The choice between flexible exchange rates, capital control and the currency board in Asian countries: A perspective from the “impossible trinity”*

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We attempt to compare adjustment costs under exchange rate regimes in East Asian economies during their recovery processes. The criteria are the degree of overshooting in exchange rates, the changes in country risks, and the severity and duration of the recovery processes. Linear ranking is difficult. Managed rates with capital control worked for macroeconomic performance despite the welfare loss due to blocking capital flows. The currency board system worked well for stability, but recent experiences of Argentina and Hong Kong were deflationary. Under flexible rates, many economies that received IMF grants suffered a drastic initial downturn but later recovered vigorously.

JEL Classification Numbers: F31, F32, F33.

1. Introduction: exchange rate regimes and adjustment costs

A number of different approaches have been used in attempting to explain the causes of the recent East Asian crises.† Before it proved possible to establish such causes, most countries had started to recover from the severe recession. In this paper, rather than focusing on the causes of the crises, we study the recovery processes and the sensitivity of recoveries to the exchange rate regimes that were adopted in those countries at the outset of the crisis. Our regional focus is on the cases of Asian economies that have suffered from recent currency crises, although Latin American experiences are often referred to for comparative purposes.

Unfortunately, since the data observation period is still extremely short, it is difficult to explain comprehensively the relationship between the recovery process and the monetary regime adopted. Nevertheless, we have attempted to provide country information that may be useful in assessing the strength and weakness of alternative exchange rate regimes as a means of coping with currency crises.‡

We start with the traditional proposition of “the impossible trinity”. A country cannot have all three goals—exchange rate stability, monetary independence, and capital

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‡ The comprehensive literature on the East Asian crises are Radelet and Sachs (1998a, b) and Furman and Stiglitz (1998).

Frankel (1999a, b) have the same motivation as ours. Our analysis differs from theirs, however, in focusing on the East Asian crises and in quantifying the cost of adjustment during the recovery process.
mobility—simultaneously under any exchange rate regime, i.e. flexible exchange rate (‘float’), currency board or capital control. It can attain a pair of objectives—the first two under capital control, the last two under pure float, or the first and third under a currency board—but not all three. In terms of what cannot be attained, each exchange rate regime has to incur the adjustment costs on the outset of financial crisis. The East Asian crisis was no exception. From this standpoint, we quantify the adjustment costs associated with the adoption of each exchange rate regime during the recovery process.

The five economies under our consideration are Thailand, Indonesia, Malaysia, South Korea and Hong Kong, with occasional references to four Latin American countries: Mexico, Chile, Argentina and Brazil. These are classified roughly in Table 1, with the approximate starting month of the currency crisis. Many Asian economies under consideration (except Hong Kong) had adopted fixed exchange rates or a crawling peg to the market basket, with a heavy emphasis on the dollar. After the crisis, Indonesia, Korea and Thailand adopted a flexible exchange rate system, presumably on the advice of the IMF. Thailand floated its currency the baht in July 1997, though it had been pegging it to a currency basket dominated by the US dollar. One month after the adoption of the float in Thailand, Indonesia followed by floating its currency, the rupiah. The IMF objected to the idea of adopting the currency board system, which was popular in Indonesian political circles. Hong Kong has long been under the currency board system. In September 1998, Malaysia took a control on capital outflow, which essentially prohibits the repatriation of foreign capital with a maturity of less than a year. For a reference, this can be contrasted with the control on capital inflow practised in Chile until recently, where capital inflows were discouraged by the zero-interest deposit requirement for a part of the inflow. The Chilean measure was taken in order to avoid the incidence of sudden outflows of foreign capital. Chile started imposing control over its capital inflow from 1991, where its exchange rate system could be called “the exchange rate within crawling bands”. As a result of the discouraging effect of this capital control on the inflow of capital, we understand that such restrictions have now been at least temporarily suspended.

In Latin America, Brazil and Mexico also adopted a flexible exchange rate regime on the recommendation of the IMF. (The IMF has not always recommended the flexible exchange rate system, however: for example, it advised Bulgaria and Estonia to opt for the currency board system; and Argentina adopted a currency board arrangement.)

<table>
<thead>
<tr>
<th>Exchange rate regime</th>
<th>East Asia</th>
<th>Latin America</th>
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<tbody>
<tr>
<td></td>
<td>Thailand (baht, Jul. 1997)</td>
<td></td>
</tr>
<tr>
<td>Capital control</td>
<td>Malaysia (ringgit, Aug. 1997)</td>
<td>Chile (^{b}) (peso)</td>
</tr>
</tbody>
</table>

\(^{a}\)Currency and starting month of currency crisis in parentheses.

