Monetary Fund.

Demirgüç-Kunt, A. and E. Detragiache. 2002. Does Deposit Insurance Increase Banking System Stability? An Empirical Investigation. *Journal of Monetary Economics*. Vol. 49 (7). pp. 1373–1406.

Demirgüç-Kunt, A., E. Detragiache and P. Gupta. 2006. Inside the Crisis: An Empirical Analysis of Banking Systems In Distress. *Journal of International Money and Finance*. Vol. 25 (5). pp. 702–718.

Demirguc-Kunt, A. and H. Huizinga. 1999 Determinants of Commercial Bank Interest Margins and Profitability: Some International Evidence. *World Bank Economic Review*. Vol. 13 (2). pp. 379–408.

DeYoung, R. and T. Rice. 2004. Noninterest Income and Financial Performance at US Commercial Banks. *The Financial Review*. Vol. 39. pp. 101–127.

Drehmann, M. and M. Manning. 2004. *Systematic factors influencing UK equity returns*. London, UK: Bank of England.

Davies, H. 2009. Pricking Bubbles in the Wind. David Finch Lecture at the University of Melbourne. Melbourne, Australia. August.

Easterly, W. and A. Kraay. 1999. Small States, Small Problems? *World Bank Policy Research Working Paper* No. 2139. Washington DC, US: World Bank.

Eichengreen, B. 2004. Financial Instability. Paper written on behalf of the Copenhagen Consensus and presented in Copenhagen on 25–28 May 2004.

Einhorn, D. 2008. Private Profits and Socialized Risk. *Global Association of Risk Professionals*. Issue 42. pp. 10–18.

English, W., K. Tsatsaronis and E. Zoli. 2005. Assessing the Predictive Power of Measures of Financial Conditions for Macroeconomic Variables. *BIS Working Paper* No. 22. Geneva, Switzerland: Bank for International Settlements.

Estrella, A. 2004. The Cyclical Behavior of Optimal Bank Capital. *Journal of Banking and Finance*. Vol. 28 (6). pp. 1469–1498.

Evans, O., A. M. Leone, M. Gill and P. Hilbers. 2000. Macroprudential Indicators of Financial System Soundness. *IMF Occasional Paper* 192. Washington DC, US: International Monetary Fund: Washington DC.

Evjen, S., A. J Lund, K. Haare Morka, K. B. Nordal and I. Svendsen. 2005. Monetary and Financial Stability In Norway: What Can We Learn From Macroeconomic Stress Tests? *BIS Paper* No. 22. Geneva, Switzerland: Bank for International Settlements.

Fernald, J. G. and O. Babson. 1999. Why Has China Survived the Asian Crisis So Well? What Risks Remain? *Federal Reserve Board International Finance Discussion Paper* No. 633. Washington DC: US Federal Reserve.

Filosa, R. 2007. Stress Testing The Stability Of The Italian Banking System: A VAR Approach. *Heterogeneity and Monetary Policy Working Paper* No. 0703. Modena, Italy: Universita di Modena e Reggio Emilia, Dipartimento di Economia Politica.

Fisher, I. 1933. The Debt-Deflation Theory of Great Depressions. *Econometrica.* Princeton, NJ: The Econometrics Society.

Fitch Ratings. 2005. Assessing Bank Systemic Risk: A New Product. *Fitch Ratings Criteria Report*. New York, US: Fitch Ratings.

Gavin, M. and R. Hausmann. 1998. The Roots of Banking Crises: The Macroeconomic Context in *Banking Crises in Latin America*. Washington DC, US: Inter-american Development Bank.

Gerlach, S., W. Peng; and C. Shu. 2005. Macroeconomic Conditions and Banking Performance in Hong Kong SAR: A Panel Data Study. *BIS Paper* No. 22. Geneva, Switzerland: Bank for International Settlements.

Gerschenkron, A. 1962. *Economic Backwardness in Historical Perspective: A Book of Essays.* Cambridge, US: Harvard University Press.

Glick, R., X. Guo and M. Hutchison. 2006. Currency Crises, Capital-Account Liberalization, and Selection Bias. *Review of Economics and Statistics*. 88 (4). pp. 698–714.

