Currency Crises in Asia and Lain America: A Comparison

Shoji Nishijima

Research Institute for Economic and Business Administration, Kobe University

2-1, Rokko, Nada, Kobe, 657-8501

nisijima@rieb.kobe-u.ac.jp

Abstract

In the second half of the 1990s, many Asian and Latin American countries suffered from the currency crises. But the causes and processes of currency crisis are not necessarily the same, though there are many common aspects. The purpose of this paper is to compare the currency crises in both regions paying attention on the inconsistent macroeconomic policies under the rapid liberalization. We first build a theoretical model in which both macro fundamentals and agents' expectations are to play crucial roles. The model implies that a deterioration of macro fundamentals would increase the possibility of currency crisis through changes in behavioral patterns of private agents and government. We then compare the macro fundamentals of the five crisis countries in Asia and Latin America. Among other macro fundamentals, we focus on the soundness of banking sector as one of the most important factors that made the crisis process different in two regions. Finally we examine the future tasks for these countries to stabilize the currencies.

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Introduction

In the 1990s market liberalization has widely spread in developing countries and policy reforms such as trade and capital liberalization, privatization, and deregulation have progressed much faster than generally expected. Along with these reforms an enormous amount of foreign capital flowed into the "emerging markets" and supported their high economic growth with favorable macroeconomic performance. However, excessive dependence on foreign capital led to the currency instability as an inevitable consequence of hasty liberalization.

Starting from the Mexican Peso crisis in the end of 1994, a series of currency crises occurred in Asian countries in 1997, Russia in 1998, and Brazil in 1999. But the causes and processes of currency crisis are not the same reflecting the differences in each country. Particularly there is a conspicuous difference between Asia and Latin America with respect to the contagion process. While the Brazilian currency crisis in 1999 had serious impacts on the neighbor countries, it did not cause infections of crisis as was seen in the Asian crisis and the recovering process in Brazil has been much faster than Asian countries.

The purpose of this chapter is to discuss the currency crises in Asian and Latin American countries and the future tasks to stabilize their currencies. Section 1 describes the background of currency crisis focusing on inconsistent macroeconomic policies under the rapid liberalization. In Section 2 a theoretical model is introduced in which both macro fundamentals and agents' expectations are to play crucial roles to cause currency crisis. The model implies that a deterioration of macro fundamentals would increase the likelihood of currency crisis through changes in behavioral patterns of private agents and government. Section 3 compares the macro fundamentals of the five crisis countries in Asia and Latin America, in which we discuss both the common and different aspects of the crises. In Section 4, among other macro fundamentals, we concentrate on the soundness of banking sector as one of the most important factors that made the crisis process different in two regions. Finally we examine the future tasks for these countries to stabilize the currencies.

1. Background of Currency Crisis

One of the crucial features of hasty and drastic policy reforms that have been carried out in many developing countries is that policy reforms do not necessarily guarantee consistencies among economic policies. For instance, a combination of trade liberalization and fixed exchange rates system (or dollar peg system) is likely to produce serious policy contradictions. Fixed exchange rate system was indispensable for attracting investment in terms of dollar in Asian countries since fixed rate can avoid exchange rate risks, and it was also indispensable for Latin American countries as an anchor policy to control inflation. However fixed exchange rate inevitably leads to currency appreciation that would weaken international competitiveness. On the other hand, trade liberalization generally increase import much faster than export, since it will take a long time to improve export competitiveness through changes in productivities and product differentiation. As a consequence, trade balance tends to deteriorate and to be unsustainable sooner or later, which would lead to a market expectation about collapse of exchange rate regime.

Other typical example of policy inconsistency is seen in a combination of capital liberalization and fixed exchange rate system. As is well known from open-macroeconomics, it is not possible to sustain free capital movement, fixed exchange rate, and independent monetary policy at the same time, whereas these crisis countries tried to maintain these three measures. In fact, capital liberalization opened the door for developing countries to attract foreign capitals. Net resource flows (the sum of long term debt, portfolio and equity investment, direct investment, and grants) increased dramatically from $ 35.3 billion in 1991 to $ 127.7 billon in 1997 in Asia, and from $ 30.7 billion in 1991 to $ 136.9 billion in 1998 in Latin America. But, as discussed later, if capital inflows exceed current account deficits, it tends to produce currency overvaluation, which would make more difficult to sustain fixed exchange rate. One of the ways to avoid this dilemma is to adopt capital control that was seen in China, Malaysia, and Chile for instance, or to abandon fixed exchange rate. In this sense, currency crisis played a role that compelled a necessary adjustment from fixed to flexible exchange rate system.

The third case of typical policy inconsistency lies in the sequence of financial market liberalization in the reform process. Many developing countries liberalized domestic financial market by abolishing regulations and controls on financial institutions, by which enhancement of financial intermediation is expected through removals of policy distortions and strengthening competition. However if financial market is liberalized without establishing institutional frameworks such as prudential regulations and independency of the central bank that would prevent moral hazard and adverse selections of financial institutions, financial system would become instable in which over-lending and risky money raising become dominant under stronger competition. In both Asia and Latin America, financial market liberalization preceded institutional reforms to build sound financial system. In addition, if foreign capital is

liberalized at the same time, financial institutions are likely to weaken their soundness. Borrowing capital in terms of foreign money inevitably includes the risks of devaluation. Once exchange rate is devalued, their indebtedness in terms of home currency will increase at the same proportion to the devaluation, which would lead to insolvency of financial institutions. Obviously these financial instabilities have produced one of the crucial conditions for currency attack.

In sum, it can be said that currency crisis is one of the inevitable results from the hasty liberalization without sufficient developments of institutional frameworks that could guarantee consistent policy implementations and disciplined behaviors of the agents in the government and private sectors. In the following section, we introduce a basic model that is useful to understand currency crisis.

2. Theoretical Analysis of Currency Crisis

(1) First and Second Generation Models

In the economic literature there are two types of arguments for explaining balance of payments crisis or currency attack. The first generation model argued by P. Krugman (1979)[1] focused on macroeconomic fundamentals as a main cause of crisis. The model describes a process in which bad macroeconomic fundamentals introduced by inappropriate fiscal and monetary policy produce macro imbalances that would make the fixed exchange rate unsustainable. The model is very distinctive in a sense that it can explain a currency attack before the depletion of foreign reserves. The model assumes that investors exactly know not only macro fundamentals but also the "shadow exchange rate" that would realize in the case of flexible exchange rate system corresponding to each state of the fundamentals. Thus investors can correctly predict whether they could gain from currency attack or not. Moreover, under the assumption of perfect foresight, it is possible to know the exact timing of currency attack by linearizing the model. One of the crucial implications from the Krugman model to avoid currency crisis is the importance of good macroeconomic fundamentals by implementing sound fiscal and monetary policies.

The second generation model, generally called "self-fulfilling" model, emphasizes the changes in expectations of investors. A representative work by Obstfeld (1996)[2] can explain a currency attack that would lead to a collapse of fixed exchange rate system even in a situation with sound macro fundamentals. When investors decide a currency attack in a cooperative or herding way, the currency crisis becomes inevitable and self-fulfilling by enforcing changes of government actions. In the case of "herd behavior," the process is very similar to the model that describes a collapse of banks by a run on banks. The point of the model is that currency attack can be possible

regardless of policy inconsistency, while the first model considers currency crisis as a result of unsustainable macroeconomic policies. In other words, the second model can explain a currency attack independently from macroeconomic fundamentals. The model generally has two equilibriums because of the assumption of imperfect foresight, but it cannot determine which equilibrium is realized (whether an attack occurs or not) depending on the extent of changes in investors' expectations and on exogenous contingent events.

