

# **Korean Currency Crisis: The Financial Sector Fragility**

**Jang-Yung Lee\***

This paper examines the behavior of various financial fragility indicators in Asian crisis countries during the five years preceding the crisis. The comparison with a control group composed of non-crisis countries shows that several banking pressure indices can be identified as useful leading indicators, including the bank loan-to-deposit ratios, the ratios of bank loans to GDP, and the ratios of banks loans to industrial production. Other measures of banking sector vulnerability, such as the large exposure to foreign exchange risk or volatility of key economic variables were of limited value in predicting the Asian crisis. Also, a closer examination of indicators of bank franchise value reveals that there did not exist incentives faced by bank managers for prudent behavior. (*JEL* Classifications: C41, E44, G21)

## **I. Introduction**

By now, there is a body of literature on the general causes and symptoms of the currency crises. A number of papers have followed the traditional approach using the Krugman's (1979) model of a speculative attack on the currency (Obstfeld 1986; Calvo, Leiderman, and Reinhart 1993). This approach stresses the role played by declining international reserves in triggering the sudden collapse of a fixed exchange rate system. Studies along this approach naturally employ economic models that focus on the evolution of the real exchange rate, the current account balance, and other macro-economic variables that affect the level of official reserves, which is a proxy for the authorities' ability to defend the parity exchange

\*Korea Institute of Finance, KFB Building 6-8th Floor, 4-1 1-Ga Myong-dong, Chung-gu, Seoul, 100-012, Korea, (E-mail) [jylee@sun.kif.re.kr](mailto:jylee@sun.kif.re.kr).  
[**Seoul Journal of Economics** 1998, Vol. 11, No. 4]

rate. An alternative approach, however, emphasizes that the crisis may take place without a significant deterioration in economic fundamentals (Calvo and Mendoza 1995; Kaminsky and Reinhart 1996). This view gained influence after the breakout of the Asian financial crises in mid-1997, since the situation of Asian countries seemed to differ from the typical pre-crisis situation in Latin America of the 1980's: the size of external economic imbalances as represented by the current-account deficit was relatively small and of short duration; the policy-makers had been pursuing generally sound fiscal and monetary policies; domestic prices were stable.<sup>1</sup> In this alternative approach, the focus is either on the growing fragility of the financial system or the panic-driven "herding behavior" on the part of international investors.

The purpose of this paper is to examine the causes of the Asian crises with a view to supporting the arguments of the alternative approach, which is claiming that fundamentals were not necessarily responsible for the crises. The main body of this paper, therefore, is devoted to assessing the degree of vulnerability of banking system in Asian countries based on various pressure indicators. The paper also discusses wrong incentives for prudent behavior and lax banking supervision standards as another important factor behind the crises. In concluding section, some policy lessons will be drawn from the Asian crises, especially for the optimal speed and sequence of financial liberalization.

## **II. Vulnerability of Financial System**

The purpose of this section is to ascertain the severity of the dangers posed to the soundness of the banking system. We will attempt to quantify the various risks to the banking system, by using various indicators. While there are many proxies for the fragility of the overall banking sector, we focus primarily on the following banking-sector indicators:

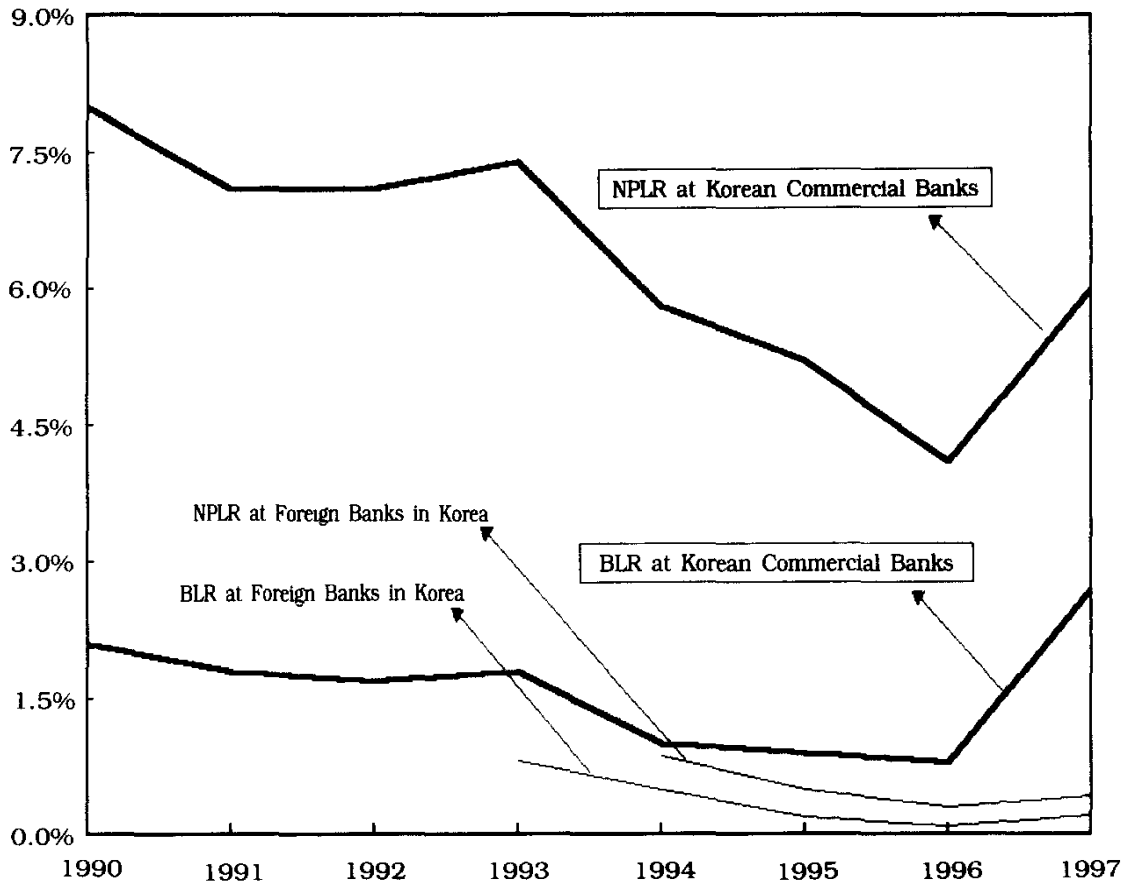
- The level and ratio of the banking sector's non-performing loans to total loans;

<sup>1</sup>Of course, some Asian policy-makers mishandled their exchange rate and debt management policies. However, Asian countries' fundamentals were relatively sound and stable.

- The proxies for the "over-stretchedness" of the banking system (e.g. loan-to-deposit ratio, loan growth rate minus GDP growth rate, and loan growth minus industrial production growth);
- Exposure to foreign exchange risk (e.g. the ratio of foreign liabilities to total liabilities);
- The franchise value of the banking system (e.g. the ratio of cash assets to deposits, and loans to total asset ratio).