Goldstein, M., G. Kaminsky and C. Reinhart. 2000. *Assessing Financial Vulnerability: An Early Warning System for Emerging Markets*. Washington DC, US: Institute for International Economics.

Goldstein, M. and P. Turner. 1996. Banking Crises in Emerging Economies: Origins and Policy Options. *BIS Paper* No. 46*.* Geneva, Switzerland: Bank for International Settlements.

Ghosh, A., J. Ostry and N. Tamirisa. 2009. Anticipating the Next Crisis. *Finance and Development*. September. Washington, DC, US: International Monetary Fund.

Gray, D., R. Merton and Z. Bodie. 2008. New Framework for Measuring and Managing Macrofinancial Risk and Financial Stability. *Harvard Business School Working Paper* No. 09-015. Cambridge, US: University of Harvard.

Hanschel, E. and P. Monnin. 2005. Measuring and Forecasting Stress in the Banking Sector: Evidence From Switzerland. *BIS Paper* No. 22. Geneva, Switzerland: Bank for International Settlements.

Hersh, A. S. and C. E. Weller. 2007. Financial Liberalization in Eastern Europe: Fortunate Fetters of Financial Underdevelopment? In Bagchi, Amiya and Gary Dymski (eds.). *Developing Nations in Global Finance: Integration, Exclusion, and Speed Breakers*. Delhi, India: Tulika Books.

Hoggarth, G., A. Logan and L. Zicchino. 2005. Macro Stress Tests of UK Banks. *BIS Paper* No. 22. (Also appeared in *Bank of England Working Paper* No. 282.) Geneva, Switzerland: Bank for International Settlements.

Hoggarth, G., R. Reis and V. Sparta. 2001. Costs of Banking System Instability: Some Empirical Evidence. *Bank of England Working Paper* No. 144. London, UK: Bank of England.

Hoggarth, G., S. Sorensen and L. Zicchino. 2005. Stress Tests of UK Banks Using a VAR Approach. *Bank of England Working Paper* No. 282. London, UK: Bank of England.

International Monetary Fund. 2008. Chapter 4: Financial Stress and Economic Downturns. *World Economic Outlook.* October. Washington DC, US: International Monetary Fund.

International Monetary Fund. 2006. *Financial Soundness Indicators: Compilation Guide.* Washington DC, US: International Monetary Fund.

Jacobsen, T., J. Linde and K. Roszbach. 2005. Exploring Interactions Between Real Activity and the Financial Stance. *Journal of Financial Stability*. Vol. 1 (3). pp. 308–341.

Kaplan, E. and D. Rodrik. 1999. Did the Malaysian Capital Controls Work? *NBER Working Paper* No. 8142. Cambridge, US: National Bureau for Economic Research.

Kaminsky, G. and C. Reinhart. 1999. The Twin Crises: The Causes of Banking and Balance-of-Payments Problems. *American Economic Review.* Vol. 89 (3). pp. 473–500.

Kindleberger, C.. 1978. *Manias, Panics, and Crashes: A History of Financial Crises*. New York: John Wiley & Sons.

Laeven, L. and F. Valencia. 2008. The Use of Blanket Guarantees in Banking Crises. Mimeo. Washington DC, US: International Monetary Fund.

Lindgren, C-J. G. Garcia and M. Saal. 1996. *Bank Soundness and Macroeconomic Policy*. Washington DC, US: International Monetary Fund.

Lustig, N. 2000. Crises and the Poor: Socially Responsible Macroeconomics. *Sustainable Development Department Technical Paper Series* No. POV-108. Washington DC, US: Inter-American Development Bank.

Mörttinen, L., P. Poloni, P. Sandars and J. Vesala. 2005. Analysing Banking Sector Conditions: How to Use Macro-Prudential Indicators. *European Central Bank Occasional Paper Series* No. 26. Frankfurt, Germany: European Central Bank.

Merton, R. 1974. On the Pricing of Corporate Debt: The Risk Structure of Interest Rates. *Journal of Finance*. Vol. 29. pp 449–70.

Minsky, H. 1975. *John Maynard Keynes*. New York, US: Columbia University Press.

Minsky, H. 1986. *Stabilizing an Unstable Economy*. New Haven, US: Yale University Press.