It must be stressed here that these two models are not contradicting, rather complementing. When we admit that expectation is affected by "the state of the economy" (for instance, fundamentals), two models could be synthesized. In fact, as Flood and Marion (1998)[3] emphasized, one of the contributions of the second generation model is to open a way to understand currency crisis by introducing the changes in the investors' expectations that are influenced by the state of the economy. Private agents generally form their expectations about regime change observing the state of the economy. On the other hand, the government makes its decision about the exchange rate regime looking at the state of the economy and the private agents' expectations. Therefore bad fundaments tend to trigger a speculative attack, while good fundamentals tend to prevent it. In this sense, an incorporation of the state variables that reflect macroeconomic fundamentals into the second generation models constitutes an appropriate and viable model.

(2) A Synthesis of Currency Crisis Models

The basic idea for our model that combines macroeconomic foundations and investors' expectations comes from Sachs, Tornell and Velasco (1996)[4], which is focusing on insufficient foreign reserves, exchange rate appreciation, and soundness of banking system as crucial factors that affect expectations of private agents. They consider a possibility of multiple equilibria model by introducing behavioral assumptions for government and investors. Consider a government that is managing a fixed exchange rate. The government maintains a fixed exchange rate as long as foreign reserves are sufficient to finance a capital outflow. But once capital outflow becomes greater than the foreign reserves, devaluation occurs. The size of devaluation depends on the state of the economy such as the health of the banking system. As for the behavior of private agents, it is assumed that capital movements depend on anticipated exchange rate. In the event that devaluation is expected to exceed a critical value, the investors start capital flight, and retain funds in the country as far as devaluation is expected to be less than the critical value. Under such behavioral assumptions, "there is a peculiar circularity here: the devaluation depends on a capital outflow, but the capital outflow depends on the expectation of a devaluation."[5]

Here we build a simple formal model taking account of their idea about the

circularity between capital outflow and anticipated devaluation (See Technical Notes). First we specify the dynamics of capital outflows and expected rate of devaluation, which arise a possibility of multiple equilibria. Then, we introduce the critical value regarding capital outflow and expected rate of devaluation that assumed to be influenced by macroeconomic fundamentals. The implication of the model is very straightforward: when macroeconomic fundamentals deteriorate, possibility of crisis increases through changes in the critical value, vice versa. Thus, the model can be regarded as one of the synthesis of the two generations models that can capture the effects of macroeconomic fundamentals on the behaviors of government and investors. The following section examines and compares the macro fundamentals of the Asian and Latin American countries that have experienced currency crisis.

3. Comparisons of Macro Fundamentals of Asia and Latin America

In the 1990s a series of currency crisis occurred in Asian and Latin American countries like a contagion. But the causes and processes of the crises are not necessarily common reflecting the differences in each country. Table 1 compares various aspects of the currency crises of five countries: Mexico, Thailand, Indonesia, Korea, and Brazil, and Table 2 shows their main macroeconomic indicators. It is conspicuous from these tables that each crisis has both common and different dimensions. We first examine the macroeconomic fundamentals that were seen commonly in the countries of crisis.

(1) Common features in macro fundamentals

The first common feature is that many countries that fell into the crisis adopted fixed exchange rate regime or "dollar peg" that is a *de facto* fixed exchange rate. Mexico and Brazil adopted "exchange rate band system" when they were hit by currency attacks. Thailand and Korea managed their exchange rate by "currency basket system" giving the weights of more than 90 % on dollar. Indonesia adjusted its exchange rate to dollar by "crawling peg system." Dollar peg system can play an effective role to control inflation and attract foreign capital, but it often leads to massive capital inflows because foreign investors usually are not conscious to the exchange rate risks under fixed exchange rate system.

Secondly, fixed exchange rate system tends to make the domestic currency overvalued unless the inflation is completely controlled. Moreover if foreign capital inflows exceed current account deficits, the excess dollar supply in the exchange markets produces another pressures for overvaluation, which aggravates the current account deficits furthermore. When government tries to finance the current account deficits by stimulating capital inflows, there will appear a vicious cycle that accelerate

overvaluation and current account deficits. When current account turns to be very serious or if capital inflows halt for some reason, foreign investors regard the dollar peg system unsustainable and have incentives for a currency attack. Comparing with the base year of 1994 in which the real exchange rate (evaluated by wholesale price index) is normalized to one, Table 2 clearly shows that many countries had a large appreciation in the preceding year of crisis: Mexico in 1993, Brazil in 1998, Thailand and Indonesia in 1996. However Korea does not show a sign of appreciation in 1996.

The third common aspect of the currency crises is a fact that many countries experienced financial instability before the currency crisis. When the Peso crisis happened, the Mexican banking sector had been seriously vulnerable due to liberalization and privatization of financial sector. Financial liberalization in 1988 generated a rapid increase in bank lending pulled by the consumption boom that caused the financial instability by accumulating non-performing loans. In Thailand, asset bubble had already collapsed in 1996 and it brought about a sharp decline in immobile and stock price. As a consequence, the balance sheets of the banks that took part in bubble economy deteriorated considerably. Table 2 shows a clear sign of investment boom in Thailand in which domestic credit/GDP ratio increased sharply from 92.0% in 1992 to 132.7% in 1997. Bangkok Bank of Commerce bankrupted in 1996 and the 16 non-bank institutions collapsed in the following year. Thai government injected huge amount of liquidity into these financial institutions to prolong their lives, but it produced a typical response of moral hazard from these financial institutions. In Indonesia the financial liberalization from 1988 provoked a rush of new bank establishments, but these new banks were not endowed with sufficient prudential regulations and thus accumulated bad loans because of fraudulent loans. Therefore it must be stressed that many countries had a financial instability before currency crisis.

Fourthly, the heavy dependence of short-term capital inflows is important. Mexico had received short-term capitals that were invested into short-term government bonds such as *Cetes* (peso-denominated) and *Tesobonos* (dollar-denominated). In the end of 1994, the accumulated stock of *Tesobonos* had been reaching at US$ 29 billion (US$17 billion of which was held by foreign investors) and the share of short-term foreign debts over total foreign debts had reached at 28.1%. In such a circumstance, because of the political instabilities and the increase of US interest rate in 1994, investors gradually increased their expectation about the collapse of exchange rate regime. They reshuffled their portfolio from *Cetes* to *Tesobonos* and started outflows of their funds to avoid exchange rate risks. Foreign reserves plummeted from US$ 29.3 billion in February 1994 to around US$ 17 billion in the mid 1994. Moreover when investors realized that nearly US$ 10 billion were due to mature in the first three months of 1995, they rushed to sell Mexican bonds. Thus, the Mexican government eventually decided to adopt flexible exchange rate system, when foreign reserves were nearly depleted.

Therefore it can be said that the excessive dependence on short-term portfolio investments is likely to lead to currency crisis by sensitive changes in the market expectation.

