

LEADING INDICATORS FOR MONITORING THE STABILITY OF ASSET AND FINANCIAL MARKETS IN ASIA AND THE PACIFIC

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The Asian economic and financial crisis of 1997 has spawned a considerable body of analysis as to its origin, causes and resolution. It is generally recognized that structural weaknesses of the financial systems of the affected countries were at the core of the problem. It follows from this that monitoring the stability of financial markets, including asset markets, and devising early warning systems for problems in these markets would enable the authorities to deal better with potential crises and to develop more effective policy interventions to that end. The Asian Development Bank has undertaken the development of a system of MPIs macroprudential indicators (MPIs) to facilitate cross-country comparisons of economic and financial vulnerability in the Asian and Pacific region. This paper evaluates the significance of the MPIs chosen for this purpose and highlights the need for a core set of leading indicators for giving early warning of financial vulnerability.

In 1997, Thailand, Malaysia, Indonesia, the Philippines and the Republic of Korea reeled from a devastating financial crisis. Following years of robust growth, positive strides in standards of living and export expansion, these economies suffered from crippling devaluations, massive capital flight, corporate and banking failures and spikes in unemployment. In contrast with the substantial capital inflows in the early 1990s, close to US\$100 billion of capital flew out of the region shortly after the Thai baht peg collapsed.

The Asian crisis has spawned a massive literature on the economics of the crisis that advance numerous hypotheses on the origin, development and resolution of crises. Although it is acknowledged that the financial crisis in Asia was multifaceted

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and that no single cause can explain the entire phenomena, it is generally recognized that structural weaknesses of the financial system were at the core of the problem.

More specifically, at the heart of the currency turmoil and banking crises is the speculative pressure that economic agents bring to bear on vulnerable financial and economic systems, and the shortcomings of policy responses on the part of national authorities and the international financial institutions alike. In such situations, the role of timely and accurate information is paramount in informing policy officials of the probability and potential severity of crises, the specifics of an individual crisis and the policy interventions required. Hence, the immediate aftermath of the crisis saw renewed calls for monitoring the stability of asset and financial markets, early warning, international cooperation in policy consultations, coordination, etc. It is in the context of the need to monitor the strength and vulnerability of financial markets where the development of macroprudential indicators (MPI) or financial soundness indicators acquires greater relevance. MPIs are defined broadly as indicators of the health and stability of financial systems.

Because the MPIs are indicators that measure certain attributes of the financial sector (e.g. measures of incidence of non-performing loans), they are appropriate tools for monitoring the stability or vulnerability of the financial system. Inasmuch as the soundness of the financial sector depends critically upon prevailing macroeconomic conditions (Sundarajan, Marston and Basu 1999), MPIs also include macroeconomic variables in addition to indicators specific to the financial sector. A number of MPIs are also used in models of early warning (Kaminsky, Lizondo and Reinhardt 1998). There is value in developing a common set of indicators to permit cross-country comparisons of experiences and to evaluate regional effects.

The Asian Development Bank (ADB), through a technical assistance project, undertook the development of a system of commonly agreed MPIs for selected developing member countries or areas, namely Fiji, Indonesia, the Philippines, Thailand, Viet Nam and Taiwan Province of China. This paper aims to evaluate a set of commonly agreed ADB MPIs and identify or select a core set of leading indicators that could give early warning signals of vulnerability of financial markets, and support regular economic and financial monitoring.

I. ASIAN DEVELOPMENT BANK MPIs

The process of identifying and collecting the MPIs is a necessary precondition for a comprehensive process of monitoring and responding to financial sector risks. Interpretation and analysis of these indicators is also a major challenge. The MPIs are used in macroprudential analysis, which is a tool that helps to quantify and qualify the soundness and vulnerabilities of financial systems. Macroprudential analysis can also be understood as the analytical framework for interpreting the MPIs or the indicators of financial soundness or stability. Clearly, the choice of the MPIs will

depend on the level of sophistication of the macroprudential analysis to be employed. For instance, the International Monetary Fund (IMF, 2001) collects not only the traditional macroeconomic indicators but also includes aggregated microprudential data (i.e. data at the firm level) and market-based indicators as well. This combination of MPIs is used by the IMF in conducting stress tests and scenario analysis to determine the sensitivity of the financial system to macroeconomic shocks. Alternatively, the vulnerability of the financial system can be assessed using simple benchmarks, critical or regulatory thresholds, or comparisons with peer group or historical norms.

Work on the MPIs and their interpretation is still recent and there is no consensus on an optimum set of MPIs nor of the best analytic framework to use. In fact, there is as yet no universally accepted definition of financial soundness or stability. Obviously, the degree of complexity of the macroprudential analysis will depend on factors such as degree of accuracy of assessing vulnerability that is desired, technical capacity of the monitoring agency, cost and availability of data and the structure, openness, and sophistication of the financial system. Although there is a limited amount of empirical work that has identified some possible MPIs, at this early stage in their development the identification and relative importance of the MPIs remains largely a matter of judgment given the aforementioned factors.

In general, there are a number of desirable characteristics of MPIs. First, from the point of view of crisis prevention, the MPIs should have early warning capability. Thus, taken from a statistical perspective, desirable MPIs should be leading indicators or at least coincident indicators. For short-term monitoring use, the ideal frequency of the indicators should be quarterly or monthly. Also, some capital market indicators can provide continuous monitoring of some aspects of the financial system.

Secondly, the set of MPIs should include a broad variety of indicators since currency and banking crises seem to be usually preceded by multiple economic problems. For instance, Kaminsky and Reinhart (1999) identified 15 early warning variables whereas Goldstein, Kaminsky and Reinhart (2000) add another nine variables to the earlier set. According to this research, the variables that have the best track record in anticipating crises include exports, deviations of the real exchange rate from trend, the ratio of broad money to gross international reserves, output and equity prices.

Third, qualitative variables should also be considered in the set of MPIs. Traditionally, MPIs in the literature are quantitative variables. However, the importance of qualitative variables cannot be underestimated, especially when dealing with financial variables. In emerging markets, where in the light of contagion, speculative pressure can be very powerful, qualitative measures can be important. Also, in developing markets, the qualitative analysis of possibly underdeveloped financial market infrastructures and supervisory institutions could provide important information about possible crisis situations. Thus, there is a need to combine quantitative and qualitative indicators for assessing the health of a financial market. The qualitative indicators or

information should include a judgment on the adequacy of the institutional and regulatory framework of countries.

Under the ADB's technical assistance project, an inception workshop was conducted in April 2000 and a follow-up a year later. One major objective of the first workshop was agreement on the list of indicators which should be included in a harmonized financial and monetary monitoring system. On this basis, each participating country would develop, compile, analyze and disseminate the commonly agreed key indicators on a regular basis. During the Inception Workshop, the participating countries in consultation with representatives from IMF, the Bank for International Settlements (BIS), Deutsche Bundesbank, Bank of Japan, Bank of Korea, Australian Bureau of Statistics, ESCAP, and ADB identified a set of commonly agreed MPIs, with the following subsets of indicators (Bhattacharyay, 2001):

- a) External Debt and Financial Flows (8 indicators);
- b) Money and Credit (17 indicators);
- c) Banking (14 indicators);
- d) Interest Rates (12 indicators);
- e) Stock Markets and Bonds (9 indicators);
- f) Trade, Exchange and International Reserves (10 indicators); and
- g) Business Survey Data (9 indicators): mainly Manufacturing but also Construction, Retail and Wholesale Trade and Services.

The system of ADB MPIs can be classified into three categories, namely, (i) aggregated microprudential indicators of the health of individual financial institutions; (ii) macroeconomic indicators concerning the health of financial sectors; and (iii) qualitative business tendency survey indicators. The set is unique as it includes qualitative and leading business tendency survey indicators as key elements. Of course, as will be covered more fully later, these MPIs should have a clear theoretical link with the vulnerability and soundness of the financial sector.

The agreed set of indicators is comprised of the core set (commonly agreed) and some additional ones (specific to country needs). Table 1 reports the list of the 67 commonly agreed indicators.

It was agreed in the workshop that participating countries should for the time being adhere to the list of 67 commonly agreed indicators and the set of voluntary additional indicators and gain experience in using this information as an analytical tool before changing the list of indicators. Countries could compile and analyse any additionally agreed indicators for meeting country-specific requirements depending on data availability. Table 2 presents the 33 additional indicators that are specific to country needs.