Let's begin with the severity of the bad loan problem by looking at the ratio of banks' nonperforming loans to total loans. Figure 1 provides two measures of the nonperforming loan ratios over the 1990-7 period. First, the Bad Loan Ratio (BLR) is calculated using the two worst categories of bad assets (Estimated Loss and Doubtful Loans), while the Nonperforming Loan Ratio (NPLR) covers the three worst categories of bad assets (Estimated Loss, Doubtful, and Substandard Loans). As Figure 1 shows, both the BLR and NPLR have risen recently from 0.8% to 2.7%, and from 4.1% to 6.0%, respectively, between end-1996 and end-1997. The main cause of this sharp increase is apparently the severe economic slowdown and the series of corporate bankruptcies since early 1997. On the surface, this recent increase in the nonperforming loan ratios does not seem to pose dangerously high risks to the Korean banking system, because the system had already handled the similar nonperforming loan problems during the recession period of 1990-3. We should be cautious in interpreting this data, however, because the magnitude of nonperforming loans are systematically understated in Korea: First, the criteria for placing a loan on non-accrual status is lax. Unlike in other advanced countries, bank loans that are overdue by more than 90 days (Precautionary Loans) are not classified as bad loans; Second, because the size of nonperforming loans is understated, the amount of loan loss provisions are inadequate to cover actual losses incurred by the banks. The provisions are insufficient also because of regulatory forbearance: although the required loan loss provision ratios for each type of subquality assets are broadly in line with international standards, the Korean banks' actual compliance with the provisioning standards was only 75 percent as of mid-1997.<sup>2</sup>

<sup>2</sup>The loan loss provisioning standards adopted by Korean supervisory authorities as of end-1996 were as follows: 20 percent for Substandard



**FIGURE 1**

MEASURE OF KOREAN BANK'S NONPERFORMING LOANS

Also note here that the bank supervisory authorities lowered the required provision ratio for Doubtful Loans from 100 percent to 75 percent in 1996; Third reason why the true extent of nonperforming loan problems is not verifiable is that the bank accounting conventions for security valuation are not tight enough to prevent banks from making *de facto* capital erosion invisible: only 45 percent of the securities held by banks are subject to the mark-to-market valuation principle—that is valued at market prices rather than book values. Hence, the failure of Korean banks to identify problem assets and write-off or fully provide for actual and potential losses resulted in financial statements that underestimate the severity of actual financial conditions in the banks. Inaccurate

Loans, 75 percent for Doubtful Loans, and 100 percent for Estimated Loss Loans.

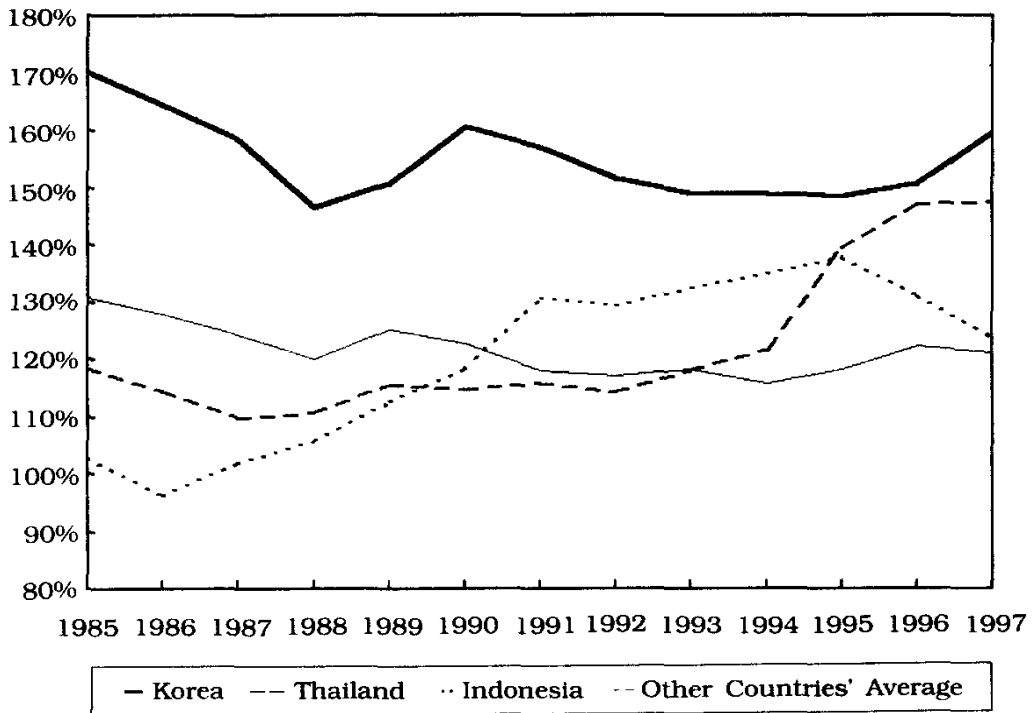
and non-transparent information on "true" size of nonperforming loans at Korean banks was one of the important reasons why international investors took unnecessarily pessimistic views on the weakness of the banking system.

Another group of indicators for measuring banking sector fragility is banking pressure indices, which focus primarily on bank loan growth. The loan growth rate captures the degree of "over-stretchedness" in the banking system, since a rapid rise in bank loans relative to general economic activities, often the result of rapid financial liberalization, tends to deteriorate the quality of banks' asset portfolio. The banks' assets are especially likely to be contaminated when the banking system's ability to intermediate large increases in credit is limited by poor risk assessment skills and lax banking supervision standards. In this study, we use three ratios to measure excessive credit creation by banks in Asian crisis countries: bank loan-to-deposit ratio; the ratios of loan/GDP; and the ratio of loans to industrial production. For comparison purposes, we also calculated these ratios for a control group composed of countries where no crisis occurred.<sup>3</sup>

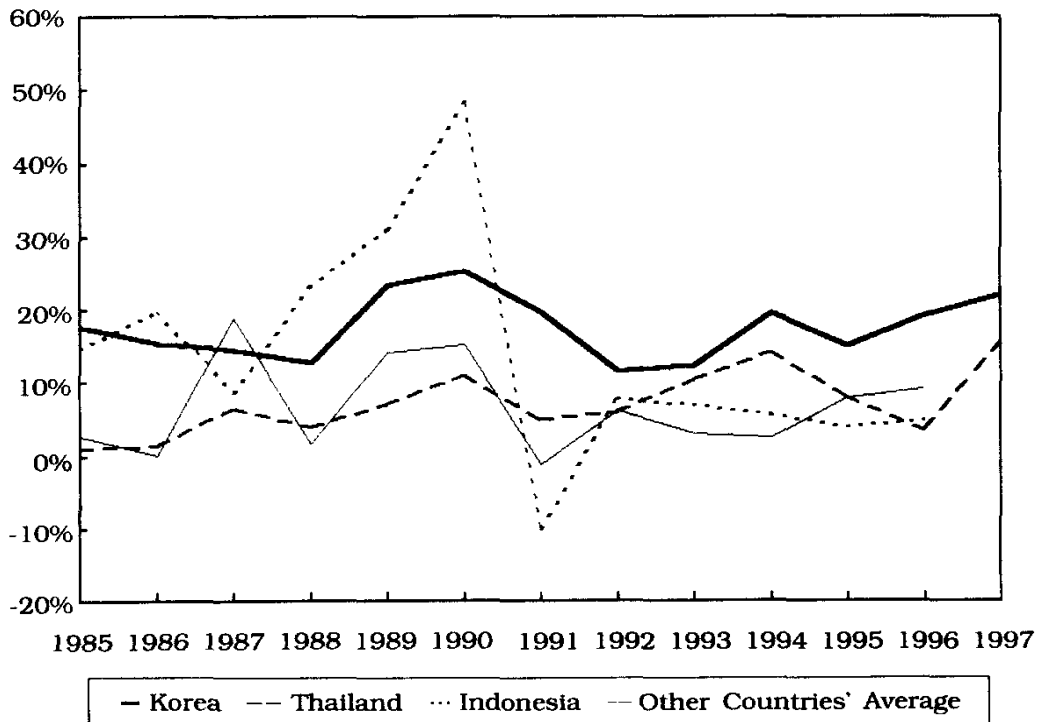
First, as seen from Figure 2, a high and rising loan-to-deposit ratio has been present in the banking systems of Korea, Thailand, and Indonesia in preceding three years since 1995. Korea's ratio of 150-70 percent and the pre-crisis behavior of Thailand's ratio are especially alarming signals. In contrast to the abnormally high ratios in the Asian crisis countries, however, the average ratio for the control group countries was remarkably stable at the low level of 110-20 percent between 1985 and 1997. This result clearly indicates a higher systemic risk faced by the banking systems of the crisis countries. The high systemic risk arises from two basic factors: on the asset side, the relatively high proportion of loans and low proportion of government bond holdings means a higher credit risk; and, the combination of primarily longer-term loans and short-term deposits creates a high maturity mismatch risk.