On the other hand, Asian countries had accumulated short-term debts from international banks. For instance the ratio of short-term debts over total debts of Thailand and Korea reached at 41.4% and 57.5% in 1996 respectively (See Table 2). Similar to short-term portfolio investment, excessive short-term debts make a recipient country very vulnerable to capital flight. Once international banks become passive for lending or reject the rollover, private agents who borrowed foreign money face liquidity shortage, which would increase the expectation about default and then trigger a sudden capital flight. Such a capital flight is likely to occur in particular when the short-term debts become grater relative to the stock of foreign reserves. In the case of Korea the most of the short-term debts were held by banking sector and its ratio reached at over 260% when the currency crisis happened in 1997. Indonesia also had a very high short-term debts/foreign reserves ratio, nearly 160% in 1996. According to the Central Bank of Indonesia, Indonesia's short-term foreign debts in January 1998 was US$ 80.2 billion, and non-financial sectors owned 73.3% of them. Thailand opened an offshore market in 1993 and attracted huge amount of foreign loans. The ratio of short-term debts over foreign reserves reached at 129.5% in 1997. By contrast, Latin American countries generally had a lower share of short-term debts, and particularly the Brazil's ratio was only 10.8% in the preceding year of the currency crisis.

(2) Different features in macro fundamentals

With respect to different aspects of crisis, the following must be emphasized. First, while current account deficit is one of the most important sings for crisis, there are clear differences among countries. Mexico and Thailand had high current account deficits in term of GDP in the preceding period of crisis, 7.12% in 1994 for Mexico and 8.32% in 1996 for Thailand, and these deficits are generally interpreted to be unsustainable. But other countries had smaller deficits: 3.46% in 1996 for Indonesia, 4.44% in 1996 for Korea and 4.46% in 1998 for Brazil. In the case of Korea, rapidly growing current account deficit must be underlined, from 0.96% in 1994 to 4.44% in 1996.

Second, there was a difference in the level of foreign reserves among countries when the crisis happened. Since the Mexican government tried to defend the fixed exchange rate by selling dollars, it is estimated that foreign reserves were lost nearly US$ 25.0 billion only in 1994. In Thailand the reserves almost depleted to US$ 5.0 billion due to the mismanagement in the forward market when it was hit by the speculative attack. On the other hand, Indonesia and Brazil could maintain a certain level of reserves

when they were forced to the devaluation, though Brazil lost about US$ 47.7 billion from July 1998 to January 1999.

Third, the types of investors who were responsible for the capital flights differed among countries. In Mexico the main investors that could be blamed to capital flight were the residents in Mexico who were more pessimistic than foreign investors. The Thai crisis was undoubtedly caused by the speculation of hedge funds. But there were no clear evidence of speculation of foreign investors in Korea and Indonesia. It is said that Indonesia suffered from the capital flight of overseas Chinese. It is evident that the trigger for crisis in Korea was the rejection of rollover by international banks for shot-term debts.

Fourth, the types of the boom also differed among countries. As mentioned above, financial instability preceded currency crisis, and in many cases financial instabilities occurred from a sudden collapse of the overheated economy. The Thai immobile and stock price plunged sharply in 1996 from the burst of its asset bubble, which brought about serious bankruptcy of banks and non-bank financial institutions. By contrast, Mexico had a consumption boom rather than investment boom led by the expansion of consumption goods import in 1991 through 1994 that was covered by growing foreign capital inflows. Indonesia did not have an apparent evidence of bubble, but it is said that there was a symptom of asset bubble particularly in Jakarta. Korea had excess investments by *chaebol* that deteriorated the balance sheets of banking sector. Brazil had a boom in the stock market, but not in the immobile assets. We should pay attention on the difference in the features of boom.

Fifth, the timing of IMF rescue package was also different depending on the countries. Although the IMF program was implemented after the depletion of foreign reserves in Mexico and Thailand, Indonesia received the rescue money when it had rather sufficient reserves and the macroeconomic situation was not in a critical situation. But, market prediction that the Indonesian government would not respect or could not satisfy the conditions of the agreement with IMF spread after the implementation of the IMF program, and immediately the Indonesian currency rupiah started to devalue. Moreover, because the problem of the president's family company became a subject of the IMF program, the political situation deteriorated rapidly and it made the economy more instable. In Korea, the agreement with IMF was concluded in December 1997 when foreign reserves begun to decline sharply due to refusals of rollover for debts by international banks. Though Brazil suffered from huge capital flights after the Russian crisis of August 1998, it still had enough foreign reserves when the agreement with IMF was concluded in November 1998, but eventually the IMF program could not prevent the Brazilian currency crisis of January 1999.

Sixth, one of the apparent differences between Asian countries and Brazil lies in the fiscal position. Asian countries basically had maintained fiscal surplus, but Brazil had continued large fiscal deficits in term of GDP: -7.2% in 1995, -5.9% in 1996, -6.1% in

1997, and -8.0% in 1998. It is obvious that such unsound fiscal position weakened credibility for the Brazilian fiscal policies. Facing with the Russian crisis, capital flight became serious in the second half of 1998. But the Brazilian government could not change the market expectation about the fiscal situation because of the presidential election and the slow fiscal reforms confronted with political pressures. With such a fiscal imbalance the market predicted a resurgence of inflation that would make the dollar peg unsustainable. Even with the agreement with IMF about a rescue package the Brazilian government could not calm the market expectation. In January 1999, triggered by the replacement of the central bank president, the market expectation reached at the peak and induced large capital flight that forced the Brazilian government to abandon the exchange rate regime.

In sum as for causes and processes of currency crisis there are both common and different aspects. But, in the context of the comparison between Asia and Latin America, we should discuss in more detail about the soundness of the banking sector as one of the most important factors. Generally speaking, banking sectors in Asian countries are not healthy relative to Latin America, because many Latin American countries had already restructured their banking sectors due to financial instabilities before 1997. This deference in soundness of banking sectors (though it is in relative sense) is one of the most crucial factors that could explain the difference in crisis process and recovering process. Although Brazil could not defend the currency crisis itself, it could prevent a transformation from currency crisis to banking crisis that was seen in Asian countries and could enjoy a smooth recovering process of the economy. Moreover, while Argentina, Mexico and Chile had some impacts from the Brazilian crisis, Latin American countries did not have a crisis contagion that happened in Asian countries.

Table 1   Comparison of Countries Currency Crisis

	Mexico	**Thailand**	**Indonesia**	**Korea**	**Brazil**
Timing of crisis	December 94 March 95	July 97 December 97	October 97 June 98	November 97 January 98	January 99 May 99
Macro problems	Current account deficit and unsound banking system	Current account deficit, unsound banking system (bubble)	Unsound banking system	Excessive investment and unsound banking system	Overvaluation and budget deficit
Short-term foreign debts	*Tesobonos*	Borrowing of banks	Borrowing of private sectors	Borrowing of banks	Borrowing of private sectors
Foreign reserves	Depleted before devaluation	Lost in the future market	Not depleted	Lost by debt payments of banking sector	Not depleted
Trigger to crisis	Capital flight	Speculation of hedge funds	Capital flight and contagion	Refusal of rollover and contagion	Capital flight and contagion
Destabilizing factors at devaluation	Lack of information about *Tesobonos* and expectation for default of bonds	Lost of forward position of Central Bank, and bad loans of private banks	Short-term debts of private sectors, and the president scandal	Short-term debts	Slow fiscal reforms and replacement of Central Bank president
Political risk	Presidential election (December 94)	Instable coalition	Presidential election (March 98)	Presidential election	Presidential election (October 98)
Warning signal	Rapid accumulation of *Tesobonos*	Burst of the bubble and bad loans	No particular signal	No particular signal	Capital flight after Russian Crisis
Financial liberalization	In the 1980s.	In the1990s. Opened BIBF in 1993.	In the 1970s.	Maintained regulations.	In the 1990s.
IMF rescue package	Feb. 1st, 1995 $51.6 billion	Aug. 20, 1997 $17.2 billion	Nov. 5, 1997 Jan. 15, 1998 $40.0 billion in total	Dec.3, 1997 Dec. 24, 1997 $570 billion in total	Nov.13, 1998 $41.5 billion

Source: Mexico, Thailand, Indonesia and Korea: T. Itou, "Asian Currency Crisis and IMF", *Keizai Kenkyu*, Vol.50, No.1, January 1999 (in Japanese), p.89, Brazil: Nishijima, S. and E. Tonooka, "Crise cambial Brasileira: fundamentos vs. ataque auto realizábel," *Kobe Economic & Business Review*, No.44, March 2000.