Table 1. ADB commonly agreed macroprudential indicators

| External Debt and Financial Flows | |
|--|---|
| 1. | Total Debt (per cent of GDP) – ratio of total debt to nominal GDP. |
| a. | ...of which public debt |
| b. | ...of which private debt |
| 2. | Long Term Debt (per cent of total debt) – ratio of long term debt to total debt. |
| 3. | Short Term Debt (per cent of GDP) – ratio of short-term debt to nominal GDP. |
| 4. | Short Term Debt (per cent of total debt) – ratio of short-term debt to total debt. |
| 5. | Foreign Direct Investment (per cent of GDP) – ratio of foreign direct (expressed as flows) investment to nominal GDP. |
| 6. | Portfolio Investment (per cent of GDP) – ratio of portfolio investment (expressed as flows) to nominal GDP |
| Money and Credit | |
| 7. | M1 Growth (per cent) – per cent difference from previous period. M1 are liabilities of the monetary system consisting of currency and demand deposits. |
| 8. | M2 Growth (per cent) – per cent difference from previous period. M2 equals M1 plus quasi-money. |
| 9. | Money Multiplier (ratio) – ratio of M2 to money base. Money base is the sum of currency in circulation, reserve requirement and excess reserves (with the central bank). |
| 10. | M2 (per cent of International Reserves) – ratio of M2 to international reserves. |
| 11. | M2 (per cent of GDP) – ratio of M2 to nominal GDP. |
| 12. | M2 to international reserves growth – the growth rate of M2 over international reserves. |
| 13. | Quasi money (per cent of GDP) – ratio of quasi money to nominal GDP. |
| 14. | Money Base Growth (per cent) – per cent difference from previous period. |
| 15. | Central Bank Credit to the Banking System – Central Bank's credit to the banking system. |
| 16. | Growth of Domestic Credit (per cent) – per cent difference from previous period. Consists of net claims from central government, claims on official entities and state enterprises, and claims of private enterprises and individuals. |
| 17. | Domestic Credit (per cent of GDP) – ratio of domestic credit to nominal GDP. |
| 18. | Credit to Public Sector (per cent of GDP) – ratio of credit to public sector to nominal GDP. |
| 19. | Credit to Private Sector (per cent of GDP) – ratio of credit to private sector to nominal GDP. |
| 20. | Capital Adequacy Ratio (per cent) – ratio of total capital to risk weighted assets (threshold value is 8 per cent meaning that the ratio should not be less than this value). Ratio of Tier 1 + Tier 2 capital to risk weighted assets. Tier 1 capital includes issued and paid-up share capital, non-cumulative preferred stock and disclosed reserves from post-tax retained earnings. Tier 2 capital can include a range of other entities. These are undisclosed reserves that passed through profit and loss account, conservatively valued revaluation reserves, revaluation of equities held at historical cost (at a discount), some hybrid instruments, general loan loss reserves (up to 1.25 per cent of risk weighted assets) and subordinated term debt. |

Table 1. (continued)

| | |
|-----------------------------------|--|
| 21. | Liquidity Ratio (per cent) – ratio of commercial banks' liquid assets to total assets: a) domestic liquid asset ratio and b) foreign liquid asset ratio. |
| Banking | |
| 22. | Bank Capital (per cent of Total Assets) – ratio of capital equity including reserves, profits and loss to total assets. |
| 23. | Total Assets (per cent of GDP) – ratio of total assets (as in Monetary Survey without interbank positions) to nominal GDP. |
| 24. | Growth of Total Assets (per cent) – per cent growth from previous period. |
| 25. | Share of 3 Largest Banks (per cent of total assets) |
| 26. | Net Operating Profits (per cent of period-average assets) |
| 27. | Loan-Loss Provisions (per cent of Non-Performing Loans) – ratio of loan loss provision to non-performing loans |
| 28. | Non-Performing Loans (per cent of total loans) – ratio of non-performing loans |
| 29. | Loans to Key Economic Sectors and (per cent of total loans) |
| 30. | Real Estate Loans (per cent of total loans) – ratio of real estate loans to total loans. |
| 31. | Total Loans (per cent of total deposits) – ratio of total loans to total deposits (i.e., demand deposits, savings deposits and time deposits.) |
| 32. | International Liabilities from Banks with Maturities, Total (US\$ million) – total international liabilities from commercial banks. |
| | a. short term borrowing |
| | b. long term borrowing – more than one year |
| 33. | International Liabilities with Maturities, one year and less (US\$ million) – total international liabilities from commercial banks. |
| Interest Rates (mean rate) | |
| | (In case of monthly data, average of daily rates; in case of quarterly data, monthly averages are to be applied) |
| 34. | Central Bank Lending Rate (e.o.p.) – end of period; rate at which the monetary authorities lend or discount eligible paper for deposit money banks. |
| 35. | Commercial Bank Lending Rate (a.o.p.)/Prime Rate – average of period; ratio of commercial bank lending rate to prime rate. Prime rate refers to the short and medium term financing needs of the private sector. |
| 36. | Money Market Rate/Inter-Bank Rate (a.o.p.) – average of period; rate at which short-term borrowings are effected between financial institutions. |
| 37. | Short-term (3 mos.) Time Deposit Rates – interest rates of savings account held in a financial institution for 3 months or with the understanding that the depositor can withdraw only by giving a notice. |
| 38. | Long-term (12 mos.) Time Deposit Rates – interest rates of savings account held in a financial institution for 12 months or with the understanding that the depositor can withdraw only by giving a notice. |

Table 1. (continued)

| | |
|---|---|
| 39. | US\$ (international market)/Domestic Real Deposit Interest Rate – unweighted averages of offered rates quoted by at least 5 dealers early in the day for 3-month certificates of deposit in the secondary market. |
| 40. | Bond/Treasury Bill Yield (short term) – yield to maturity of government bonds (short-term) |
| 41. | Bond/Treasury Bill Yield (long term) – yield to maturity of government bonds (long-term) |
| Stock Markets and Bonds | |
| 42. | Foreign Share in Trading (per cent of total volume of trading) – proportion of foreign share in trading to total volume of trading. |
| 43. | Share of 10 Top Stocks in Trading (per cent of total volume of trading) – proportion of top 10 stocks in trading to total volume of trading. |
| 44. | Composite Stock Price Index (in national currency unit) – equity price index of national capital city and expressed in national currency unit. |
| 45. | Composite Stock Price Index Growth – per cent difference from previous period of equity price index; end of period and based on national currency unit. |
| 46. | Composite Stock Price Index (in US\$) – equity price index of national capital city and expressed in US\$. |
| 47. | Market Capitalization (per cent of GDP) – ratio of market capitalization to nominal GDP. Market Capitalization refers to the total market value of stocks or shares. |
| 48. | Stock Price Earnings Ratio |
| Trade, Exchange and International Reserves | |
| 49. | Export Growth (per cent) – export growth (fob) per cent difference from previous period. |
| 50. | Import Growth (per cent) – import growth (cif) per cent difference from previous period. |
| 51. | Trade Balance (US\$ million) – difference between exports (fob) and imports (cif) |
| 52. | Current account deficit/surplus (US\$ million) |
| 53. | Exchange Rate (average of period) – national currency unit to the US\$ |
| 54. | Exchange Rate (end of period) – national currency unit to the US\$ |
| 55. | Real Effective Exchange Rate – ratio of an index of the period average exchange rate of a currency to a weighted geometric average of exchange rate for the currencies of selected countries adjusted for relative movements in national prices of the home country and the selected countries. Refers to the definition used in the IMF, IFS series. |
| 56. | International Reserves (US\$ million) – international reserves include total reserves minus gold plus gold national valuation. |
| 57. | Growth of International Reserves (per cent) – per cent difference from previous period. |
| 58. | International Reserves (per cent of imports) – ratio of international reserves to total imports. |

Table 1. (continued)

| Business Survey Data (Manufacturing, Construction, Trade and Services) | |
|---|--|
| 59. | Assessment of Current Business Situation |
| 60. | Expectations on Business Situation in Next Months/Quarters |
| 61. | Limits to Business (present situation) |
| 62. | Stocks of Finished Products (present situation) |
| 63. | Assessment of Order Books |
| 64. | Selling Prices (future tendency) |
| 65. | Employment (future tendency) |
| 66. | Financial Situation (present situation) |
| 67. | Access to Credit (present situation) |

Table 2. List of additional indicators

| | |
|--|---|
| External Debt and Financial Flows | |
| 1. | Short Term Debt (per cent of foreign reserves) |
| 2. | Use of IMF credit (per cent of GDP) – ratio of IMF credit to nominal GDP |
| Money and Credit (data from IFS) | |
| 3. | Growth of Currency in Circulation (per cent) |
| 4. | M3 Growth – per cent difference from previous period. M3 equals M2 plus liabilities of other financial institutions. |
| Banking | |
| 5. | Non-Performing Loans (per cent of average assets): simple average of assets over the period |
| 6. | Loans to Commercial Real Estate Sector (per cent total loans) |
| 7. | Loans to Residential Real Estate (per cent total loans) |
| 8. | International Liabilities from Banks, with Maturities over 1 year and up to 2 years (US\$ million) – total international liabilities from commercial banks. |
| 9. | International Liabilities from Banks, with Maturities over 2 years (US\$ million) – total international liabilities from commercial banks. |
| 10. | International Liabilities from Banks, with Maturities, unallocated (US\$ million) – total international liabilities from commercial banks. |
| 11. | Gini coefficient of market shares of banks in terms of assets. |
| Interest Rates | |
| 12. | Real Deposit Rate (3 mos.) (a.o.p.) – average of period; defined as the difference between deposit and inflation rate. |

Table 2. (continued)

13. Real Lending Rate (3 mos.) (a.o.p.) – average of period; defined as the difference between commercial bank lending and inflation rate.
14. Real Lending Rate – Real Deposit Rate (each 3 mos.) – difference between commercial bank lending rate and deposit rate.
15. Real Lending Rate/Real Deposit Rate (each 3 mos.) – ratio of real lending rate to real deposit rate.