Second, the gap between total loan growth and the GDP growth is often used as a proxy for real credit growth, and various studies have found that banking crises tend to follow a significant rise in real credit growth. This can be observed in Figure 3, which indicates

<sup>3</sup>The control group countries are Japan, Philippines, Singapore, United Kingdom, New Zealand, and Ireland.



**FIGURE 2**  
BANK LOAN/DEPOSIT RATIO



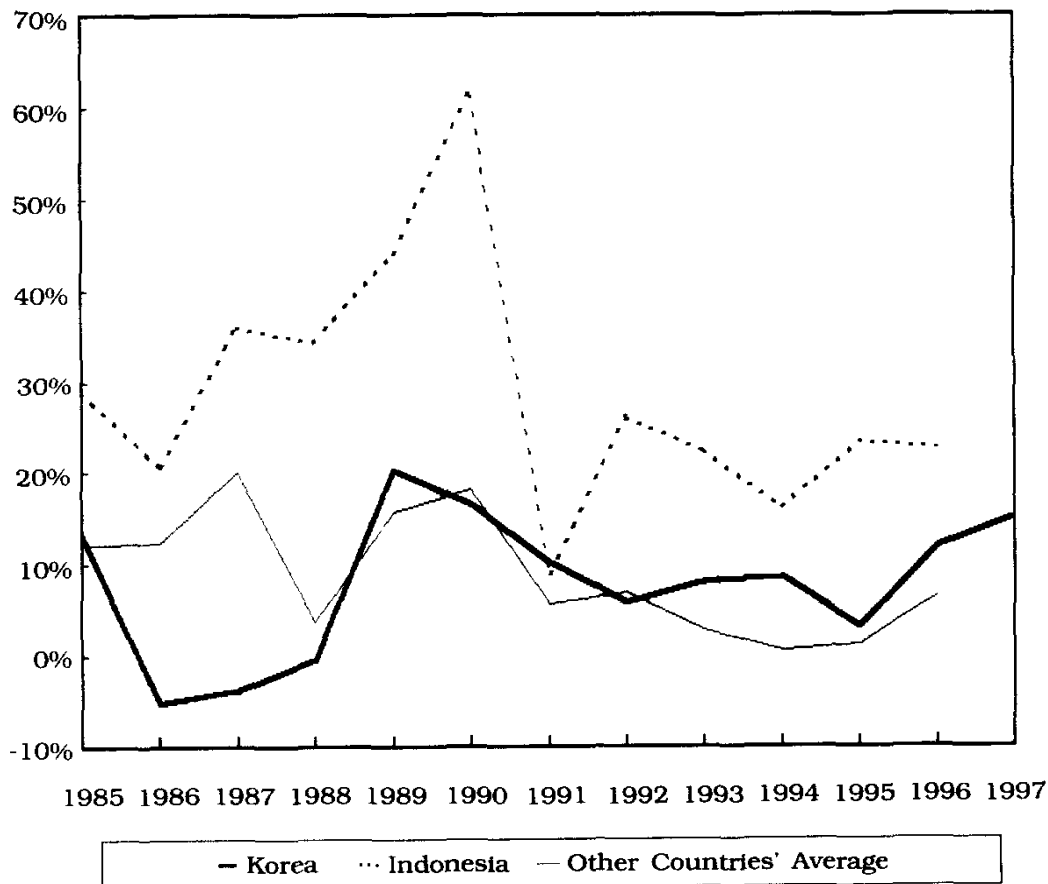
**FIGURE 3**  
LOAN GROWTH RATE - GDP GROWTH RATE

that although all crisis countries extended bank loans rather generously relative to the overall expansion of business cycles, Korean banks increased loans most lavishly. This high real loan growth in the crisis countries can be contrasted with those in the control group: as indicated in Figure 3, the average gap for reference countries was just 0-10 percent, much lower than the 10-20 percent for the crisis countries. This result implies that the banking systems in the Asian crisis countries were approaching runaway credit growth. Such credit growth can lead to stress in the banking system, especially when credit appraisal skills and risk management procedures are not well developed.

Third, Figure 4 shows behavior of a similar bank pressure index: overall loan growth minus industrial production growth. As in the previous case, Figure 4 indicates that a considerable margin existed between loan growth and industrial growth in the Asian crisis-ridden countries. One noticeable difference here, however, is that Indonesia's index level has been historically very high and, for the 5 years preceding the crisis, its index shows the highest growth rate, far surpassing that of Korea (Note that Indonesia's 5-year average is 21.9 percent). This difference stems mainly from the fact that the divergence of Korea's loan growth from industrial production growth was relatively modest as compared to that of Indonesia. This in turn suggests that Korean banks' exposure to the non-industrial sector was smaller than that of Indonesia's banks. Indeed, a closer examination of bank loan portfolios by sector confirms that there was manufacturing-oriented bank lending in Korea and real-estate-oriented lending in Thailand and Indonesia.

As indicated in Figure 5, the manufacturing sector accounts for almost 40 percent of bank loans in Korea, but just 27 percent in Thailand. Loans to the real-estate sector, on the other hand, accounts for only 0.9 percent of bank loans in Korea while in Thailand it accounts for 9 percent.<sup>4</sup> This marked difference in sectoral distribution of bank loans among crisis countries is often cited as one of the reasons why some economies (e.g. Thailand, Indonesia) suffered from more serious boom-and-bust asset price cycles, that typically stem from the build-ups of property price bubbles.

<sup>4</sup>The lack of consistent data on property prices in other Asian countries has prevented comprehensive examination of their influences.