Nakornthab, D., K. Kritayakirana and S. Chantapant. 2007. Are Thai Banks Vulnerable? Structural Analysis of Bank Corporate Loan Portfolio and Implications. Presented at Bank of Thailand Symposium 2007. Bangkok, Thailand.

Obstfeld, M.. 2009. International Finance and Growth in Developing Countries: What Have We Learned? *NBER Working Paper* No. 14691. Cambridge, US: National Bureau for Economic Research.

Ostrom, E. 1990. *Governing the Commons. The Evolution of Institutions for Collective Action*. Cambridge, UK: Cambridge University Press.

Pesaran, M. T. Hashem, B. Schuermann, J. Treutler and S. M. Weiner. 2006. Macroeconomic Dynamics and Credit Risk: A Global Perspective. *Journal of Money, Credit, and Banking*. Vol. 38 (5). pp. 1211–1261.

Pollin, R. 1995. Financial Structures and Egalitarian Economic Policy. *New Left Review*. Vol. 214 (I). pp. 26–61.

Pollin, R. 1997. The Relevance of Hyman Minsky. *Challenge*. Vol. 40 (2). pp. 75–94.

Podpiera, R. 2006. Does Compliance with Basel Core Principles Bring Any Measurable Benefits? *IMF Staff Papers*. Vol. 53 (2). Washington DC, US: International Monetary Fund.

Rajan, R. 2005. Has Financial Development Made the World Riskier? *NBER Working Paper* No. W11728. Cambridge, US: National Bureau for Economic Research.

Reinhart, C. and K. Rogoff. 2008. This Time Is Different: A Panoramic View of Eight Centuries of Financial Crises. *NBER Working Paper* No. 13882. Cambridge, US: National Bureau for Economic Research.

Sahel, B. and J. Vesala. 2001. Financial Stability Analysis Using Aggregated Data. *BIS Paper* No. 1. Geneva, Switzerland: Bank for International Settlements.

Schaeck, K. and M. Cihák. 2007. How Well Do Aggregate Bank Ratios Identify Banking Problems? *IMF Working Paper* No. 07/275. Washington DC, US: International Monetary Fund.

Schroeder, S. K. 2002. A Minskian Analysis of Financial Crisis in Developing Countries. *Center For Economic and Policy Analysis Working Paper* No. 2002-09. Washington DC, US: CEPR.

Sorge, M. 2004. Stress-Testing Financial Systems: An Overview of Current Methodologies. *BIS Working Paper* No. 165. Geneva, Switzerland: Bank for International Settlements.

Sorge, M. and K. Virolainen. 2006. A Comparative Analysis of Macro Stress-Testing Methodologies With an Application to Finland. *Journal of Financial Stability*. Vol. 2. pp. 113–151.

Stiroh, K. 2004. Diversification in Banking: Is Noninterest Income the Answer? *Journal of Money, Credit, and Banking*. Vol. 36 (5). pp. 853–882.

Taylor, L. and S. O'Connell. 1985. A Minsky Crisis. *Quarterly Journal of Economics*. Vol. 100. pp. 871–85.

Virolainen, K. 2004. Macro Stress Testing With a Macroeconomic Credit Risk Model for Finland. *Bank of Finland Discussion Paper* No. 18/2004. Helsinki, Finland: Bank of Finland.

Watanagase, T. 2006. Maintaining Financial Stability: The Experience of Thailand. *BIS Paper* No. 28. Geneva, Switzerland: Bank for International Settlements.

Weller, C. E. and A. Hersh. 2004. The Long and Short of It: Global Liberalization and Incomes of the Poor. *Journal of Post-Keynesian Economics*. Vol. 26 (3). pp. 471–504.

Weller, C. E. 2007. The Presence of Multinational Banks and the Supply and Quality of Credit in Emerging Economies. *International Review of Applied Economics*. Vol. 21 (2). pp. 273–92.

White, W. R. 2009. Should Monetary Policy 'Lean or Clean'? *Federal Reserve Bank of Dallas Globalization and Monetary Policy Institute Working Paper* No. 34. Dallas: US Federal Reserve.

Willem van den End, J., M. Hoeberichts and M. Tabbae. 2006. Modeling Scenario Analysis and Macro Stress-Testing. *De Nederlansche Bank Working Paper* No. 119/2006. Amsterdam, Holland: De Nederlansche Bank.