Stock Markets and Bonds

16. Gini Coefficient of Market Share of Stocks in Trading – measure of concentration of market capitalization (inequality of market share among the stocks traded during the day). This is the ratio of the actual concentration of total value of stocks among traded companies to the maximum concentration.

$$Gini\ Coefficient = \frac{N+1}{N-1} - \frac{2}{N(N-1)A} \left(\sum_{i=1}^N P_i a_i \right)$$

where:

- P_i = is the rank of each company in the stock market counting from the top in terms of stock assets or market capitalization
- a_i = stock asset of ith company
- A = total asset or market capitalization of all securities
- N = total number of companies listed
17. Turnover in stocks (as per cent of market capitalization)
 18. Turnover in bonds (as per cent market capitalization)
 - a. Volume of government bonds traded
 - b. Volume of corporate bonds traded
 19. Turnover in mutual funds (as per cent market capitalization)
 20. Foreign investment in stock by sector

Business Survey Data (Manufacturing, Construction, Trade and Services)

21. Production/Turnover (present tendency)
22. Production/Turnover (expected tendency)
23. Capacity Utilization (present situation)
24. Credit Demand by Sector (only for survey of financial sector)

Supervisory Surveys

25. Lending and Credit Standards of Financial Institutions
26. Proportion of Institutions Having License Withdrawn
27. Spreads Between Reference Lending rates and Reference Borrowing Rates

Table 2. (continued)

| | |
|---------------|--|
| 28. | Spreads Between Depository Corporations' Securities and the Rate of Comparable Treasury Securities |
| 29. | Securities Between Depository Corporations' Subordinated Debt Securities and the Rate for Comparable Treasury Securities |
| 30. | Distribution of 3-Month Local Currency Interbank Rates for Different Depository Corporations |
| 31. | Average Interbank Bid-Ask Spread for 3-Month Local Currency Deposits |
| 32. | Average Maturity of Assets |
| Others | |
| 33. | Real Estate Price Index and Its Growth Rate |

The concluding workshop was held in May 2001 in Manila. The objectives of the concluding workshop were to: (i) present and discuss the country compendium on commonly agreed MPIs as per the conclusions of the inception workshop as well as provide an analysis of the indicators; (ii) discuss the various approaches and methodologies used in producing the MPIs and the problems and issues encountered in generating them; (iii) appraise participants on the appropriate analysis and interpretation of the indicators and the usefulness of composite indicators for monitoring the asset and financial markets; and (iv) provide recommendations and share the countries' future plans on compiling, analyzing, interpreting, and disseminating MPIs and other activities related to the monitoring of the vulnerability of the asset and financial markets. The concluding workshop was attended by 13 participants from six countries and areas: Fiji, Indonesia, the Philippines, Taiwan Province of China, Thailand, and Viet Nam. There was one representative from IMF, one from the European Central Bank, eight from ADB (including an ADB consultant from IFO Institute, Germany), one from the University of Asia and the Pacific, and five observers from the Ministry of Finance, Viet Nam, the Ministry of Economy and Finance, Cambodia, the Ministry of Finance and Revenue, Myanmar, and the Bangko Sentral ng Pilipinas.

It needs to be appreciated that the task of macroprudential analysis or the framework for identifying and interpreting MPIs is still work-in-progress. Various international financial institutions such as IMF, ADB, as well as private firms are still in the process of developing or testing different systems. As such, there is no standard system for macroprudential analysis at present. Yet, as the experience of the Asian crisis shows, systematic monitoring of the financial and economic systems is an important element in crisis prevention strategies. Regional Technical Assistance (RETA) is thus envisioned to provide a catalytic role in developing macroprudential

systems in Asian and Pacific developing member countries. This role takes practical form in the identification, collection and dissemination of an initial set of MPIs.

All the participating countries have already undertaken the necessary steps to implement the gathering and dissemination of the commonly agreed MPIs. In fact, arrangements have been made for countries to submit to ADB two types of templates – monthly and quarterly – for eventual posting in the ADB website. The template organizes the MPIs according to the following categories: (a) external debt and financial flows; (b) money and credit; (c) banking; (d) interest rates; (e) stock market and bonds; (f) trade, exchange and international reserves; and (g) business survey data. In preparing the core set of MPIs, some countries could not include all items in the recommended list of MPIs for the reason that the availability of data and collection problems varied significantly among the participating countries. For instance, some participating DMCs, especially those in transition, do not have fully developed stock markets. Hence, they could not report stock market-based MPIs. The MPI data are already available in the ADB statistics website. Most of the participating countries are submitting quarterly updates of MPIs. The commitment of the participating countries to regularly submit to ADB updates of the MPI is important for the systematic development and refinement of the MPI analysis. In future, other developing member countries of ADB will be invited to submit their MPIs on a regular basis to the ADB website. Furthermore, there is an urgent need to strengthen the capacity of those countries to analyse and interpret these MPIs.

One of the distinguishing features of the ADB MPIs, as proposed in this RETA, is the inclusion of information gleaned from business tendency/confidence surveys (BTS). The use of BTS within the framework of MPI is unique in the literature on MPIs. The main reason for incorporating BTS information as part of the MPIs is due to the ability of BTS to capture current and future profitability trends in the corporate sector. Precisely because expectations can play an important role in the business cycle, it can have a significant influence on investments, output and employment. Inasmuch as the health of the financial sector is tied up with developments in the real sector, e.g. the effect of the profitability in the corporate sector on the loan portfolios of banks and the information gathered from the BTS can have a bearing on the health of the financial system. More importantly, since BTS are by nature forward looking, the information they convey can augment the early warning capabilities of the conventional quantitative MPIs.

All participating countries are conducting business surveys or are in the process of introducing them. However, there is scope for further work on incorporating BTS in the MPI framework. Issues such as harmonization of the survey instrument and its interpretation are areas for capacity-building. ADB has recently implemented another regional technical assistance project (RETA 5938) jointly with OECD to help selected countries develop Business Tendency Surveys using the harmonized set of core questions used by most OECD countries. The countries or areas involved are China;

Hong Kong, China; India; Indonesia; Malaysia; the Philippines, the Lao People's Democratic Republic; Singapore; Thailand and Viet Nam. Under this RETA, each country conducted a pilot BTS Survey based on the improved and harmonized questionnaire, analyzed and interpreted the results and published a report and compendium on these qualitative statistics.

II. IDENTIFICATION AND EVALUATION OF CORE SET OF LEADING INDICATORS

Following the selection of the commonly agreed indicators, an attempt was made to identify a core set of leading indicators that could give early warning signals of the vulnerability of financial markets, based on graphical analysis of the series of MPIs compiled by countries.

One of the main objectives of this exercise is to identify indicators which appear to be particularly promising for financial and economic monitoring and which therefore should be included in a core list of harmonized indicators at ADB. Although a broad and exhaustive set of indicators could potentially give a more complete assessment of the soundness of financial systems, they can be costly to compile and unwieldy to maintain for the purpose of periodic monitoring. Hence, the workshops recommended that a separate core set of MPIs of manageable size be kept and updated regularly. Apart from this core set of indicators, there will be a number of series of special importance in some countries but not in all.

As indicated earlier, one criterion for inclusion in the core set of MPIs is early warning capacity. Hence, the MPI should be a leading indicator or, at the very least, a coincident one. For a short-term monitoring system, however, only indicators which are available at least on a quarterly basis (even better on a monthly one) can be useful. However, this requirement is not always fulfilled by all participants.