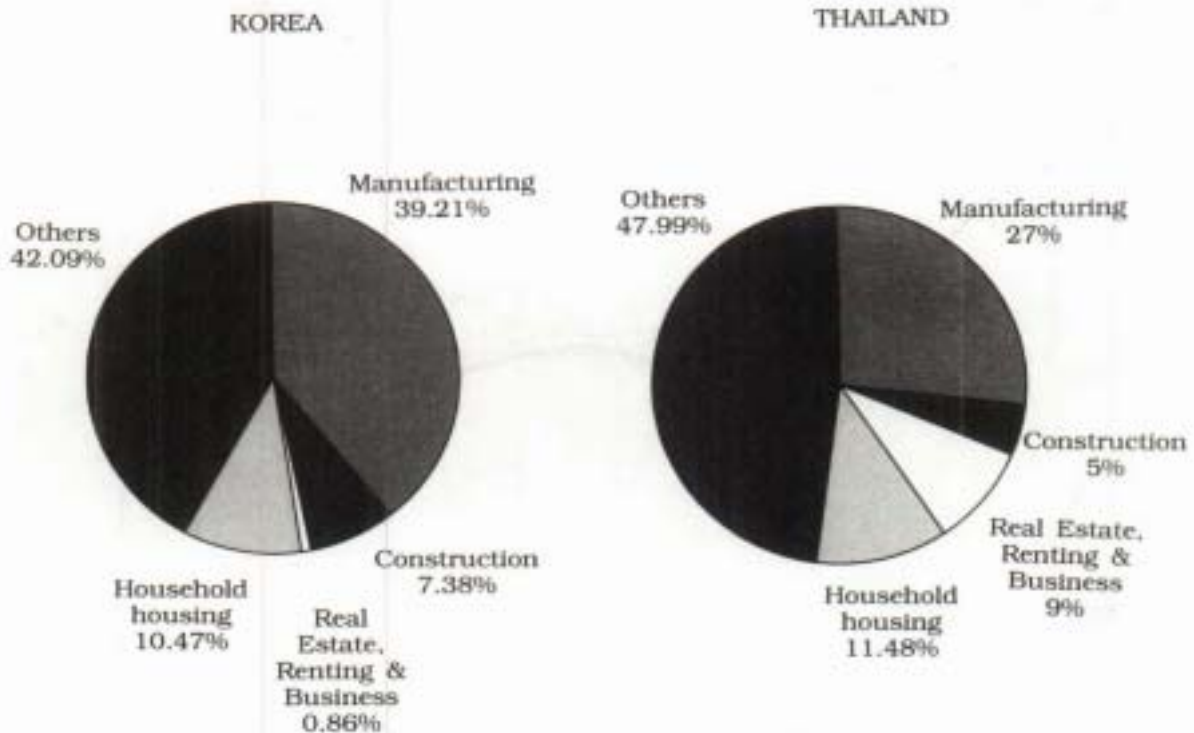
**FIGURE 4**

LOAN GROWTH RATE — INDUSTRIAL PRODUCTION GROWTH RATE

From the discussions above, it can be concluded that all the Asian crisis countries have one negative commonality: the overly generous extension of bank loans leading to overinvestment either in manufacturing or real-estate sector. This in turn led to a protracted deterioration in asset quality and severe stress in the banking system, be it from a collapse in real estate prices or increased bankruptcies in the corporate sector.

Experience also shows that financial crises are often associated with a rapid rise in banks' net foreign liabilities relative to total liabilities. A high and rising foreign-liability-to-total-liability ratio for banks means a larger exposure to foreign exchange risk, which not only makes a country's financial system more vulnerable to a financial crisis, but also exacerbates the negative consequences of such a crisis through foreign exchange losses. The cross-country

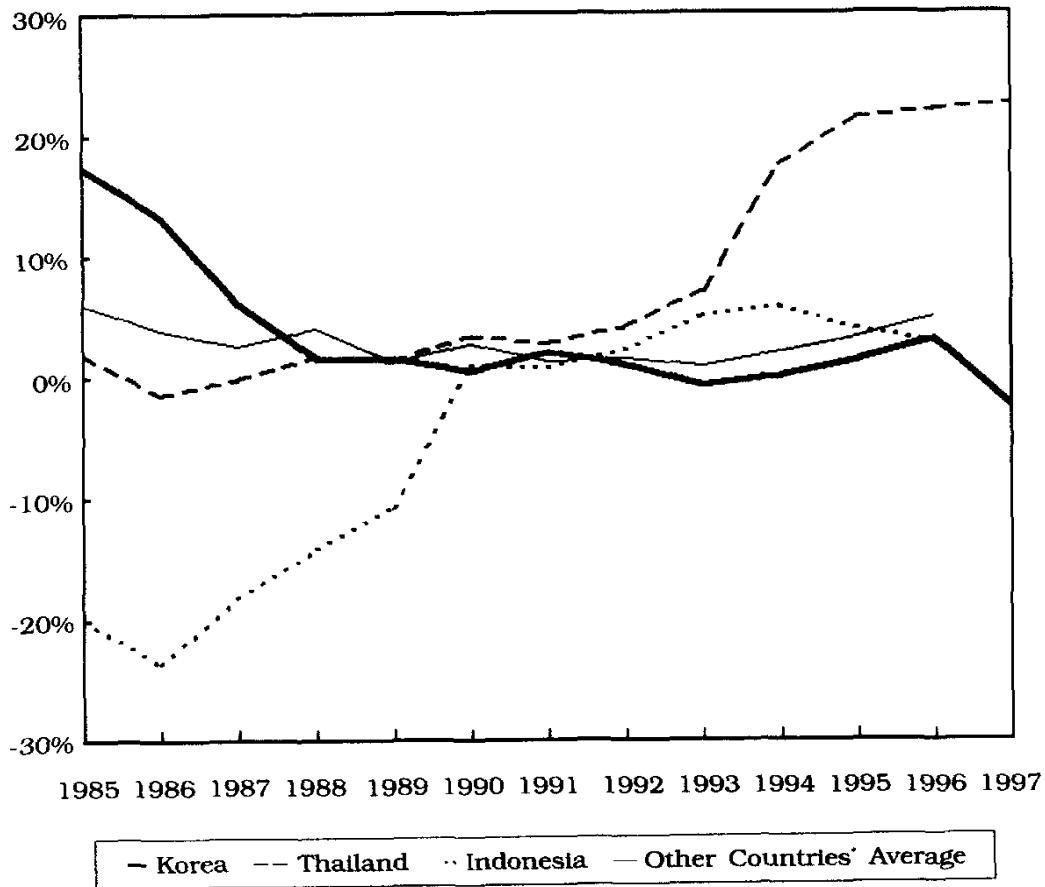




Source: Bank of Korea, *Monthly Bulletin*  
 Bank of Japan, *Economic Statistics Monthly*  
 Bank of Thailand, *Quarterly Bulletin*

**FIGURE 5**  
 SECTORIAL DISTRIBUTION OF BANK LOANS

comparison of this index is shown in Figure 6. As can be seen from Figure 6, the Thailand's ratio stands out with a 15-20 percentage points higher than other control group countries, while the indices for both Korea and Indonesia remained below the 5 percent level, similar to levels in the control group countries. During the five years preceding the crisis, Thai banks' net foreign liabilities jumped 10-15 percentage points, and Korean banks' ratio rose from being in balance at end-1994 to 3.1 percent of the total by year-end 1996. This rapid rise in the foreign liabilities ratio in advance of the crises exacerbated banks' financial condition once the currency crisis broke out and the local currency depreciated substantially. For example, between December 1996 and December 1997, the Korean won declined from 844 to 1,696 to the dollar and the foreign-currency-denominated liabilities of Korean banks jumped