Table 2　Major Macro Fundamentals

		Current Account/ GDP (%)	Foreign Reserves (US$ Billion)	Real Exchange Rates	Short Term Debts/ Total Debts (%)	Short Term Debts/ Reserves (%)	Domestic Credit/ GDP (%)
Mexico	1992	-6.90	19.2	0.680	21.8	128.0	31.3
	1993	-5.97	25.3	0.623	27.5	143.3	31.4
	1994	-7.21	6.4	1.000	28.1	610.5	34.5
	1995	-0.49	17.0	1.031	22.4	218.8	28.1
	1996	-0.69	19.5	0.777	19.1	154.0	17.0
	1997	-2.14	28.9	0.675	19.1	98.8	28.7
	1998	-4.19	31.9	0.724	17.2	86.3	26.6
Thailand	1994	-5.71	30.3	1.000	44.8	96.4	92.0
	1995	-8.23	36.9	0.928	49.5	111.3	99.5
	1996	-8.32	38.6	0.927	41.4	97.3	100.7
	1997	-2.03	26.9	1.627	37.2	129.5	132.7
	1998	12.63	29.5	1.127	27.3	79.6	133.0
Indonesia	1994	-1.64	13.3	1.000	18.1	146.1	50.6
	1995	-3.34	14.9	0.951	20.9	174.2	51.8
	1996	-3.46	19.4	0.917	25.0	166.2	54.2
	1997	-2.33	17.5	1.817	24.1	187.9	57.8
	1998	4.65	23.6	1.862	13.3	85.2	59.2
Korea	1994	-0.96	25.8	1.000	32.5	122.7	57.7
	1995	-1.74	32.8	0.938	54.3	142.1	56.6
	1996	-4.44	34.2	0.991	57.5	194.9	61.0
	1997	-1.72	20.4	1.915	39.3	262.8	69.4
	1998	12.8	52.1	1.213	20.2	54.0	79.0
Brazil	1994	-0.21	38.5	1.000	20.8	81.6	57.7
	1995	-2.62	51.5	0.730	19.2	59.2	36.6
	1996	-3.05	59.7	0.734	19.6	59.4	38.0
	1997	-3.79	51.7	0.729	17.4	66.6	40.0
	1998	-4.46	43.9	0.762	10.8	57.2	49.1

Source: IMF: *International Financial Statistics*, World Bank: *Global Development Finance*, 2000.

4. Soundness of Banking Sector

As described by the model in the previous section, when economic fundamentals get deteriorated, the probability of collapse of exchange rate regime is to increase. Here deteriorated fundamentals refer to such economic states as insufficient foreign reserves, overvalued exchange rate, unsound banking system, current account deficits, massive capital inflows or outflows, budget deficits, excessive ratio of short-term debts over long-term debt, etc. But we focus among others on the soundness of financial sectors as one of the most important variables in the context of comparison among crisis countries in Asia and Latin America. Of course, the casual relationship between currency crisis and financial instability must be in a two-way. For instance, Kaminsky and Reinhart (1996)[6], using a concept of "twin crisis", investigated the two-way causal relationship between banking crisis and currency crisis by using the 20 countries' data that experienced currency crisis from 1970-95. As already discussed in the preceding section, the financial instability was one of the most significant causes for the currency crisis in Asia. But, it is also true that the currency crisis provoked serious banking crisis in some Asian countries. We now discuss the two-way causality between currency crisis and banking crisis.

(1) From banking crisis to currency crisis

First, as is well known, when a banking crisis happens, either resident depositors or non-resident investors are likely to flow out their resources to less risky financial institutions in foreign countries. Such capital flights lead to gradual or abrupt depletion of foreign reserves that would make fixed exchange rate unsustainable. Particularly, when investors are motivated by "herd behavior" or they behave in a corporative way in the speculative attack, capital flights tend to be serious.[7] Moreover, if the monetary authority acts as a "lender of last resort" to bailout banks, banking crisis will aggravate capital flights by providing enough resources (money) to buy foreign currency, which depletes foreign reserves.[8]

Second, financial liberalization without adequate prudence regulations is likely to cause excessive external borrowing of financial sectors and/or non-financial sectors. Under fixed exchange rate system in particular, because the exchange rate risk is not recognized, banks are likely to borrow excessive money from abroad and lend it to private sectors. If possible, corporate sectors themselves also raise money directly from abroad. Such disproportionate borrowings and credits are conspicuous when asset price is soaring. In Thailand the establishment of offshore market (Bangkok International Banking Facilities: BIBF) in 1993 significantly facilitated capital inflows. It is very probable that investors are inclined to increase high-risk investments when available credits are abundant. These high-risk investments naturally increase non-performing

loans, by which banks' balance sheets inevitably deteriorate and their credibility begins to decline. When credibility is lost, new borrowing or debt rollover becomes difficult and the market expects an imminent default of the borrowers. If such expectation becomes dominant, capital flights start immediately. Therefore, the more banking sector (and private sectors that borrow money from banks) becomes insolvent, the more currency crisis is likely to happen due to the increased expectation about default of banks and corporate sectors.

Third, unhealthy banking sector makes it difficult for monetary authority to adopt necessary policy measures to defend domestic currency. As is well known interest rate policy is one of the most popular measures against capital flight, because it can attract foreign capital by increasing the differential between domestic and foreign interest rates. However, when banking sector is vulnerable, raising interest rate will deteriorate banks' balance sheets by increasing insolvencies of non-financial sectors (corporate sectors) , which would bring about bank failure. If political situation does not allow such banking crisis, the government must abandon fixed exchange rate system, instead of defending it by introducing tightening policies like high interest rate. In case investors understand well about the government behavior, they suddenly flow out their funds by predicting an immense collapse of fixed exchange rate system.

Why banking sector becomes vulnerable and instable? There are many cases in which hasty financial liberalization caused the instability in banking sector. Generally financial liberalization removes policy distortions and increase market competition, and then it can improve resource allocations through enlarging efficient financial intermediation. From the point of financial institutions, liberalization can create a circumstance in which they could enjoy higher profits and "risk sharing" of their investments by diversifying operations and assets, and expanding "economy of scope." In reality, however, because financial market itself is incomplete due to asymmetric information, if liberalization does not bring with institutional frameworks that restrict "moral hazard" and "adverse selections", impetuous liberalization generally destabilizes the financial system. Under the strong market competition led by liberalization, the following risks are expected to increase:

(1) Credit risk: Liberalization strengthens competition among institutions and increases the preference for lending to high risk-high return projects that have a high probability of insolvency.