As the data series provided by the countries participating in RETA 5869 are not very long (available only from 1995 onward or even later) and are not always complete over the whole time span, it may not be appropriate at this stage to apply formal statistical methods like regression or factor analysis to identify the best candidates for a harmonized set of core MPIs but to use in this first round graphical inspection of the series. At a later stage, more formal statistical methods should be applied to identify the exact informational content of those series and to use multivariate analysis to estimate the joint impact of different subsets of indicators for explaining and forecasting banking and currency crises.

According to this pragmatic approach, the following series have been selected for the core set of ADB MPIs. In cases where a clear lead could not be detected this is labeled with coincident/leading. It appears at this stage that it is not possible to give a range of the lead in months or weeks. For this purpose, observations over a longer time span and the construction of a synthetic curve acting as reference series

would be necessary. Table 3 presents the core set of leading MPIS which are selected on the basis of trend analysis of commonly agreed indicators. The trend analysis for relevant countries is presented below.

Table 3. Core set of leading MPIS

| <i>Type of indicator</i> | <i>Title</i> | <i>Characteristics</i> |
|---|---|------------------------|
| Money and Credit | | |
| 7. | M1 Growth (percentage) | leading |
| 8. | M2 Growth (percentage) | leading |
| 4. (additional) | M3 Growth (percentage) | leading |
| 15. | Central Bank Credit to Banking System | coincident/leading |
| 16. | Domestic Credit Growth (percentage) | coincident/leading |
| 17. | Domestic Credit Growth (in percentage of GDP) | coincident/leading |
| 19. | Credit to Private Sector (in percentage of GDP) | coincident/leading |
| Banking | | |
| 26. | Net Bank Profits (in percentage of total assets) | leading |
| 31. | Total Bank Loans (in percentage of total deposits) | leading |
| 33. | International Borrowings with Maturities one year and less (US\$ million) | leading |
| 6. (additional) | Real Estate Loans | leading |
| Interest Rates | | |
| 36. | Money Market Rate/Inter Bank Rate | leading |
| Stock Markets and Bonds | | |
| 44. | Composite Stock Price Index | leading |
| 47. | Market Capitalization (in percentage of GDP) | leading |
| 48. | Stock Price Earnings Ratio | leading |
| Trade, Exchange and International Reserves | | |
| 55. | Real Effective Exchange Rate | coincident/leading |
| 56. | International Reserves | leading |
| Business Survey Results | | |
| 59. | Current Business Situation | coincident/leading |
| 60. | Expected Business Situation (next 6 months) | coincident/leading |
| 62. | Stocks of Finished Products | coincident/leading |
| 65. | Employment (Present Situation) | coincident/leading |
| 66. | Financial Situation (Present Situation) | coincident/leading |

According to business cycle and economic indicators research, reliable indicators (both coincident and leading) should not only have a sound statistical basis (e.g. broad coverage, representative, no missing data), short delay in publication, limited ex post revisions, a good track record in the reference period and, importantly, a solid theoretical foundation. Otherwise there exists the problem of measurement without theory (“fishing in the data”).

Taking into account these requirements, the main arguments for selecting the above-mentioned indicators are the following:

Growth rates of M1, M2 and M3: liquidity indicators

The growth rates of money supply aggregates (percentage change from the previous period) – despite some irregular changes which could be smoothed out with a low-pass filter – signal in advance dangers for financial stability due to excess liquidity which may cause inflation to pick up or create over-exuberance of investment. This again may fuel speculative attacks on the currency, thus leading possibly to a currency crisis.

Excess liquidity can feed into the money financed fiscal deficit basis for currency crisis as in the first generation model for currency crises. Alternatively, excessive liquidity can lead to over investment or to real appreciation of the currencies with the attendant loss in export competitiveness. In such cases, “excess” money balances can render an economy vulnerable to shocks.

Apart from this theoretical foundation, the money aggregates have the advantage of availability in practically all countries on a monthly basis. The publication lag varies between one and three months; efforts should be made to shorten this time lag to about one month in all countries participating in this harmonized financial monitoring project.

Figures 1-5 (see appendix) present the trend of growth rates of narrow and broad money supply, namely, M1 (Thailand and Indonesia), M2 (Thailand and Indonesia), and M3 (Thailand).

Central bank credit to banking system

A large increase in central bank credit to banks and other financial institutions often reflects severe liquidity or solvency problems in the financial sector. Although central bank credit is part and parcel of the functions of the central bank as the facilitator of the smooth functioning of financial markets or as lender-of-last-resort, a spike in this variable heralds either a severe liquidity problem of a major bank (which can be problematic in itself), or worse, a systemic liquidity problem of the banking sector. Left unsolved in times of uncertainty a bank run in a particular bank may turn into a systemic run and unleash a solvency problem, unless the central bank

acts immediately to quell liquidity problems. At any rate, a large upward movement of central bank credit may indicate distress in the banking sector. On the other hand, large increases in central bank credit to banks could also be to stimulate bank lending to revive a sluggish economy, but this can also indicate possible recession-caused deterioration in the quality of bank lending indicator rather than a leading indicator indicating a potential crisis. Thus, this indicator should – as empirical evidence has proved – be more of a coincident nature.

Domestic credit growth (percentage) and domestic credit (percentage) of GDP

The leading character of domestic credit is not as obvious from a theoretical point of view than in the case of money supply aggregates. Nevertheless, sharp increases in credit demand over a longer time span bear the risk of over-investment (non-productive investment) which as a consequence may cause a deterioration of the credit portfolio of the banks. As a further argument for the leading character of these two indicators it can be brought forward that high growth rates of domestic credit are as a rule incompatible with a currency peg and could thus signal pending currency and banking problems. In addition, a persistent increase in domestic credit could lead to deterioration in credit quality. In an environment of euphoria and due to informational asymmetries, it is not easy to make a more measured assessment of credit applications. As the experience of the Asian crisis showed, a credit boom preceded a banking crisis (Evans, Leone, Gill and Hilbers, 2000).

On the other hand, the ratio of domestic credit as a percentage of GDP may start rising only in the early phase of the onset of a banking crisis. The reason for it is that the central bank – as the crisis unfolds – may be pumping money into the banks to alleviate their financial situation. This would explain why this series is not a clear-cut leading indicator but shows characteristics of a coincident indicator with regard to currency and banking crises. Furthermore, the construction of this indicator suggests that continued expansion of credit – either by momentum or other reasons – during recessionary periods would increase credit risk in the banking system, making it vulnerable to a banking crisis. Rapid credit growth could also induce unsustainable asset price increases, including for assets used as collateral for lending.

All countries included in RETA 5869 can provide domestic credit growth on a monthly basis. The publication time lag ranges between one and 24 weeks. The indicator no: 21 (“Domestic Credit in per cent of GDP”) is available as a rule only on a quarterly basis as the GDP figures come out only four times a year. In Fiji and Indonesia, the indicator no: 21 is presented on a monthly basis; the quarterly GDP figures are obviously interpolated to get monthly estimates.

Figures 6-8 (see appendix) present the trend for domestic credit growth for Fiji, Indonesia and Thailand.

Credit to private sector (in per cent) of GDP

A sharp increase of this indicator may signal over-investment of the private sector which could lead to a deterioration in the quality of credit portfolios of the banking sector and, consequently, in financial institutions' cash flows, net income and solvency. An increase in consumer lending, including credit card debt, especially if financed by heavy capital flows, can lead easily to a current account deficit. A large current account deficit, accompanied by a loss of competitiveness can put some pressure on the exchange rate. Of course, a massive devaluation can put severe stress on the paying capability of debtors and undermine the asset quality of the banking system.

Monthly data are available from Fiji and Indonesia, otherwise there exist quarterly data with the exception of Viet Nam (only annual data). The publication time lag ranges between one and 24 weeks.

Figures 9-12 (see appendix) present the trend for credit to private sector in per cent of GDP for Fiji, Indonesia, Thailand and the Philippines.

Net profits (as per cent of average assets)

The indicator reflects one of the most commonly used measures of profitability. Unusually high profitability may be a sign of excessive risk taking. On the other hand, bank earnings are a buffer against capital erosion caused by shrinkage in asset value. Thus, a steady increase would be the optimal performance of this indicator from a macroeconomic point of view. High profits may also be indicative of protected or imperfectly competitive banking markets. Thus, a sharp decrease of this indicator is indicative either of more competition or a deterioration of credit quality.