\(^{b}\)There seems to be no record of a crisis in Chile, but we include the country among our sample in order to describe how it installed the control on capital inflow and to compare Chile’s performance with those experiences that are not based on capital control.
2. Quantifying the adjustment costs

For our sample economies, we attempted to evaluate the costs of adjustment under each exchange rate regime, according to four criteria. The first is the degree of overshooting in nominal and real exchange rates implied by our portfolio approach to exchange rates, explained below. The second is a change in country risk measured by risk premium, observed as the deviation from the exact interest rate parity condition under certainty. This risk preference can also be understood in the framework of the portfolio approach. The third is the strength of the monetary contraction policy that the crisis necessitated. This cost arises whatever regime is adopted. The fourth and final indicator is the severity and the duration of the recovery processes after a currency crisis.

By comparing these measures for the countries under consideration, we can assess how the above costs of adjustment varied in the recovery from a financial crisis under alternative exchange rate regimes. We have first to distinguish the strength of the initial shock, and the recovery process corresponds to the movement of the dynamic process after the shock. We present a simple portfolio model of the exchange rate determination, similar to Kouri (1976) and Branson and Henderson (1985), taking the currency of Indonesia, the rupiah, as the example.

Suppose that Indonesians hold only the asset denominated in rupiah, but that residents in the rest of the world hold the assets denominated in rupiah and those denominated in dollars. Let us denote the exchange rate of the rupiah in terms of the dollar as $e$. Note that this is the reverse of the usual exchange rate. Let the total asset that the rest of the world possesses be $Z$ rupiah. Then the balance of payments of Indonesia is a function of the exchange rate $e$, and the amount of indebtedness $Z$. The balance of payments is a decreasing function of the exchange rate $e$ and an increasing function of the indebtedness $Z$. In terms of the increase in $Z$, that is, the negative of the balance of payments of Indonesia, one obtains

$$\frac{dZ}{dt} = f(Z, e), \quad (1)$$

where $f_Z < 0$, and $f_e > 0$.

The portfolio balance equation expresses the relationship that people in the rest of the world hold a higher proportion of the Indonesian asset in their portfolio if the expected rate of appreciation of the value of the Indonesian currency is higher. That is, denoting the expectation by operator $E$,

$$(eZ)/(W + eZ) = g(\pi), \quad (2)$$

where $\pi = E[(dZ/dt)/e]$, and $g'(\cdot) > 0$. If we impose the assumption of rational expectations such that $E[(dZ/dt)/e] = (dZ/dt)/e$, we obtain from (2) above, the following:

$$\frac{dZ}{dt} = h(Z, e), \quad (3)$$

where $h_z > 0$, and $h_e > 0$.

Strictly speaking, the portfolio balance is meaningful for the nominal exchange rate $e$, and the current account balance is meaningful for the real exchange rate because the current account is considered to respond to the real exchange rate. For the moment this aspect is not taken into consideration, though further development of the portfolio approach should certainly do so.

In Figure 1, the phase diagram of the simultaneous equation system (1) and (3) is drawn as $CC$ and $PP$. $CC$ indicates the combination of $e$ and $Z$ that keeps the current account of Indonesia in balance, or that maintains the value of Indonesian asset held by the rest of the
world constant. This is an intrinsically stable relationship, and the value of $Z$ increases in the left side of $CC$ and decreases in the right. $PP$ indicates the combination of $e$ and $Z$ that keep the portfolio balance of the rest of the world. This is an intrinsically unstable relationship, so that $e$ increases above $PP$ and decreases below $PP$. The combination of these two balances creates a phase diagram around the intersection of $CC$ and $PP$—point $A$—of the well-known saddlepoint type. Under changes in exogenous factors, exchange rate $e$ jumps to the saddle stable path and the balance of payment adjusts gradually to the new equilibrium.

Before the crisis, the prospect of the Indonesian economy was so bright that Indonesians were willing to invest even more of their savings, or to borrow from abroad. At that time this perception was shared by the lenders as well. The rest of the world too was willing to hold a large amount of Indonesian debt. Indonesia’s future appeared bright, and the country risk was considered small. Thus the portfolio balance $PP$ was located to the right in the figure. Equilibrium was at a point like $A$, where Indonesian debt was large and the value of Indonesian rupiah was high. Then, all of a sudden, the asset demand for the asset in rupiah declined precipitously, and the new equilibrium shifted to a point like $B$. Since $Z$ can move only slowly, only $e$ jumps, and the path of variables takes the trajectory like $A$ through $B'$ to $B$. As will be shown below, a similar situation occurred in many countries, including Thailand and South Korea.

The model thus predicts first the sudden overshooting depreciation in an Asian currency by the dislocation of demand for the currency, and then the process by which the current account of the Asian country gradually improves. The prediction of this model, surprisingly, applies equally well to the experiences of Asian countries, and even to those of some Latin American countries. Figure 2 shows the changes in exchange rates after the dislocation of currency demand and the following slow adjustment in current accounts. In most countries (except Brazil and Chile) shown, one can detect jumps in exchange rates and the reversal of the current account from deficit to surplus. In our context we can interpret this as follows. When market participants suddenly realize that they have been over-optimistic about a country’s future income, then the flow relation, equation (1) ($CC$ in Figure 1), shifts to the left because participants no longer regard the returns on their investments as reasonable. Moreover, the stock relation, equation (3) ($PP$ in Figure 1), shifts drastically downward, indicating the precipitating fall of the exchange rate.