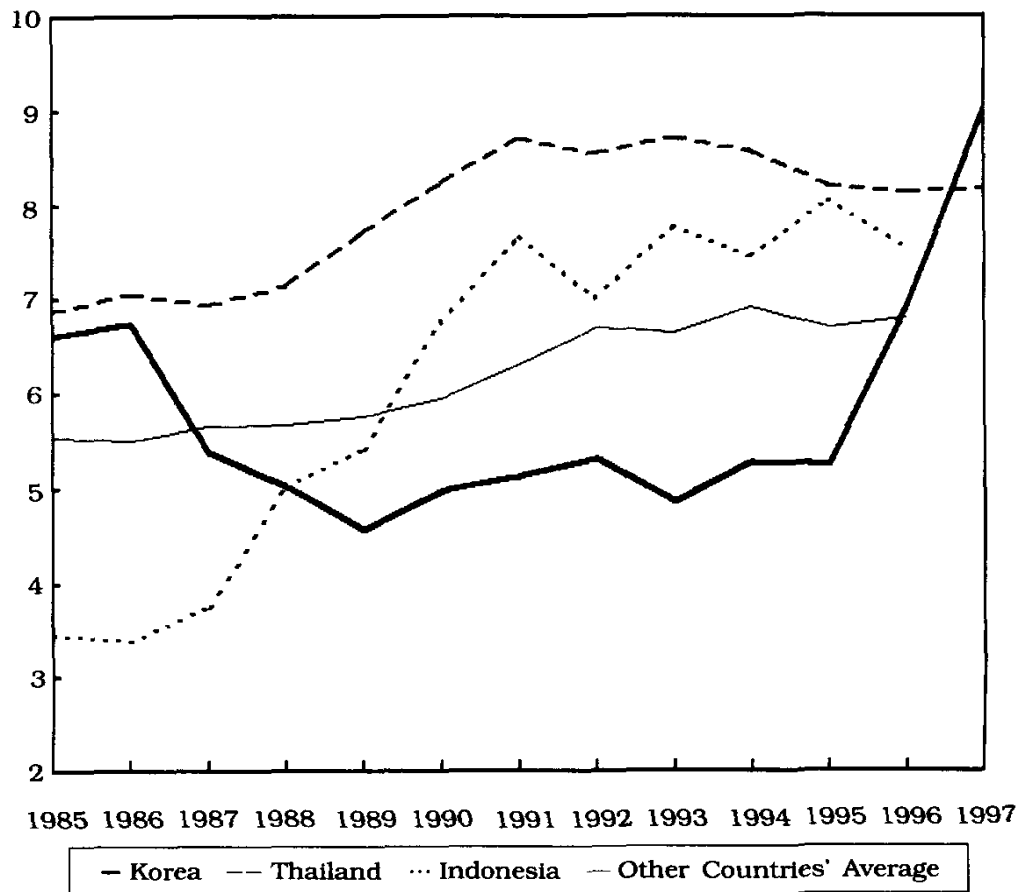
**FIGURE 6**

NET FOREIGN LIABILITIES / TOTAL BANK LIABILITIES

from 7.56 trillion won to 10.64 trillion won. Furthermore, the Korean banks' exposure to the foreign exchange risk was actually much higher, because proper hedging instruments such as currency forward, futures, and swaps were not available or remained expensive to use.<sup>5</sup> Under these circumstances, the foreign currency liabilities were passed on to the corporate sector which tends to neglect to hedge the foreign currency risk.

Another important variable often used to measure the vulnerability of the banking system is the change in the money multiplier, i.e. the ratio of M2 (currency plus demand and savings deposit) to reserve money. A rising money multiplier (or falling reserve requirement) is often associated with the process of rapid

<sup>5</sup>In Korea, for example, hedging through forward exchange transactions is available only for very short maturities.



**FIGURE 7**  
MONEY MULTIPLIER (M2)

financial liberalization. When banks' risk management capacity and appraisal skills for credit risks do not keep pace with financial deregulation, a rising money multiplier often leads to increased bank pressure. For this reason, a serious banking crisis is often preceded by rapid financial liberalization without a concomitant strengthening of prudential regulation and supervision. As seen from Figure 7, the money multipliers for Indonesia and Thailand were more or less stable during the five years preceding the crises, while the index for Korea rose sharply from 5.3 percent at end-1995 to the unprecedented level of 9.0 percent by end-1997. This high multiplier could have invited excessive balance sheet expansion and the poor credit risks at Korean banks, which helped finance overly ambitious corporate projects.

Volatile economic environments can also affect the vulnerability of

the banking system. This suggests that the evolution of key economic variables can also be used as leading indicators of banking crisis. For instance, volatile interest rates and exchange rates have been criticized for increasing the fragility of the banking system. As noted earlier, banks in emerging economies are not properly equipped with expertise and instruments to deal with the fluctuation in market interest rates and exchange rates. A risky situation may arise when market interest rates fluctuate sharply and banks with large holdings of government securities see their market value decrease sharply.<sup>6</sup> Volatile interest rates and exchange rates also hamper the way in which the real value of impaired bank asset is adjusted downwards and the ability of the central bank to act as a lender-of-last-resort to illiquid but solvent banks.<sup>7</sup> Volatilities in the industrial production index and other asset prices such as the share price are often singled out as leading causes of bank failures, because such changes not only contribute to the relatively high volatility of growth rates, but they are also serious causes of falling profitability.

Table 1 shows four measures of volatility for the Asian crisis countries, with Singapore included as a reference country: volatility for exchange rate, interest rate, industrial production index, and share price measured in terms of the standard deviation of monthly or quarterly percentage changes for the sample period of 1993-7. As seen from Table 1, each of the three Asian crisis countries exhibited more volatile fluctuations in exchange rate and interest rate than those of the Singapore, which maintained the same exchange rate regime of *managed floating* as those of Korea and Indonesia.<sup>8</sup> Among others, Korea's volatility of the exchange rate and the Indonesia's volatility of the interest rate were especially pronounced. Volatility of asset prices, as represented by the share price, is the highest in Indonesia, then followed by Thailand and Korea. The significant volatility of share prices can be explained by the large scale of private capital flows relative to the size of equity markets in those economies.<sup>9</sup>

<sup>6</sup>See de Juan (1998) for detailed discussion of typical situations.

<sup>7</sup>See Goldstein and Turner (1996) for details.

<sup>8</sup>Thailand, on the other hand, has maintained the exchange rate system of pegging to a composite of currencies.

<sup>9</sup>See Folkerts-Landau *et al.* (1995).

**TABLE 1**  
VOLATILITY OF ECONOMIC ENVIRONMENT

(Unit: In percent)

		Exchange Rate	Interest Rate	Industrial Production Index	Share Price
Korea	Monthly	5.95	11.56	4.69	6.76
	Quarterly	-	13.10	3.86	11.17
Thailand	Monthly	3.48	-	-	8.59 <sup>2)</sup>
	Quarterly	-	39.95	-	-
Indonesia	Monthly	5.91	-	-	8.94 <sup>2)</sup>
	Quarterly	-	63.46 <sup>1)</sup>	12.72 <sup>3)</sup>	-
Singapore	Monthly	1.14	-	-	-
	Quarterly	-	25.14	6.61 <sup>4)</sup>	-

Note: Each volatility index was calculated using the standard deviation for the monthly and quarterly changes in percentage terms during the sample period of 1993/1Q-1997/4Q.

1) 1994/4Q-1997/4Q.

2) 1994/1M-1994/12M.

3), 4) Indonesian figure denotes production index of the crude petroleum, and Singapore denotes production index of manufacturing.

Source: IMF, *International Financial Statistics*.

IMC, *Emerging Stock Markets Factbook 1995*.

The discussions so far suggest that there already existed strong warning signs for financial sector vulnerability in Asian banking markets in advance of crisis. It is uncertain, however, whether bank managers or supervisory authorities detected the problem early enough to adopt pre-emptive or corrective measures to prevent the impending banking crisis.