Woolford, I. 2001. Macro-Financial Stability and Macroprudential Analysis. *Reserve Bank of New Zealand Bulletin*. Vol. 64 (3). pp. 29–43. Wellington, New Zealand: Reserve Bank of New Zealand.

Worrell, D. 2004. Quantitative Assessment of the Financial Sector: An Integrated Approach. *IMF Working Paper* No. 04/153. Washington DC, US: International Monetary Fund.

Yellen, J. 2009. A Minsky Meltdown: Lessons for Central Banks. Presentation to the 18th Annual H.P. Minsky Conference on the State of the US and World Economies at the Levy Institute. Annandale-on-Hudson, US. 16–17 April.

Yue, E. 2001. Marrying the Micro- and Macro-Prudential Dimensions of Financial Stability—The Hong Kong Experience. *BIS Paper* No. 1. Geneva, Switzerland: Bank for International Settlements.

ADB Working Paper Series on Regional Economic Integration*

1. “The ASEAN Economic Community and the European Experience” by Michael G. Plummer

2. “Economic Integration in East Asia: Trends, Prospects, and a Possible Roadmap” by Pradumna B. Rana

3. “Central Asia after Fifteen Years of Transition: Growth, Regional Cooperation, and Policy Choices” by Malcolm Dowling and Ganeshan Wignaraja

4. “Global Imbalances and the Asian Economies: Implications for Regional Cooperation” by Barry Eichengreen

5. “Toward Win-Win Regionalism in Asia: Issues and Challenges in Forming Efficient Trade Agreements” by Michael G. Plummer

6. “Liberalizing Cross-Border Capital Flows: How Effective Are Institutional Arrangements against Crisis in Southeast Asia” by Alfred Steinherr, Alessandro Cisotta, Erik Klär, and Kenan Šehović

7. “Managing the Noodle Bowl: The Fragility of East Asian Regionalism” by Richard E. Baldwin

8. “Measuring Regional Market Integration in Developing Asia: a Dynamic Factor Error Correction Model (DF-ECM) Approach” by Duo Qin, Marie Anne Cagas, Geoffrey Ducanes, Nedelyn Magtibay-Ramos, and Pilipinas F. Quising

9. “The Post-Crisis Sequencing of Economic Integration in Asia: Trade as a Complement to a Monetary Future” by Michael G. Plummer and Ganeshan Wignaraja

10. “Trade Intensity and Business Cycle Synchronization: The Case of East Asia” by Pradumna B. Rana

11. "Inequality and Growth Revisited" by Robert J. Barro

12. "Securitization in East Asia" by Paul Lejot, Douglas Arner, and Lotte Schou-Zibell

13. "Patterns and Determinants of Cross-border Financial Asset Holdings in East Asia" by Jong-Wha Lee

14. "Regionalism as an Engine of Multilateralism: A Case for a Single East Asian FTA" by Masahiro Kawai and Ganeshan Wignaraja

15. "The Impact of Capital Inflows on Emerging East Asian Economies: Is Too Much Money Chasing Too Little Good?" by Soyoung Kim and Doo Yong Yang

16. "Emerging East Asian Banking Systems Ten Years after the 1997/98 Crisis" by Charles Adams

17. "Real and Financial Integration in East Asia" by Soyoung Kim and Jong-Wha Lee

18. “Global Financial Turmoil: Impact and Challenges for Asia’s Financial Systems” by Jong-Wha Lee and Cyn-Young Park

19. “Cambodia’s Persistent Dollarization: Causes and Policy Options” by Jayant Menon

20. "Welfare Implications of International Financial Integration" by Jong-Wha Lee and Kwanho Shin

21. "Is the ASEAN-Korea Free Trade Area (AKFTA) an Optimal Free Trade Area?" by Donghyun Park, Innwon Park, and Gemma Esther B. Estrada

22. "India’s Bond Market—Developments and Challenges Ahead" by Stephen Wells and Lotte Schou- Zibell

23. “Commodity Prices and Monetary Policy in Emerging East Asia” by Hsiao Chink Tang