(2) Market risk: Liberalization increases the volatility of asset price that would cause unexpected loss by fluctuations of interest rate, exchange rate, and financial asset price.

(3) Management risk: Liberalization reveals the risks related to management capabilities (e.g. inadequate risk-screening capacity, excessive expansion of credit and operations, lack of in-house disciplines, etc.)

In consequence, by an increase in these risks, banks' asset profiles deteriorate and bad

loans accumulate. Also, when capital markets are also liberalized externally at the same time, domestic financial institutions actively acquire foreign-currency funds and build up its positions. These borrowing naturally expose them to risks related to fluctuations in exchange rates and overseas interest rates. In many developing countries, financial liberalization in the 1980s and 1990s destabilized financial market because it was not accompanied by the institutional developments to establish prudent financial system. Tale 2 lists the ratio of domestic credit over GDP as an indicator of soundness of banking sector. Every country shows a clear sign of lending boom in the preceding years of the crises, implying a deterioration of soundness of the banking sector.

(2) From currency crisis to banking crisis

To the contrary, currency crisis also tends to aggravate banking instability because exchange rate devaluation increases the foreign debts in term of local currency, held by local banks or corporate sectors. In Mexico, Thailand, and Indonesia, currency crisis transformed the unsound banking sector into crisis by the large depreciation, which magnified the economic depression and prolonged their recovering process. Table 3 shows the ratio of non-performing loans over total loans of five countries. It clearly indicates that the ratio of non-performing loans increased after the currency crisis particularly in Thailand and Indonesia, from less than 10% to more than 50%. In Thailand the banking sector held huge amount of foreign debts, while non-financial sector was the major debtor in Indonesia. In either case, devaluation reduced the solvency of the borrowers and led to the banking crisis.

Table 3   Ratio of Non-performing Loan over Total Loans

	Before crisis	Peak	Current
Brazil	10.5% (Dec.1998)	10.5% (Dec.1998)	5.8% (Dec.2000)
Mexico	7.3% (Dec.1994)	12.2% (Jan.1997)	17.6% (June 1999)
Thailand	8.3% (June 1997)	52.3% (May 1999)	34.7% (Nov.2000)
Indonesia	9.3% (March 1997)	58.7% (Dec. 1998)	23.9% (Nov.2000)
Korea	6.3% (Sept.1997)	8.5% (March 1999)	7.1% (Sept.2000)

Source: Central Banks of each country and BIS, *70th Annual Report*.

But the Brazilian case seems exceptional. It reduced the ratio from 10.5% at the peak (before the crisis) to 5.8% (after the crisis). It is worthwhile to consider here this difference to make the comparison clear between Brazil and Asian countries. Brazilian banks also borrowed huge amount money from international banks in the 1990s. In the end of 1998, the total foreign debts owned by the Brazilian banking sector reached at US$ 52.7 billion. This amount was enough for the market to fear the default by

Brazilian banks if devaluation had occurred. But in reality Brazilian banks did not suffer from the losses from devaluation in January 1999. It is said that they had enough time to avoid the exchange rate risks by hedging in the future market and the investment in dollar-indexed bond. In the end of 1998, the total stock of dollar-indexed bond was about US$68.0 billion, of which banks held US$ 65.0 billion. The point is that banks could gain huge amount of "wind-fall profits" by holding dollar-indexed bond when devaluation occurred. Table 4 shows the profit rate of banks, which increased to a greater extent after the devaluation. In this sense, it must be emphasized that Brazilian banking sector was in a specific condition and it improved its financial situation by currency crisis.

Table 4. Profitability of banks before and after the devaluation in Brazil

	Group 1		Group 2		Group 3		Total	
	1989	1999	1989	1999	1989	1999	1989	1999
Net Profit/Net Wealth (ratio of total value)	5.8	9.9	-15.6	17.1	-4.1	17.8	-0.3	13.3
Net Profit/Net wealth (average)	6.3	9.8	6.3	14.4	6.0	10.2	6.1	10.8

Note: Figure of 1999 is the ratio of the first quarter of 1999 over that of 1998. Group 1 is the banks that have the gross wealth greater than 1.5% of the total gross wealth of the largest 176 banks, and 0.15% to 1.5% for Group 2, and less than 0.15% for Group 3.
Source: FGV, *Conjuntura Econômica*, Dezembro, 1999, Vol.53, No.12.

Finally we must add the difference in the corporate sectors between Asia and Latin America as one of the important factors that can explain the different course for banking crisis. In Latin America, due to the long history of high inflation as well as the low level of financial intermediation, corporate sectors have not had large debts from banks. This means that even though the corporate sectors turn into insolvency due to devaluation and accumulate non-performing loans, its effect on the banks' loan profile would be rather small compared to the Asian banks. This must not be overlooked as one of the factors that prevented the emergence of banking crisis process in Latin America after the currency crisis.

5. Future Tasks

According to a famous proposition of open-macroeconomics, an economy cannot pursue dollar peg system, liberalized capital market, and independency of monetary policy at the same time.[9] In this sense, currency crisis that collapses dollar peg system

can be regarded as a necessary adjustment forced by market mechanism. If this adjustment is abrupt and enormous, it must be called currency crisis. Five countries that experienced crisis had been trying to maintain above three systems without exceptions.

A possible prescription to prevent crisis is to abandon at least one of these three systems. In the actual world, there are three types of combination:

(1) Adopt flexible exchange rate system instead of dollar peg:
　　Mexico, Thailand, Indonesia, Korea, Brazil after currency crises
(2) Adopt capital control maintaining dollar peg:
　　China, Malaysia after currency crisis, Chile until 1998
(3) Abandon monetary policy independence but maintain dollar peg:
　　Hong Kong and Argentina with currency board system

Capital liberalization generally improves resource allocations in both recipient countries and the world as a whole. But there is a case in which capital control is justified from a macroeconomic point of view. [10] When an economy receives excessive capital inflows that are greater than the current account deficits, there is an excess supply of dollars in the exchange market. In such a case, once flexible exchange rate system is adopted, local currency would be appreciated, which would deteriorate current account deficits furthermore. Then, one of the ways to avoid such a dilemma is adopting capital control that restricts the inflows of capital. China introduced a capital control before 1997 and Malaysia adopted it in August 1998 when it returned to the fixed exchange rate system. Chile implemented *encaje* to control short-term capital inflow in June 1991, by which investors were obliged to deposit 10% to 30% of their capital (in case of not productive investment such as borrowing, portfolio and financial investment) to the Central Bank for one year without interest yields. In 1998 *encaje* was actually abolished, but there is a lot of *the pros and cons* about the evaluation of *encaje.* According to ECLAC, *encaje* contributed to some extent to contain the short-term capital inflows and to prolong the terms of capital. [11] But the ECLAC study emphasized that the sound banking system and strong macroeconomic fundamental in Chile had played an important role to support the workings of *encaje.*

Under a currency board system, Central Bank intervenes the exchange market to maintain the fixed exchange rate in response to inflow and outflow of foreign capital, by which the monetary base changes automatically according to the changes in foreign reserves. In this sense, monetary policies are usually considered not independent. However, it is said that currency board has a strong resistance against currency crisis, because, when capital outflow reduces money supply, it would increase interest rate and would recover capital inflow. Argentina had adopted a quasi-currency board system from April 1991. But the Argentine case shows that currency board is not necessarily an omnipotent measure to prevent currency crisis. Argentina suffered from serious

speculative attacks at the Mexican crisis as well as the Brazilian crisis. In particular, after the Brazilian crisis the Argentine economy has confronted with strong pressures from the market to abandon its currency board because of the shortage of foreign reserves and the lack of credibility due to unfavorable macro economic conditions. It can be said from the Argentine experience that currency board also needs sufficient supports from good macroeconomic fundamentals. In fact, the Argentine economy turned into a difficulty in paying its foreign debts and agreed a rescue package with IMF in December 2000. Argentina finally discarded the currency board system and implemented a "currency basket system" in April 2001.