### III. Inadequate Banking Supervision

Given the lack of a sophisticated monitoring system and prudential regulatory framework, and the heavy government involvement in banking activities, the bank supervisory authorities in the Asian crisis countries could easily overlook the fragility indicators. Even if warning signs were noticed, the authorities could have opted for *regulatory forbearance* for non-economic reasons.<sup>10</sup> A forbearance policy is a policy of ignoring the problem in the banks

<sup>10</sup>See Kane (1989) for details.

based on the view that the problem is a temporary and cyclical phenomenon.<sup>11</sup> For example, as noted earlier, supervisory authorities were not concerned about the high proportions of non-performing loans at Korean banks in 1996-7 period, simply because the high and rising ratio was not unprecedented in the past. Thus the dominant view among the policy-makers was that economic growth would resolve the bad loan problem without the need for any corrective action, in exactly the same way as the economic recovery after 1993 had lowered the bad loan ratio to a more sustainable level. Together with the absence or weakness of prudential regulation, this forbearance policy created severe moral hazard problems—that is, encouraged the troubled banks to engage in more high-risk activities.

Now, the next issue is whether there existed incentives faced by bank owners or managers for prudent behavior because they eventually determine the quality of bank supervision. When appropriate incentives do not exist, supervisor cannot enjoy the support of the banking industry. While there are many factors that affect the incentives, this paper will focus on the banks' special role in monitoring borrowers' behavior. Of course, bank capital and the owners' share in the costs of any bank restructuring are important factors that can promote better governance. However, for reasons discussed earlier, the data on bank capital in developing countries are often seriously contaminated. When standardized procedures for classifying bad loans or deducting defaulted loans from capital and loan loss accounts do not exist, usual indicators of bank soundness, such as capital-to-asset ratios and loan loss provisions to nonperforming loans, are often meaningless. Also, because of the implicit guarantee provided by the government, it is almost impossible to ascertain who bears how much the cost of bail-out if a bank becomes insolvent.<sup>12</sup> Therefore, we chose to focus on the incentive for bank to monitor and discipline customer borrowers. The incentives can be measured by the *franchise value*—that is the

<sup>11</sup>See Garber (1995) for details.

<sup>12</sup>In their loan decisions, especially to the large business groups called chaebols, Korean bankers tended not to heed the groups' financial unsoundness but the explicit or implicit guarantees provided by the government. Therefore, the top thirty chaebols, of which the average debt-to-equity ratio was almost 400% in 1996, could still obtain financial resources from the Korean banking system.

special power conferred on banks by the banking charter to issue liabilities that are accepted as a means of payment. The franchise value captures the value of banks' commitment to deliver "good funds" and benefits derived from having a demand deposit relationship with a customer, which provides it with current information about the state of the borrower's financial condition. Thus, the franchise value becomes a very informative indicator to evaluate the quality of banking supervision.

Now, one apparent method to measure the quality of the bank franchise value is to calculate banks' cash assets (i.e. cash and deposits at the central bank) relative to their deposit liabilities. If banks hold a larger amount of cash assets, they have less incentive to press their borrowing customers to remain liquid. That is, the market discipline exerted by banks on borrowers—by requiring frequent delivery of good funds as a way to prove borrowers' credit-worthiness—is reduced. Hence, a relatively high cash ratio represents a weak franchise.<sup>13</sup> A second measure of franchise value is the ratio of loans to assets. Banks that hold a high ratio of non-loan assets to assets (e.g. government bonds) are probably not fulfilling their role of policing the liquidity of borrowers. A relatively high loan to asset ratio, therefore, represents a strong franchise. Now, let's evaluate the strength of Korean banks based on the ratios described above. As can be seen from Table 2, the relatively low ratio of cash asset to deposit liabilities seems to suggest comparatively high franchise value for Korea: Notice that its five-year average is only 18.2 percent, while those of several Latin American countries before and during the banking crisis were much higher, ranging from 21 percent in Chile and 65 percent in Mexico to over 75 percent in Argentina. Based on the modestly low loan-to-asset ratio of about 39 percent, however, the Korean banking system seems to have relatively weak franchise value: Notice that the loan-to-asset ratios in the Latin American countries range from 45 percent to 63 percent (See Table 2).

Because of these conflicting indicators, our interpretation of the Korean data is rather mixed. A closer examination of more recent

<sup>13</sup>Note, however, that low liquidity ratios in financially-developed economies are often taken as an indicator of problems in a bank, because banks in developed countries operate much lower cash ratios than those in developing countries. For details, see Rojas-Suárez and Weisbrod (1995).

**TABLE 2**  
INDICATORS OF BANK FRANCHISE VALUE

(Unit: In percent)

Countries	Cash Assets to Deposits	Loans to Assets
Korea	18.28	39.64
Chile	21.13	63.42
Colombia	20.96	58.66
Argentina	76.19	48.57
Mexico	65.13	45.53
Peru	55.32	45.82

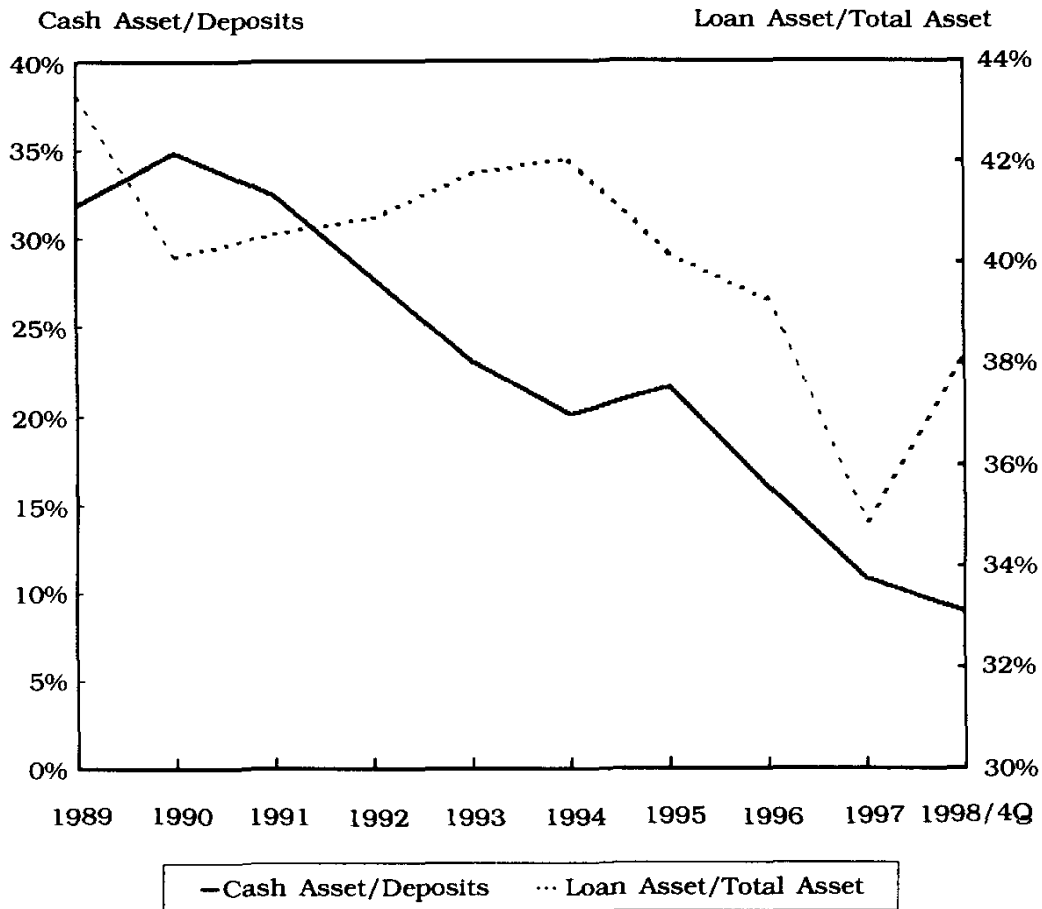
Note: Data for Korea are 5-year average figures during 1993-7 period, while other countries correspond to 1982, when the Latin American debt crisis broke out.

figures, however, reveals that both measures of the franchise value have been rapidly improving since the outbreak of the crisis at year-end 1997: the cash to deposit ratio is falling and the loan to asset ratio is rising (See Figure 8). This rising franchise value implies that there is now a weaker tendency for Korean banks to provide new credit to borrowers in arrears on their payment, thereby making the loan workout program more credible in period of systemic banking crisis. Unfortunately, this improvement was made only after the onset of the crisis.