As empirical evidence has shown, this indicator rose sharply in some places in 1997 (e.g. Taiwan Province of China) before collapsing in the wake of the financial crisis in 1998 and only slowly recovering since then. With the exception of Viet Nam, short-term data (at least quarterly) are available in all RETA 5869 countries. The publication time lag ranges between one and 24 weeks. Profitability data are significantly affected by practices for provisioning and recognition of impairment of assets, factors which should always be considered in analyzing these indicators.

Figures 13-15 present the trend for net profits for Taiwan Province of China, Indonesia and Thailand.

Total bank loans (as per cent) of total deposits

The ratio of credit to deposits may give indications of the ability of the banking system to mobilize deposits to meet credit demand. A high and growing ratio may indicate stress in the banking system and a low level of liquidity to respond to shocks. Banks that have large outstanding loans relative to the deposit base may be relying on a relatively volatile liability base and could be subject to contagion or to

suffer in the event of a slowdown in economic activity. This is particularly true if the bank loans are financed by foreign borrowings. This explains why this indicator proved to give early warning signals of financial vulnerability.

All countries participating in RETA 5869 can provide this indicator on a monthly basis. The publication lag ranges between one and 24 weeks.

Figures 16-18 (see appendix) present the trend for total bank loans in per cent of total deposits for Taiwan Province of China, Indonesia and Thailand.

International borrowings with maturities of one year and less (in US\$ million)

A high and growing amount of short-term international borrowing bears the risk that large amounts of foreign capital may be withdrawn rapidly. Central to the justification of this indicator is the prevalence of maturity mismatches during the Asian crisis. During the banking crisis of 1997-1998, many banks in South-East and East Asia borrowed from the international capital markets in short maturities but relented the funds for longer terms. Because of moral hazard and the implicit guarantees that exchange rates will continue to be pegged indefinitely, this arrangement proved to be a profitable one for both the banks and their debtors (Corsetti, Pesenti and Roubini, 1999). However, given the shock of the collapse of the Thai baht peg and the ensuing contagion, many banking systems could not bear the pressure arising from the maturity mismatches and the depreciation of the currencies. Thus, this indicator appears from a theoretical point of view suited for giving early warning signals for liquidity crunches, caused e.g. by contagion effects of financial shocks in a neighbouring country.

Figure 19 (see appendix) presents the trend for international borrowings with maturities of one year and less in US\$ million for Thailand.

Real estate loans

Many financial crises have been caused or amplified by downturns in particular sectors of the economy spilling over into the financial system. This has often been the case when a concentration of loans occurred in the real estate sector which can be subject to severe boom and bust price cycles. In Asia, for instance, almost all affected countries saw rising real estate and equity prices during the early 1990s, then sharp declines from around mid-1996. With hindsight, it can easily be said that the banking sectors of many Asian economies were particularly exposed to a narrow industry. Furthermore, the lack of diversification of the loan portfolio signals vulnerability of the banking system. Thus, this indicator when surpassing a certain threshold (defined country by country) can act as a leading indicator for financial disturbances.

Not all countries participating in RETA 5869 are providing this information. For Thailand quarterly data are only available since the fourth quarter 2000; prior to that only annual data existed.

Figures 20-21 (see appendix) present the trend for real estate loans for Indonesia and Thailand.

Money market rate/inter-bank rate (average of period)

A sharp increase of this rate signals a tight liquidity situation in the banking sector, which can possibly lead to solvency problems. Of course, sharp increases in interest rates could also exacerbate the adverse selection problem in financial markets (Mishkin, 1997). All countries participating in the RETA have provided this indicator on a monthly basis. The publication time lag is about one month.

Stock market indicators concerning the performance of the composite stock market index, market capitalization and the price earnings (PE) ratio

Stock market developments signal changes in market perceptions of capital investors. A steep decline in stock prices – which as a rule is also combined with a sharp drop of market capitalization (in per cent of GDP) – signals tensions in the capital markets which may spread sooner or later to the real sector of the economy, thus posing the danger to set in force a cumulative downward spiral. Indicators nos: 54 and 57 are generally accepted leading indicators for financial markets. The stock market indicators also reflect confidence in the economy quite broadly. Because the price of a stock is theoretically the net present value of the future stream of income, its movement reflects the potential profitability of firms. Extended to the macroeconomic plane, movement of the stock market index is taken as the collective assessment by stock market analysts of corporate profitability, which is tied up with general economic growth. Thus, the financial literature (Fama, 1981) often links the movements of the stock market index with future economic growth. It has been observed that prior to a crisis, stock prices tend to decline. This may indicate that the market players foresee a weakening of corporate profits or a general economic slowdown in the near future.

The same conclusion holds true for the stock price earnings ratio. If this indicator is already high and increases further this may signal increasing asset inflation, unsustainable in the medium term. This indicator can also be a measure of euphoria or speculation in the markets. Astronomical PE ratios can persist for a time (asset bubbles), but a correction invariably happens. The problem with high PE ratios is that it may falsely lead companies to over-invest and undertake heavy debt positions. Thus, this indicator gives warning signals that the stock asset bubble may burst with all the negative consequences known e.g. from Japan.

Apart from Fiji and Viet Nam, these indicators exist without any significant delay in all participating countries.

Figures 22-23 (see appendix) present the trend for composite stock price index for Indonesia and Thailand.

Real effective exchange rate

If real appreciation of a currency is not backed by corresponding productivity gains in the real economy, this implies a loss of international competitiveness which is possibly a source of increasing vulnerability of a country's economy. A loss in competitiveness arising from a peg might put pressure on policy makers to devalue in order to hit some economic growth targets. The financial markets will recognize the pressure of the policy makers to react to recessionary moves in the face of loss of competitiveness and would engage in speculative actions. If not managed well, this could lead to a currency crisis. Indeed, it has been observed that in the run-up to a crisis, the real value of the domestic currency was, on average, significantly higher than its mean during tranquil periods (IMF 1998).

Until now, monthly data for this indicator are only available for Thailand and Fiji and on a quarterly basis for the Philippines.

Figures 24-25 (see appendix) present the trend for the real effective exchange ratio for the Philippines and Thailand.

International reserves (in US\$ million)

A low and declining amount of international reserves (central bank and the financial sector as a whole) signals possible problems for the country to meet international payment requirements. Thus, this series is seen particularly by capital market investors as one of the most important early warning indicators of financial vulnerability. This is an indicator of relative international illiquidity (Sachs, Tornelli and Velasco, 1995). Too low a level of reserves could increase the vulnerability of a financial system to changes in sentiments.

This indicator is available in all participating countries; Thailand, Taiwan Province of China and Fiji have provided monthly, Indonesia and the Philippines quarterly and Viet Nam only annual data.

Figures 26-28 (see appendix) present the trend for international reserves in Fiji, Indonesia and Thailand.

Indicators on business survey data

Business survey results in many countries have proved to be good leading indicators for the real economy. In particular, the business survey results for the manufacturing sector – which is still the cycle maker in most countries – show a significant lead compared with GDP and industrial production. Answers on the current business situation as well as on the expected business trend in the next three to six months mainly reflects the perceived profit assessment and outlook of managers, which is not only of great importance for the real economy (in particular for future production, investment and employment) but also has implications for the financial sector (soundness of the loan portfolios of banks, share price development).

For all these reasons, business survey results play in many countries a prominent role as leading indicators both for the real economy as well as for the financial sector. The majority of countries participating in RETA 5869 have started regular monthly or at least quarterly business surveys only recently. Thus, a thorough assessment of the leading character of these variables is not yet possible. The only exception is Taiwan Province of China and Indonesia where longer time series are available showing that these data give timely signals on economic trends. Also in Thailand where business survey data go back only to early 1999 they appear to give early information of the recovery phase after the Asian crisis and the slowdown in the first half of 2000 followed thereafter by a renewed economic pick-up.

III. CONCLUDING REMARKS

An attempt has been made here to identify a core set of MPIs which can be useful in monitoring the financial stability of the financial and asset markets. The above identification is based on the limited time series of MPIs compiled by the participating countries. The length of time series and missing data within the time series, frequency and time lag of availability of ADB MPIs vary considerable from country to country. Therefore, the above identification should be considered tentative. A rigorous and sophisticated quantitative analysis based on longer time series and more data should ideally be conducted by individual countries to identify a set of leading indicators appropriate for their economic situations and institutional environments. The analysis should be a continuous process as the core set may need inclusion or exclusion of some indicators depending on the forthcoming changes in the financial sector and in the economy. As monitoring the financial stability of a country involves both statisticians and financial sector supervisors, and employs supervisory and statistical data, there is a need for a closer collaboration and coordination among the statistical agencies producing the data and financial sector supervisors including central banks and security commissions.