24. "Does Trade Integration Contribute to Peace?" by Jong-Wha Lee and Ju Hyun Pyun

25. “Aging in Asia: Trends, Impacts, and Responses” by Jayant Menon and Anna Melendez-Nakamura

26. “Re-considering Asian Financial Regionalism in the 1990s” by Shintaro Hamanaka

27. “Managing Success in Viet Nam: Macroeconomic Consequences of Large Capital Inflows with Limited Policy Tools” by Jayant Menon

28. “The Building Block versus Stumbling Block Debate of Regionalism: From the Perspective of Service Trade Liberalization in Asia” by Shintaro Hamanaka

29. “East Asian and European Economic Integration: A Comparative Analysis” by Giovanni Capannelli and Carlo Filippini

30. “Promoting Trade and Investment in India’s Northeastern Region” by M. Govinda Rao

31. "Emerging Asia: Decoupling or Recoupling" by Soyoung Kim, Jong-Wha Lee, and Cyn-Young Park

32. “India’s Role in South Asia Trade and Investment Integration” by Rajiv Kumar and Manjeeta Singh

33. “Developing Indicators for Regional Economic Integration and Cooperation” by Giovanni Capannelli, Jong-Wha Lee, and Peter Petri

34. “Beyond the Crisis: Financial Regulatory Reform in Emerging Asia” by Chee Sung Lee and Cyn-Young Park

35. "Regional Economic Impacts of Cross-Border Infrastructure: A General Equilibrium Application to Thailand and Lao PDR" by Peter Warr, Jayant Menon, and Arief Anshory Yusuf

36. "Exchange Rate Regimes in the Asia-Pacific Region and the Global Financial Crisis" by Warwick J. McKibbin and Waranya Pim Chanthapun

37. “Roads for Asian Integration: Measuring ADB's Contribution to the Asian Highway Network” by Srinivasa Madhur, Ganeshan Wignaraja,and Peter Darjes

38. "The Financial Crisis and Money Markets in Emerging Asia" by Robert Rigg and Lotte Schou-Zibell

39. “Complements or Substitutes? Preferential and Multilateral Trade Liberalization at the Sectoral Level” by Mitsuyo Ando, Antoni Estevadeordal, and Christian Volpe Martincus

40. “Regulatory Reforms for Improving the Business Environment in Selected Asian Economies—How Monitoring and Comparative Benchmarking can Provide Incentive for Reform” by Lotte Schou-Zibell and Srinivasa Madhur

41. “Global Production Sharing, Trade Patterns, and Determinants of Trade Flows in East Asia” by Prema–Chandra Athukorala and Jayant Menon

42. “Regionalism Cycle in Asia (-Pacific): A Game Theory Approach to the Rise and Fall of Asian Regional Institutions” by Shintaro Hamanaka

* These papers can be downloaded from: (ARIC) http://aric.adb.org/reipapers/ or (ADB) www.adb.org/publications/category.asp?id=2805

A Macroprudential Framework for Monitoring and Examining Financial Soundness

Lotte Schou-Zibell, Jose Ramon Albert and Lei Lei Song describe concepts and tools behind macroprudential monitoring, and the growing importance of macroprudential tools for assessing the stability of financial systems. Using data from selected developing economies in Asia, South America, and Europe, as well as selected economies from the developed world, they also estimate panel regressions to quantify the impacts of the major influences on key financial soundness indicators, including capital adequacy, asset quality, and earnings and profitability.

About the Asian Development Bank

ADB's vision is an Asia and Pacific region free of poverty. Its mission is to help its developing member countries substantially reduce poverty and improve the quality of life of their people. Despite the region's many successes, it remains home to two thirds of the world's poor: 1.8 billion people who live on less than $2 a day, with 903 million struggling on less than $1.25 a day. ADB is committed to reducing poverty through inclusive economic growth, environmentally sustainable growth, and regional integration.

Based in Manila, ADB is owned by 67 members, including 48 from the region. Its main instruments for helping its developing member countries are policy dialogue, loans, equity investments, guarantees, grants, and technical assistance.

Asian Development Bank
6 ADB Avenue, Mandaluyong City
1550 Metro Manila, Philippines
www.adb.org/poverty
Publication Stock No.

Printed in the Philippines