The interpretation of the weak franchise value as a disincentive for the effective banking supervision described so far suggests that international lenders are scrutinizing the movement of the franchise value in any banking system and any other available indicators of banking sector fragility. Hence, it is not surprising that many analysts, economists, and senior managers at these international financial institutions issued early warning signals to the Asian crisis countries pointing out the high risks of banking crises. These warnings were based on the abnormal behavior of some financial sector indicators which were similar to the ones used in this study. Some analysts gave out alarming signals to Korea as early as July 1997, 5 months before the onset of the crisis.<sup>14</sup>

<sup>14</sup>See Kapur and Ma (1997) for examples.





**FIGURE 8**  
FRANCHISE VALUE OF KOREAN BANK

It is by now generally recognized that, once the alarming signs of financial fragility are detected, international lenders tend to move quickly to withdraw their loans or call in their investments. As emphasized by Calvo (1995) and Montes (1998), the “herding behavior” comes from highly-diversified portfolios, disincentive for information gathering on the part of investment fund managers, and “disaster myopia”. Under these circumstances, frivolous rumors or small bad news could easily result in massive capital flows. For the borrowing countries, this means an abrupt denial of access to international capital markets, even when there is no concrete sign of macroeconomic imbalances. Too often domestic bank managers and policy-makers, especially those who look only at economic fundamentals, fail to listen to any alarming sound from the financial sector. Hence, the countries with banking sector problems are drawn into a full-blown balance-of-payment crisis. Of course,

there are other channels through which banking crises precipitate balance-of-payment crises: the bail-out of the fragile banking system may contribute to further acceleration in credit creation, which leads to the currency crisis; a frail banking system is likely to tie the hands of the central bank in defending the currency.<sup>15</sup> This link between banking crises and balance-of-payment crises has become more strong since 1980s, when the process of financial sector liberalization was accelerated.

It is true that international capital market has some flaws, including the large variation of capital flows that may come from reckless lending in good times and "herding behavior" in bad times. Banking crises are partly the investors' fault. However, banking-crises induced by currency crises are mainly the borrowers' fault.

#### **IV. Conclusion**

We examined the behavior before and during the periods of Asian crises of various financial fragility indicators. Each of the Asian crisis countries saw their banking pressure indices rise rapidly during the five years preceding the crisis. However, due to the lack of incentives for prudent behavior on the part of the banks and the regulatory forbearance on the part of the supervisory authorities, those warning signs were ignored. International lenders, on the other hand, had been watching these indices very closely and, once alarming signals were detected, they quickly fled from the currencies and stock markets of Thailand, Indonesia, and then Korea. This is how Asian countries with banking sector problems are drawn into a full-blown currency crises.

The general conclusion of this paper is that, to be effective, early warning system should consider a broader variety of financial sector soundness indicators. Indicators of banking crises are significant in helping to predict currency crises. The evidence reviewed here suggests that the following indicators are useful, among others: the ratio of nonperforming loans to total loans, loan growth rate relative to GDP growth rate, and the ratio of net foreign liability to total liability. Discussions to date also suggest the necessity of having well-designed financial liberalization plan. While

<sup>15</sup>See Kaminsky and Reinhart (1996) for the empirical evidence.

there are many criteria for determining the optimal speed and sequencing of financial liberalization, special consideration should be given to the "financial intermediation capacity" of banks and the existence of strong prudential regulation and supervision for financial institutions. The first aspect relates to the ability of a financial system to strengthen the efficiency of allocation and raise the productivity of investment by improving its allocation of financial savings to the most efficient uses (Fry 1994). The second aspect is of paramount importance because financial liberalization generally increases the risks for financial institutions and therefore requires strengthened prudential regulation and supervision to discourage excessive risk-takings. When bank credit managers do not have the expertise needed to evaluate the new sources of credit and market risk that accompany financial liberalization,<sup>16</sup> a strong and effective bank supervisory system is the only defense against the bank lending booms that lead to a deterioration in credit quality.

<sup>16</sup>If financial liberalization is defined as broad policy changes to include external financial liberalization, i.e. the capital account of the balance of payments, then the sources of credit and market risk are increased exponentially.