In order to arrive at a smaller number of core leading indicators, one can consider constructing composite leading indicators. To what extent composite leading indicators might help in the analysis cannot be assessed at this stage. On the one hand, composite indicators facilitate structuring the vast amount of signals; on the other hand they can lead to an over-simplification of the analysis. Thus, it might be advisable to construct a group of composite indicators e.g. for each of the five segments (Money and Credit; Banking; Interest Rates; Stock Markets and Bonds; Trade, Exchange and International Reserves, as well as Business Survey Results), analogous to the weighting methods used in the supervisory CAMELS system (CAMELS is an acronym for six categories of bank performance: capital adequacy, asset quality, management, earnings and liquidity and sensitivity to market risk). As not enough experience has been gained with the ADB's MPI's, it is proposed to concentrate for the time being at

the ADB level on the core indicators and to go into more detail only when warning signals flash. At the country level, however, it is recommended that the full set of indicators be compiled and analyzed. After having gained more experience with these indicators a thorough revision should take place which might lead to some modifications of the set of core indicators collected, analyzed and disseminated at ADB level. This evaluation process must also draw on the experiences with indicators and early warning systems of the IMF, European Central Bank, BIS and others. Although this consultative process has begun well, it has been impeded by resource limitations at the ADB and other potential collaborating agencies.

Future work on the development of a country-specific early warning financial indicator systems should apply multivariate analysis to estimate the intensity of stress in the financial system based on simultaneous signals from a subset of indicators. This would help to assess better the probability of a looming financial crisis.

Another promising area for future work lies in the use of technology to address some of the problems associated with data collection, compilation and dissemination such as lags, problems in data coordination, among others. In order to streamline and improve the efficiency for searching and sharing statistical information across a multitude of sources, participating countries can consider the merits of cooperating in the Statistical Data and Metadata Exchange (SDMX) at some future stage. The SDMX is a joint collaboration of the Bank for International Settlements, the European Central Bank, Eurostat, the IMF, the OECD and the United Nations to explore common e-standards and on-going standardization activities. Their main goal is to gain efficiency and avoid duplication of effort in the field of statistical information. The technology for this initiative is underpinned by a) existing and emerging exchange protocols which have been implemented by central banks for exchanging time series, b) dissemination formats, and c) e-standards, such as Extensible Markup Language (XML). Exploring ways of adopting best practices in information exchange, as being developed in the SDMX, is certainly a task that has to be undertaken to strengthen the collection and dissemination of MPIs in the Asia-Pacific region.

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Appendix

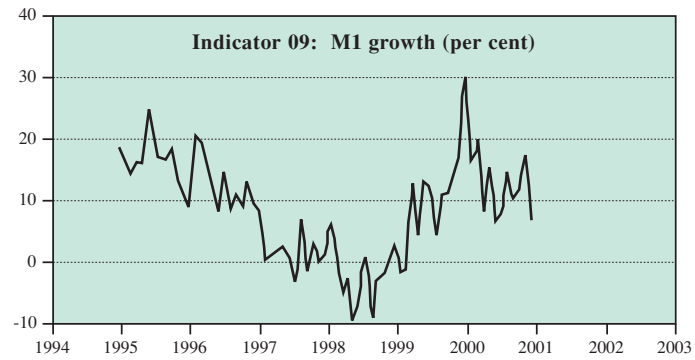
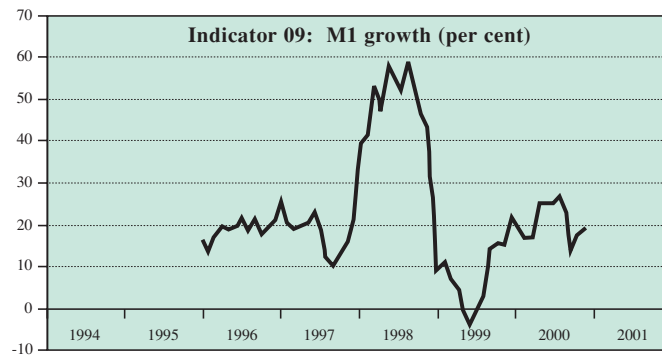
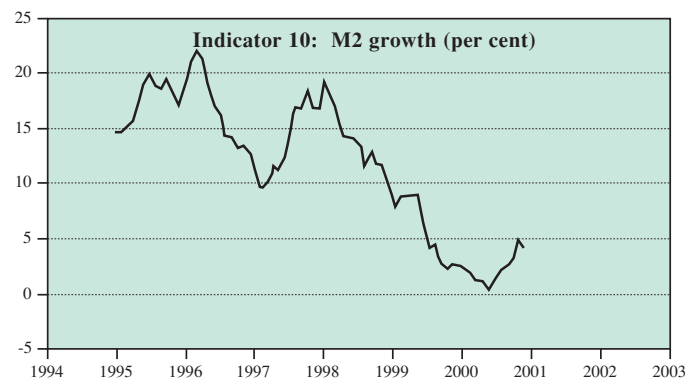
Figure 1. Money supply growth (M1) in Thailand**Figure 2. Money supply growth (M1) in Indonesia****Figure 3. Money supply growth (M2) in Thailand**