Five countries we have examined are now under flexible exchange rate regime, but it does not necessarily mean that the risks of currency crisis in a broad definition---excess volatilities or fluctuations of exchange rate that would have a serious damage on the economy---have been wiped out. We should remember the turbulence of exchange rates in Indonesia, Korea and Brazil when they entered into flexible exchange rate regime. These countries still have a lot of tasks to prevent the instabilities of exchange rate.

(1) Restructuring of banking sector

As discussed in the preceding section, we underlined the importance of the soundness of the banking sector to prevent currency crisis and to alleviate its effects on the economy as well. However market imperfections are profound in Asian and Latin American counters. Due to asymmetric information among parties, moral hazard widely spread in the financial market. Managers (shareholders) and depositors, and even authorities, are not free from being motivated by moral hazard. Thus regulations to complement market functions are necessary. If they are insufficient, the corporate governance of banks is weakened and the financial system is destabilized.

These fragilities in banking systems and lack of corporate governance have a close relation with the underdevelopment of legal systems and regulations relating to banking systems. The insufficiency of laws governing such areas as corporate activity, bankruptcies, contracts, and property rights, as well as the inadequate capacity to enforce judicial remedies, undermine lending discipline, leading to increases in bad debts and difficulties in recovering collateral. Improvements in accounting systems and information disclosure are particularly important, as these are prerequisites for enabling a bank's financial condition and the state of its risk-taking to be grasped.

For the stable and efficient functioning of a banking system that takes responsibility for financial intermediation and settlement, the regulations and systems need regulations to restrict competition, regulations on sound management, oversight and inspection by regulatory authorities, and safety nets. Among others, establishment of prudential regulations and safety nets are particularly important to create sound banking system. Prudential regulation can lower risks in banks' asset profiles and ensure sound

management by exercising control over balance sheets. They include regulations on capital ratios, on large-scale lending, on liquidity reserves, and on prime-asset ratios. Safety nets include rescue loans extended to failing banks by authorities acting as lender of last resort, and deposit-insurance systems, which can stabilize depositors' expectations.

In Mexico since the peso crisis at the end of 1994 as well as in Brazil that experienced financial instability after the Real Plan in 1994, considerable progress has been made with the restructuring of the financial systems by means of the strengthening of the supervisory functions of the authorities, the introduction of prudential rules, and the entry of foreign banks. Although progress has been made in developing the soundness of the banking system, there remains considerable room for improvement. Particularly Mexico still has a serious fiscal burden from its restructuring program called *FOBAPROA*. On the other hand, Asian countries have just started various reforms after currency crises and still remain such problems as huge non-performing loans. In Asia, special attention should be paid on prudential regulation, restructuring corporate sectors, development of local banks, and appropriate level of foreign debts to create sound banking system.

(2) Macroeconomic Stability

Under the flexible exchange rate regime, money supply becomes independent from the changes in foreign reserves implying that the monetary authority can implement monetary policy to stabilize its macro economy and exchange rate by controlling interest rate and money supply. In Brazil, the government has been pursuing "inflation targeting policy" under the new regime as a price anchor, in which interest rate policy is playing a key role as an effective policy measure. But when the risk premium in international interest arbitrage is affected by the market expectation about the government debt--- county risk---, the optimal interest rate that is derived from inflation targeting rule becomes very sensitive and difficult to manage.[12] In this meaning, Brazil should resolve the government debt problem in a definitive way to restore its credibility. On the other hand, Asian countries have had relatively stable macro economies owing to favorable fiscal positions compared to Latin American countries. As far as Asian countries realize sound banking system and maintain appropriate capital inflows, they are expected to attain macroeconomic stability without special difficulties.

However, once macro imbalance occurs, we have to identify true reasons for the imbalance. It is very useful for understanding this point to examine the case of macroeconomic management at the currency crisis in 1997. As is well known, Asian countries implemented contracting policies according to the rescue programs agreed with IMF. Traditional rescue programs of IMF that have been implemented in the developing countries (mainly in Latin America) basically assumed the macro instability

caused by large fiscal imbalance. For such an imbalance, the basic prescription recommended by IMF was a combination of tightening fiscal policy and devaluation, which was thought to be effective to restore the market credibility. However, because the true reason for the Asian crisis was not the excessive government spending but the over investments in the private sectors supported by foreign borrowing, the contracting policy could not restore the credibility for Asian countries. Rather it deteriorated furthermore the depression caused by crisis and exaggerated the skyrocketed depreciation of the local currencies. It must be emphasized that the traditional prescription of IMF that might have been effective for the Latin American cases was not a correct prescription for the Asian cases. Moreover, while the very high interest rate policy in Brazil that reached at 50% per year was helpful to prevent a resurgence of inflation and to attract new foreign capital, it only contributed to bring about extremely depressed economic situations in Asian countries. In either case, macroeconomic stability is one of the most indispensable conditions to avert exchange rate turbulence, and thus macroeconomic policy measures should be implemented in a correct way.

(3) Increase domestic savings to avoid foreign capital dependence

The most fundamental reason for the currency crisis lies in the insufficient domestic saving that is needed for investment, particularly in Latin America. Historically the saving rates in Latin American countries are very low relative to those in Asian countries. For instance, whereas the saving rates in countries such as South Korea and Malaysia exceed 35%, the corresponding rates in countries such as Mexico, Argentina, and Brazil are only around 20%. A low domestic saving rate means that investment necessary for development cannot be financed domestically, and thus it must depend on overseas savings. One of the reasons for the low saving rates in Latin America comes from the high inflation that has persisted for many years, which compels the transfer of real income from the public to the government (inflation tax) and the inclination of portfolio towards non-productive investment such as land and other real estate, U.S. dollars, and gold, while the propensity to hold financial assets such as deposits is low. Another cause of low savings is a marked inequality in income distribution. Low-income groups have no scope for saving, while high-incomes class has a strong tendency to hedge against inflation by investing in real estate or by investing their funds overseas. In this view, it is necessary to have an institutional framework for mobilizing savings, for example by the development of pension reform. It is well known that Chile succeeded in increasing domestic savings through the privations of the pension system. In addition, the development of financial systems is indispensable for the efficient mobilization of resources to increase savings through financial intermediations. Borrowing money from abroad itself is not a wrong thing, but too much dependence on it will create a destabilizing phase of development for the recipient countries.