## Appendix

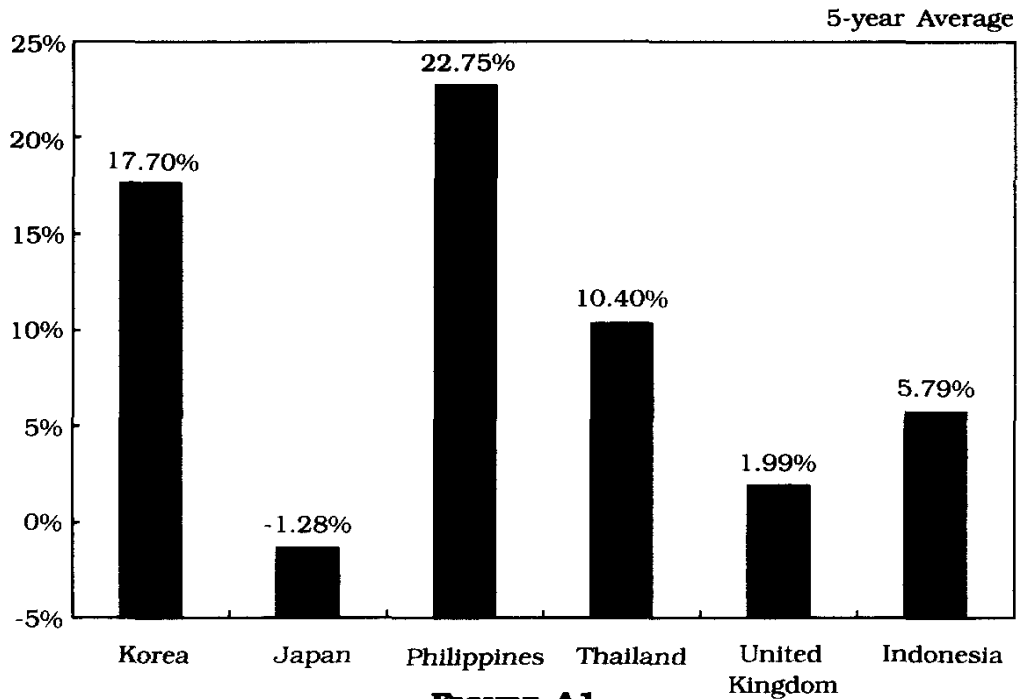


FIGURE A1

LOAN GROWTH RATE - GDP GROWTH RATE

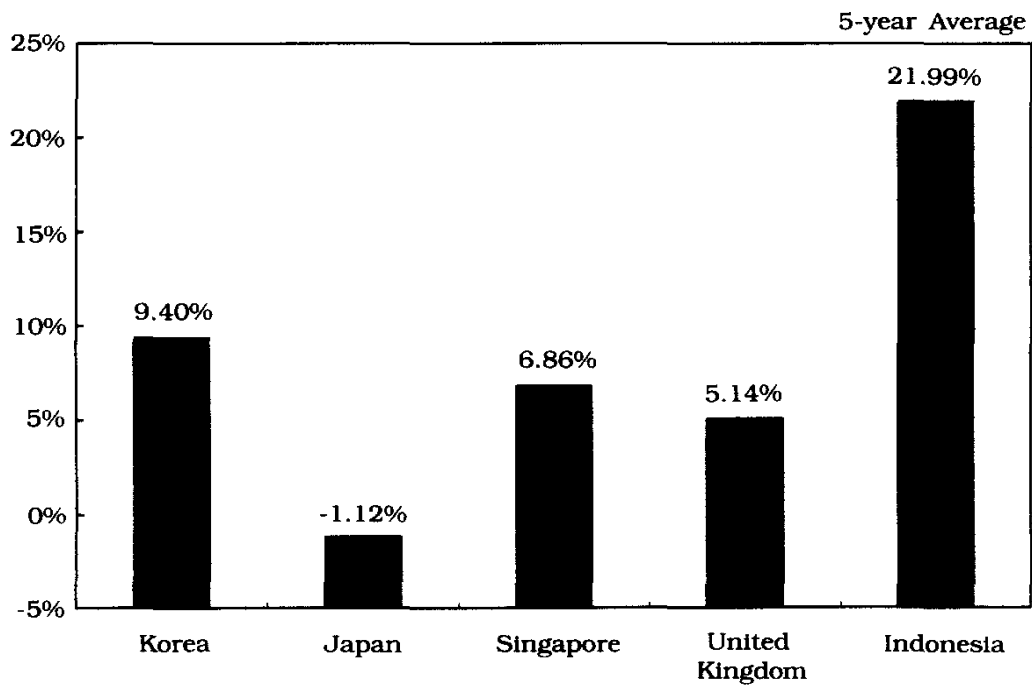
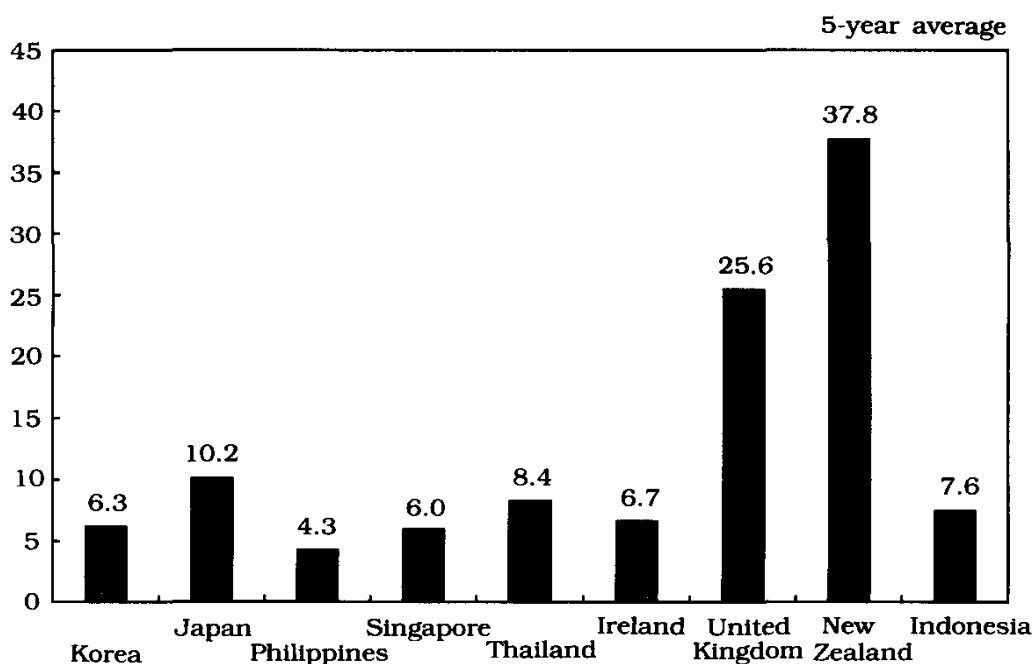


FIGURE A2

LOAN GROWTH RATE - INDUSTRIAL PRODUCTION GROWTH RATE



**FIGURE A3**  
MONEY MULTIPLIER (M2)

*(Received August, 1998; Revised October, 1998)*

## References

- Calvo, Guillermo A. "Varieties of Capital-Market Crises." A paper is part of a project on Financial Sector and Growth sponsored by the Inter-American Development Bank, February 1995.
- \_\_\_\_\_, Leiderman, L., and Reinhart, C. M. "Capital Inflows and Real Exchange Rate Appreciation: the Role of External Factors." *IMF Staff Papers* 40 (1993): 108-51.
- Calvo, Guillermo A., and Mendoza, Enrique G. "Reflections on Mexico's Balance-of-Payments Crisis: A Chronicle of a Death Foretold." October 1995.
- De Juan, Aristobulo. "The Roots of Banking Crises: Micro-Economic Issues and Issues of Supervision and Regulation." Presented in the Korea Institute of Finance Seminar on Banking Crisis Resolution Issues: International Lessons for Korea, Seoul, Korea July 1998.
- Folkerts-Landau, David *et al.* "Effects of Capital Flows on the Domestic Financial Sectors in APEC Developing Countries," in

- "Capital Flows in the APEC Region," IMF Occasional Paper No. 122. Washington: International Monetary Fund, March 1995.
- Fry, Maxwell J. *Money, Interest and Banking in Economic Development*. Baltimore: Johns Hopkins University Press, 2nd Edition, 1994.
- Garber, Peter. "Managing Risks to Financial Markets from Volatile Capital Flows: The Role of Prudential Regulation." Providence, Rhode Island: Brown University, Economics Department, Unpublished, 1995.
- Goldstein, Morris, and Turner, Philip. "Banking Crises in Emerging Economies: Origins and Policy Options." BIS Economic Papers No. 46. Banking for International Settlements, October 1996.
- Kaminsky, Graciela, and Reinhart, Carmen M. "The Twin Crises: The Causes of Banking and Balance-of-Payments Problems." International Finance Discussion Paper No. 544. Washington, D.C.: Board of Governors of the Federal Reserve, March 1996.
- \_\_\_\_\_, and Lizondo, Saul. "Leading Indicators of Currency Crises." IMF Working Paper WP/97/79. International Monetary Fund, July 1997.
- Kane, Edward. *The S & L Insurance Mess: How Did It Happen?* Washington, D. C.: The Urban Institute Press, 1989.
- Kapur, Ajay, and Ma, Miranda. "Banking Crises in Asia: Who's Next? and Why?" *UBS Global Research*. Union Bank of Switzerland, July 1997.
- Krugman, Paul. "A Model of Balance of Payments Crisis." *Journal of Money, Credit and Banking* 11 (August 1979): 311-25.
- Montes, Manuel F. *The Currency Crisis in Southeast Asia*. Singapore : Institute of Southeast Asian Studies, 1998.
- Obstfeld, Maurice. "Rational and Self-Fulfilling Balance-of-Payments Crises." *The American Economic Review* Vol. 76 (March 1986).
- Rojas-Suárez, Liliana, and Weisbrod, Steven. "Financial Fragilities in Latin America: the 1980s and the 1990s." IMF Occasional Paper No. 132. Washington: International Monetary Fund, October 1995.