Figure 4. Money supply growth (M2) in Indonesia

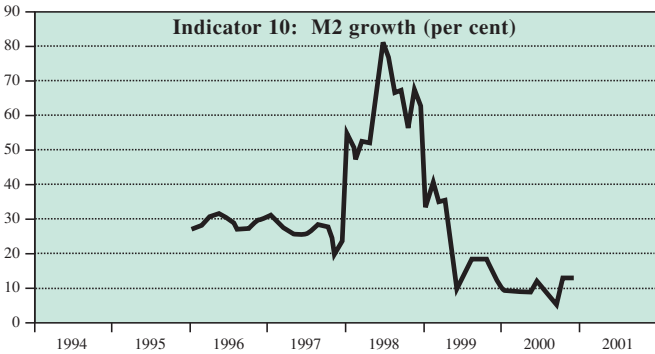


Figure 5. Money supply growth (M3) in Thailand

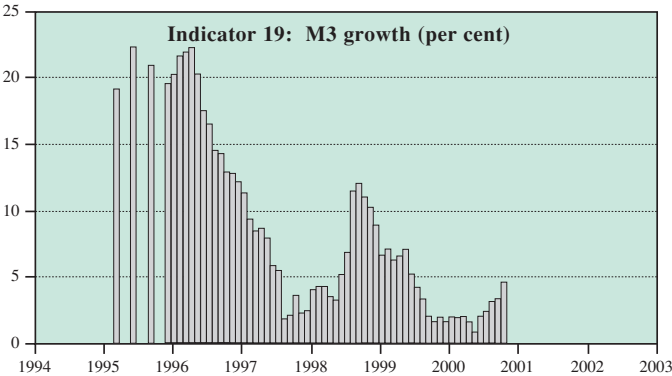


Figure 6. Domestic credit growth (per cent) in Fiji

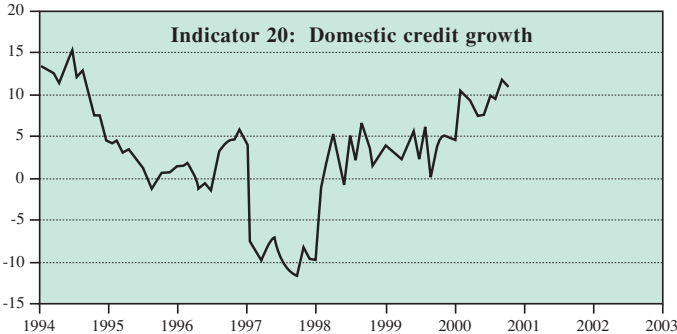


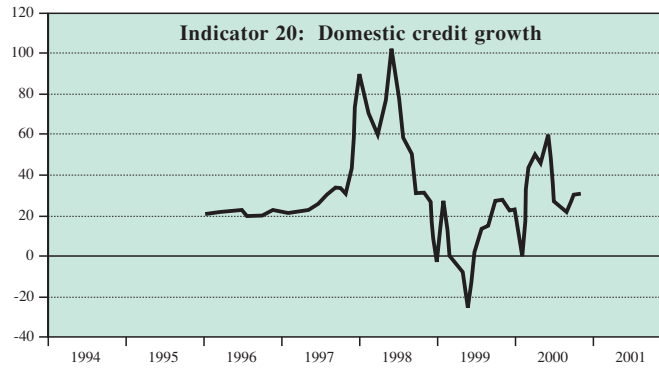
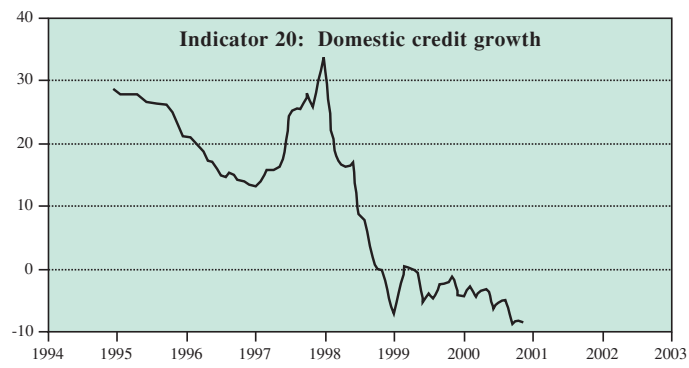
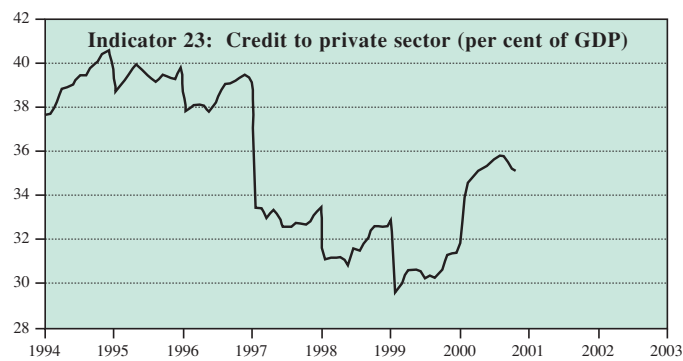
Figure 7. Domestic credit growth (per cent) in Indonesia**Figure 8. Domestic credit growth (per cent) in Thailand****Figure 9. Credit to the private sector in Fiji**

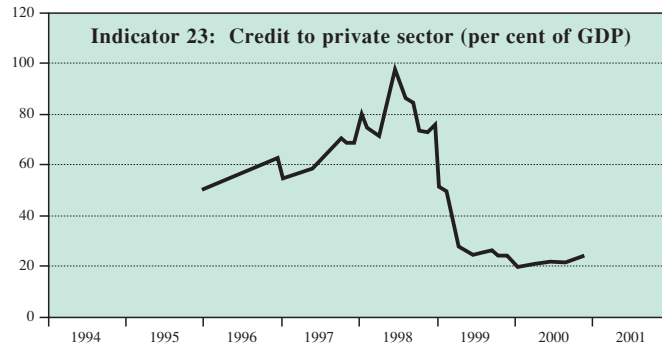
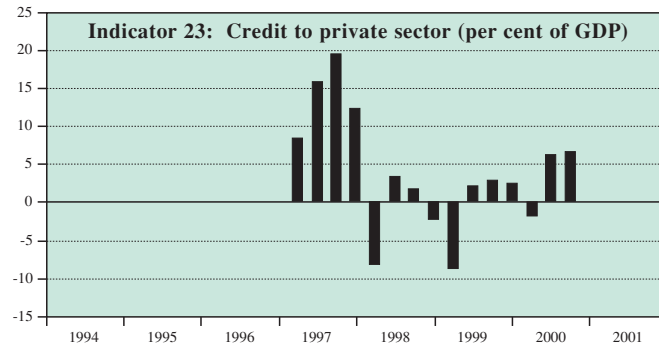
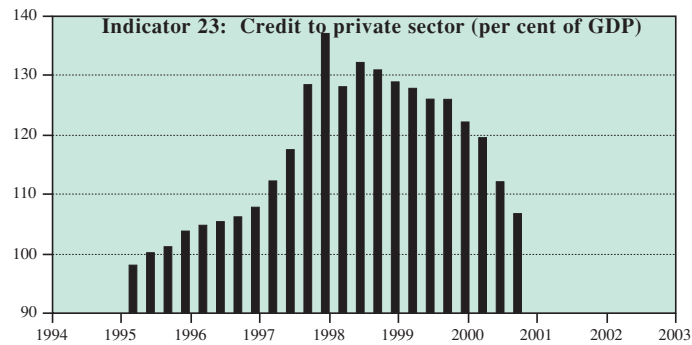
Figure 10. Credit to the private sector in Indonesia**Figure 11. Credit to the private sector in the Philippines****Figure 12. Credit to the private sector in Thailand**

Figure 13. Net profits in Taiwan Province of China

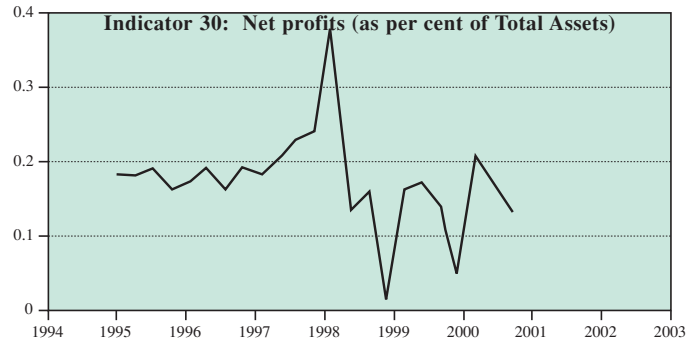


Figure 14. Net profits in Indonesia

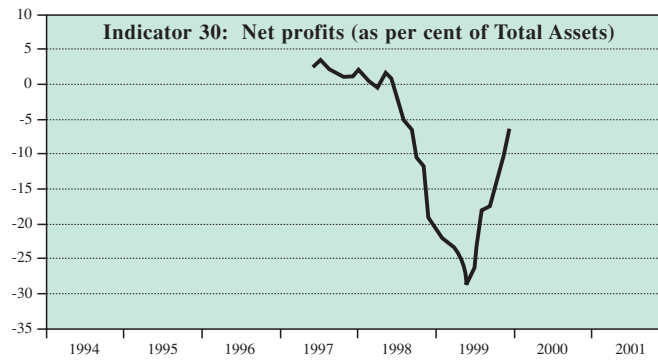


Figure 15. Net profits in Thailand

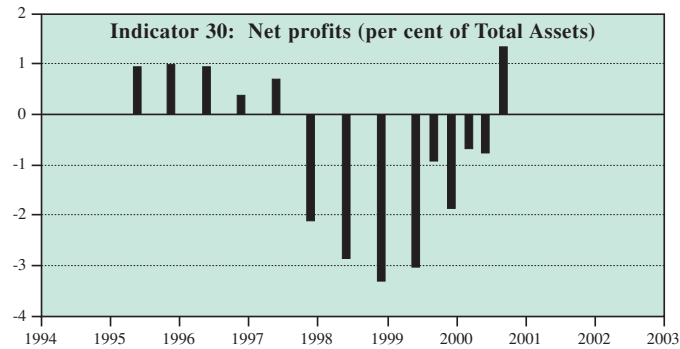


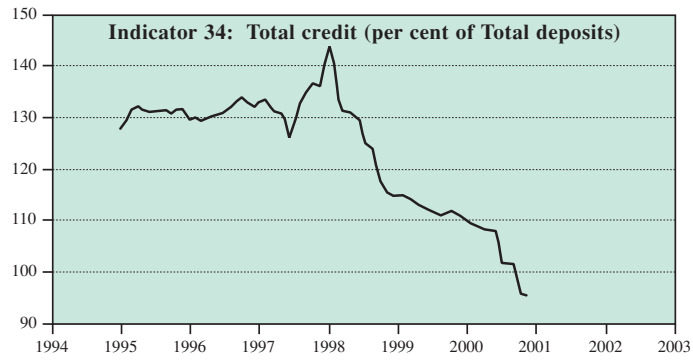
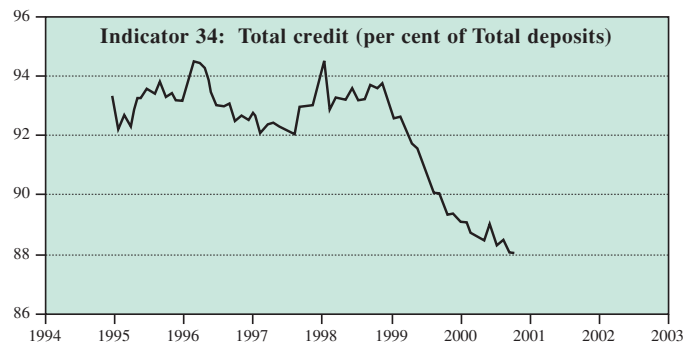
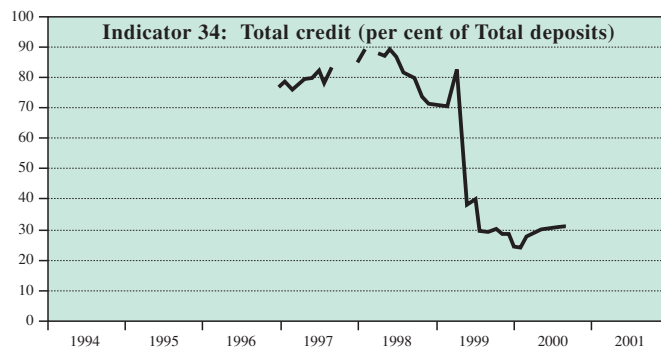
Figure 16. Total credit in Thailand**Figure 17. Total credit in Taiwan Province of China****Figure 18. Total credit in Indonesia**