Concluding Remarks

Currency crisis is only one aspect of the problems in Asia and Latin America under globalization. It is undeniable that economic liberalization has realized remarkable economic recoveries and dramatic increase in trade and investment. However it is also indisputable that the hasty liberalization has brought about clear economic and social problems such as rising unemployment, deterioration in income distribution, financial instability, and currency crises. There is no guarantee that globalization would realize a desirable consequence in Asia and Latin America that have their own historical, social and political backgrounds.

One of the questions that the currency crisis raised is the problem caused by hasty economic liberalization without sufficient development of institutional framework and without consistent policy implementations in liberalization and macroeconomic stabilization. Therefore, economic liberalization process should be planned considering the proper backgrounds of each country and should be implemented by the well deliberated plans on "speed", "sequence" and "scope" of liberalization, not by an uniform program. Not only in Asia but also in Latin America, the most important factor that the liberalization process should take into account is the social stability, because liberalization tends to create "winners" and "losers" that would aggravate social instability and would expose the liberalization process itself to danger of setback. In this meaning, both Asian and Latin American countries are required to equip enough government ability to progress social justice, to establish necessary institution, and implement consistent economic policies. At the same time, private sectors also must increase their ability to adjust and respond to new economic circumstances. In other word, these countries should improve "governance" in various levels to have desirable outcomes from economic liberalization.

In this regard, it must be stressed that clear changes have been emerging in the capability of governments and institutions in both Asia and Latin America. That is, these countries are now in a consolidation process of democracy and are exposed to global competition through the first-stage reforms. The spread of democracy and the decentralization are encouraging political involvements by the masses, creating political conditions in which irrational policies biased by specific interest groups and classes are not allowed. In addition, progress is being made with public-sector reforms and institutional reforms that are setting up checks and balances (the separation of the legislative and executive branches of government and the separation of governments at national and local level). The increasing integration of the economies with the global economy is bringing about the spread of global standards and is compelling the necessary changes to be made in existing economic systems. Private sectors are seeking

fair competition rules instead of government protection, and government and bureaucratic institutions are being required to have more transparent rules of conduct and systems. In addition, citizens are increasing their voice through group actions and the formation of citizens' networks such as voluntary organizations and NGOs, by which the development of monitoring mechanism is to be expedited. As pressure to disclose information makes it difficult to monopolize information, old bureaucratic systems and political systems are losing their legitimacy, and the room for discretionary behavior by bureaucrats is also being lost. Under the impact of these changes, societies are becoming more disciplined, and politicians and bureaucrats are being left with no choice but to abandon their opportunistic behavior. In Asia and Latin America the reform of governments and institutions through strengthening of the rule of law has just started. Through these changes, governments and institutions will be able to enhance their governance and capability for implementing correct and consistent macroeconomic policies.

Technical Appendix: A synthetic model for currency crisis

First let's specify the dynamics of capital outflows and expected rate of devaluation. Capital outflow K is assumed to increase when the actual expected rate of devaluation is greater than its long run level $D(K)$, which would be established after the accomplishment of adjustments at given K. Then, the adjustment process of capital outflow is specified as:

$$\dot{K} = (D - D(K)), \qquad D'(K) > 0, D''(K) > 0 \qquad (1)$$

where K is the change of capital outflows and is the adjustment coefficient, and $D(K)$ denotes the expected rate of devaluation in the long run after the completion of adjustments at given K. It is assumed that the private agents know the correct level of $D(K)$. In other words, private agents decides capital outflows considering the difference between the actual expected rate of devaluation and $D(K)$ as far as is positive, because $D > D(K)$ means a situation in which private agents are currently perceiving a higher possibility of collapse of fixed exchange rate regime in the near future.

On the other hand, the adjustment process of expectation about devaluation is given:

$$\dot{D} = (K - K(D)), \qquad K'(D) >, K''(D) > 0 \qquad (2)$$

where D is the change in expected rate of devaluation and is the adjustment coefficient. $K(D)$ denotes the capital outflows after the completion of the adjustments at given D. Private agents revise their expectation taking account of the difference between the actual capital flows and $K(D)$. When actual capital flows are greater than that of the long run level, private agents revise their expectations to a higher rate of devaluation as far as is positive, which means that they foresee a more provable collapse of the regime.

Under such specification for the "circularity" between capital outflow and exchange rate expectation, the system generally has two equilibriums and cannot determine a priori which equilibrium is established: the lower equilibrium where fixed exchange rate system is maintained or the higher equilibrium where speculative attack happens. Moreover, from the stability condition, if one of the equilibriums is stable, the other must be unstable. This means that the system can only describe the cases in which fixed exchange rate is always maintained or speculative attack happen at any case. However if we introduce the critical level either in capital outflows or in expected rate of devaluation, the system has a possibility to have two stable equilibriums that can describe a situation in which both cases (sustained exchange rate and speculative attack) could occur depending on the initial condition about contingent shocks.

Here we assume the behavioral rules of private agents: There is a critical level of expected rate of devaluation by which private agents decide whether they start speculative attack or not. If agent's expectation exceeds the critical level, they would decide attack (then capital outflow) and vice versa. Of course this critical level depends on macro fundamentals, and it will be lower when fundamentals are more unfavorable. For instance, the lower the level of foreign reserves is, the lower is the critical level of expected rate of devaluation by which the agents decide speculative attack. On the other hand, government has a rule that determines whether it maintains or abandons fixed exchange rate. If the actual level of capital outflows exceeds the critical level, government have to decide the abandonment of fixed exchange rate. The critical level is also dependent on macro fundamentals, which will be lower if government faces with more deteriorated fundamentals.

Figure 1 shows the case in which the critical level about expected rate of devaluation (D^*) is introduced in the adjustment process of capital outflows. Formally the meaning of the critical level is expressed by a change in the sign of coefficient   depending on whether the actual expected rate of devaluation is greater than the critical level or not.

If D D ,   .

If D D,   .

The negative sign of   in the case of D D means that, even though the actual level of expected rate of devaluation is greater than that of the long run, private agents do not increase their capital outflows (contrary to the adjustment process of equation (1)), believing a maintenance of exchange rate system since the actual level of expectation is less than the critical level. By contrast, positive sign of   means that private agents become bullish and increase their capital outflows (speculative attack) foreseeing the coming collapse of exchange rate system.

By linearizing equation (1) and (2), let's examine the stability condition.

$$\begin{bmatrix} \dot{D} \\ \dot{K} \end{bmatrix} = \begin{bmatrix} - & K'(D) \\ & - & D'(K) \end{bmatrix} \begin{bmatrix} D_0 - D \\ K_0 - K \end{bmatrix}$$

Trace $K'(D)$ $D'(K)$
Determinant $K'(D)\ D'(K)$

where D K denotes the steady state of D and K. In Figure 1, the equilibrium point B located in the area of D D is stable, because of   ,   , $K'(D)$, and $D'(K)$, the stability condition, Trace   0 and Determinant   0, is satisfied. The equilibrium point A located in the area of D D is also stable as far as | | is sufficiently large,

because, from   , $K'(D)$, and $D'(K)$, the stability condition Trace   0 and Determinant   0 is guaranteed. Therefore by introducing a critical level of expected rate of devaluation, the model has the possibility that both equilibriums would be stable.