Figure 19. International borrowings with maturities in Thailand

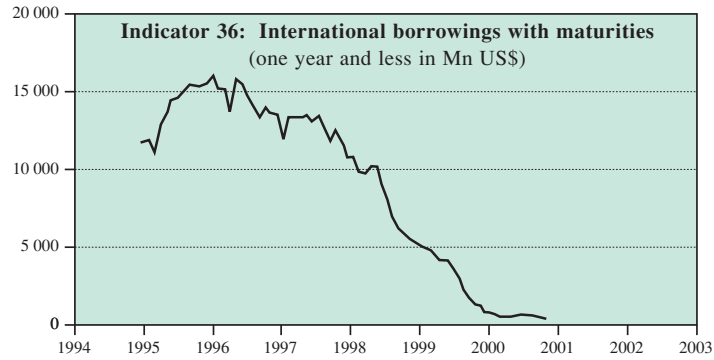


Figure 20. Real estate loans in Indonesia

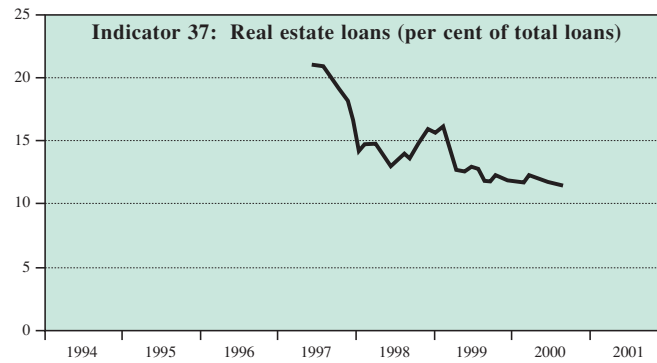


Figure 21. Real estate loans in Thailand

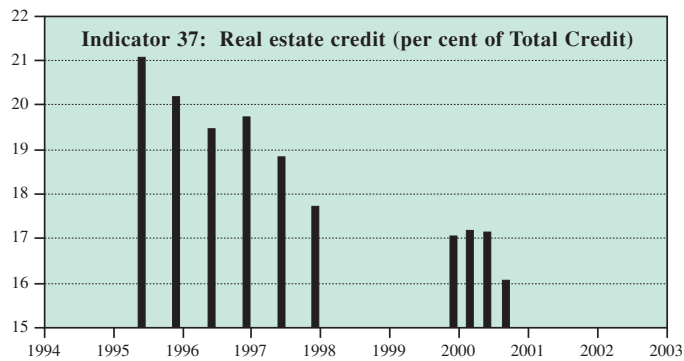


Figure 22. Composite stock price index in Indonesia

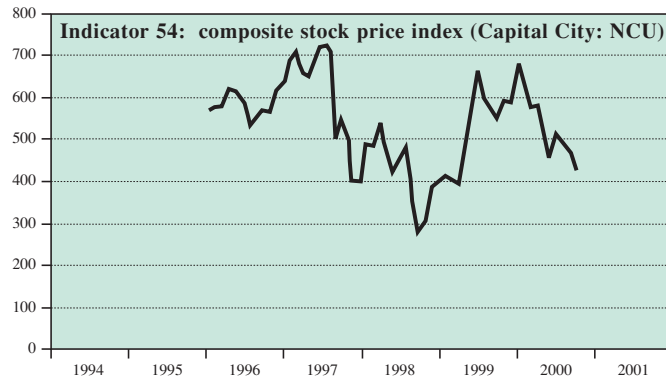


Figure 23. Composite stock price index in Thailand

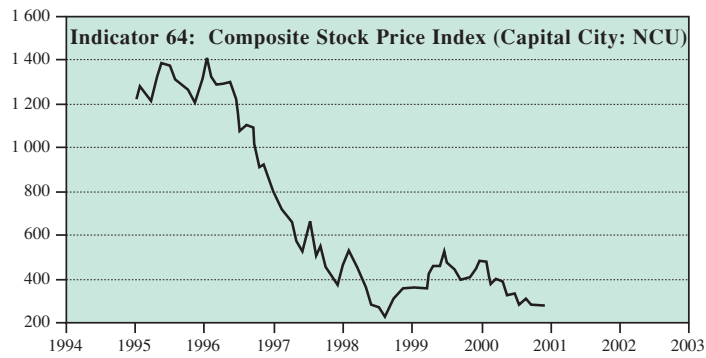


Figure 24. Real effective exchange ratio in the Philippines

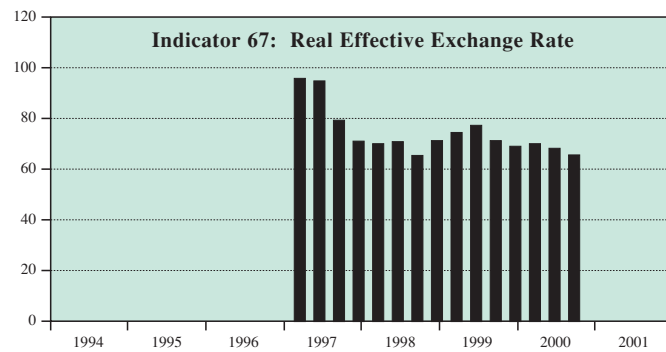


Figure 25. Real effective exchange rate in Thailand

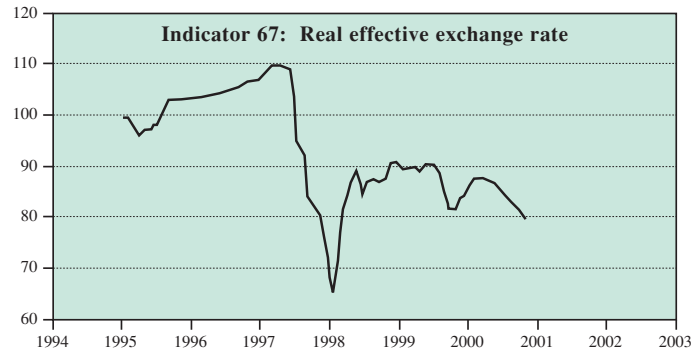


Figure 26. International reserves in Fiji

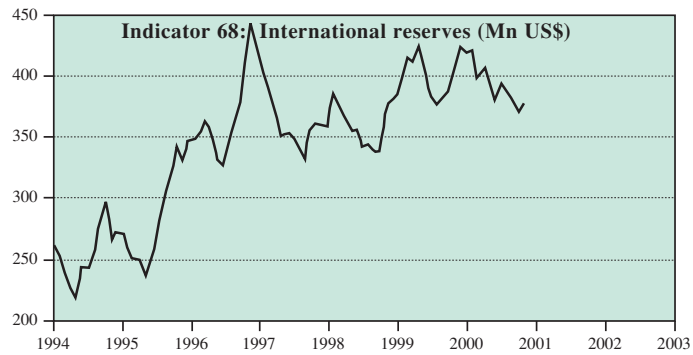


Figure 27. International reserves in Indonesia

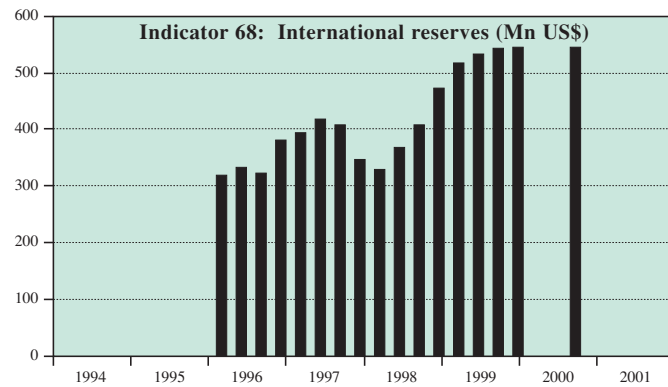


Figure 28. International reserves in Thailand