From the model with two stable equilibriums, we can derive the following implications. Depending on the location of a starting point (initial condition) that is determined by a contingent event (such as political instability, rumor, balance of payments crisis in other countries, etc.), either currency attack or maintenance of fixed exchange rate could occur. If the starting point locates in the area of "Currency Crisis" in the figure, it reaches to the equilibrium point B (currency attack would occur), and, on the contrary, if the starting point locates in the area of "Maintenance of Fixed Exchange Rate", the equilibrium point A would be established (currency attack would not occur). However, depending on the location of D , the probability of currency crisis or that of sustained fixed exchange rate would change. If D is located nearer to the origin (more downward), the initial condition is more likely located in the area of currency attack, vice versa.

The point here is that the critical level is dependent on macro performance such as foreign reserves, exchange rate overvaluation, and banking system, etc. If fundamentals are bad, the critical level by which investors decide speculative attack would be smaller (D line shifts downward), and the possible area of speculative attack would enlarge. Then, the model implies that the probability of speculative attack would increase when fundamentals deteriorate even at the same level of the initial condition. On the contrary, when fundamentals improve, the area for currency attack diminishes and the probability for currency crisis will be lessened.

Figure 2 shows the case in which the critical level of capital outflows K is introduced and the sign of adjustment coefficient in equation (2) is dependent on it. With the same logic to the preceding case, the model can have two stable equilibriums and show a case that currency attack happens depending on critical level of capital outflows. Here the critical level at which government decides to abandon fixed exchange regime is also affected by macroeconomic performance. When they are bad, government would decide devaluation at a lower level of capital outflows (K shifts to the left) and the probability of the currency crisis would increase. But here we must pay attention on that the stability of the two equilibriums is not guaranteed when both critical levels are introduced at the same time.

In sum, by introducing the critical level regarding expected rate of devaluation or that of capital outflows, we derived a simple model in a multiple equilibria framework that combines main features of two generations models, in which, depending on the nature and the extent of contingent incidents, both cases (currency attack and maintenance of fixed exchange rate system) could occur, but macro fundamentals play an important role to change the probability of the collapse of exchange rate system by influencing on the decisions of private agents and government.
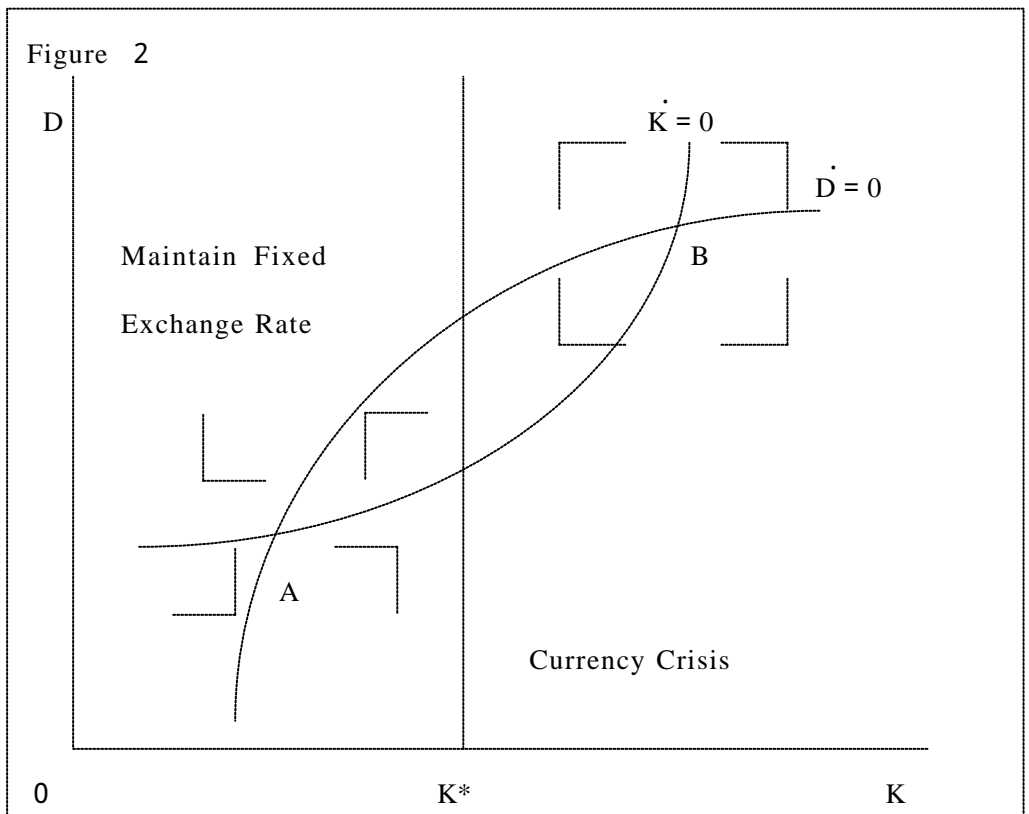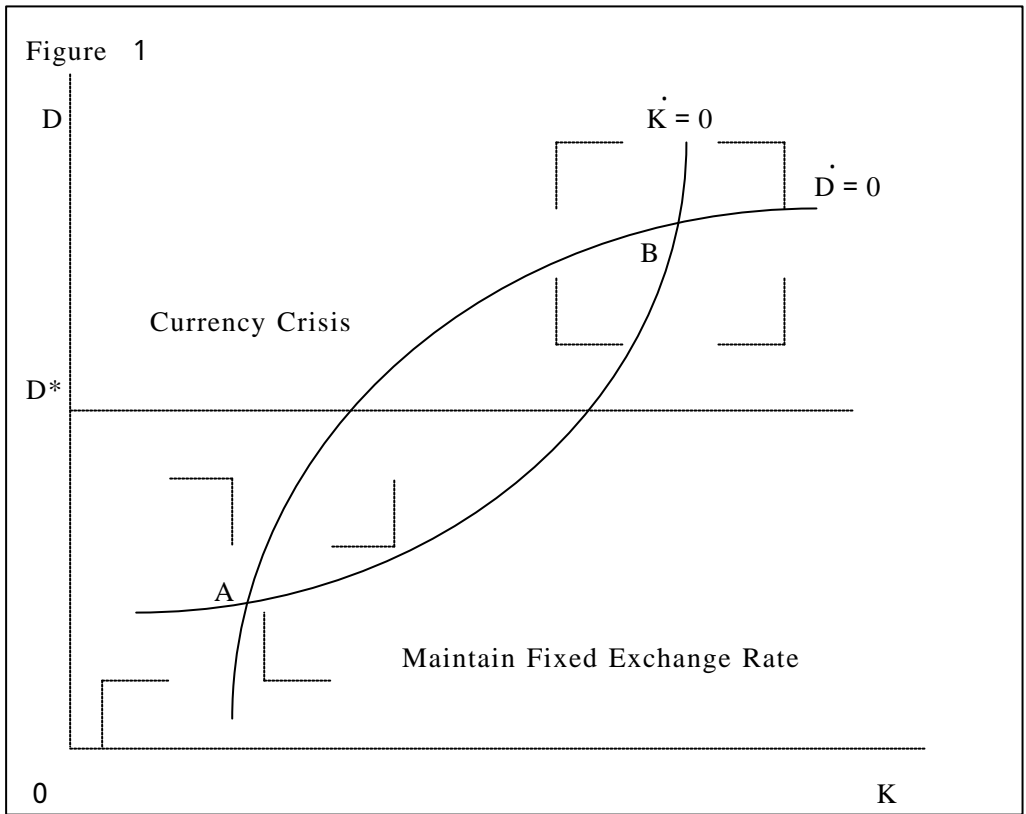
Source: by the author.

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