This model analyses a floating exchange rate regime where the exchange rate is
determined freely. This is the regime that the IMF often prefers to recommend to ailing nations. The IMF might have implicitly endorsed the fixed exchange rate practice before the onset of a crisis, but after the crisis in Asia it recommended the flexible exchange rate regime, with the fiscal and monetary austerity that may help the national economy shift $CC$ and $PP$ respectively and sustain its exchange rate. The economy should then return to a new, less extravagant, equilibrium position. Residents living in any economy that is distinct from the classical, money-neutral economy would suffer from this sudden change in the exchange rate and the following adjustment process.

As we have explained, one cannot sustain the impossible trilogy of a fixed exchange rate, free capital mobility and autonomy of monetary policy. The flexible exchange rate regime
arises when the first of the three is given up. However, this not the only possible regime. The capital control regime and the currency board regime are two other feasible options.

The capital control changes the slope of the portfolio relationship and also the speed of adjustment. The proportionate Tobin tax by rate $\tau$ on all the capital transactions will substitute $g((1 - \tau)\pi)$ for $g(\pi)$. It is easy to see that the arrows of movements in the phase diagram become steeper. In this portfolio asset model, capital transaction taxation will increase rather than decrease the volatility of exchange rates. On the other hand, if control and a deterrent to capital outflow are adopted, as in Malaysia, then the portfolio relation $PP$ will be shifted to the right and the equilibrium exchange rate for the local currency will initially appreciate. Whether this increase is offset by the reluctance of potential investors to
invest in the country because of the unexpected imposition of control remains to be seen. In case of the Chilean type of control, this effect of unexpected control does not exist, but general discouragement against capital inflow remains. Naturally, the control tends to reduce the value of the home currency.

The fixed exchange rate, including the currency board system, makes exchange rate a policy variable. It changes the nature of the differential equations. The exchange rate is no longer an endogenous, forward-looking variable, but a policy variable to be fixed by the monetary authorities. Accordingly, it is no longer a jumping variable, either. Instead, money supply is no longer a policy variable. The flow equation $CC$ and the stock relation $PP$ are forced to intersect for a determined value of the exchange rate. For this to occur, domestic

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**Figure 2B. East Asia**
price levels and the domestic interest rate will vary a great deal. Thus, the main cost to the country that adopts the currency board system is the high interest rate that comes from the speculative attack. A speculative attack could occur as long as the fixed parity of the currency is less than perfectly credible. It draws the reserves from the system rapidly enough to make the domestic interest rate extremely high. In Hong Kong, and Argentina, this is coped with technical devices designed to broaden the money base. The cost of fixing the exchange rate by the currency board system is thus the burden of high rates of interest for the country.

The adjustment mechanism differs, therefore, depending on the regime. So does the cost of adjustment to the crisis countries. In other words, adjustment costs to employment, price stability and income distribution are hidden behind equations (1) and (2). Once the dislocation of the asset demand has occurred, some adjustment costs are inevitable. We have to cultivate an open-minded view on the relative costs and benefits of the various adjustment mechanisms. Rather than arguing for or against the IMF scheme, we have to compare possible alternatives, such as the currency board system, the floating exchange rate and the capital controls of Chile or Malaysia, against the criterion of how these different systems affect the adjustment costs that inevitably arise after the dislocation of capital demand. To sum up, the strength of the initial shock corresponds to a downward shift of the $PP$ curve in Figure 1, and the income loss in the adjustment process is the propagation cost (see Hamada, 2000).

As already mentioned, in order to assess the relative merits of the various regimes, we have to distinguish between the strength of the initial shocks on one hand and the cost of the ensuing adjustment on the other (Table 2). The former may be represented by the initial exchange rate movements and by the increase in country risks. The latter can be represented by the degree of monetary contraction that was necessary to prevent the currency from devaluing, by the output loss during the adjustment period, by the duration of the resulting recession and by the duration of the continuing high country risk. We will compare these indexes across the regimes. Statistical figures are mostly drawn from International

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Because our interest is in the severity and duration of the adjustment process in the crisis countries, we need sample periods that are long enough both to detect the start impulse of a financial crisis and to trace its eruption into a full-blown shock. In East Asia, the crisis began in July 1997, when Thailand requested the IMF assistance. From Thailand it then spread to Indonesia, Malaysia, South Korea and Hong Kong. Therefore, our sample period for East Asia starts at the beginning of 1997 and extends to the present.

Similarly, in December 1994 after the “peso problem” arose in Mexico, the peso was placed under a flexible exchange rate. This seemed to have a contagious effect on other Latin American countries, especially Brazil and Argentina. For the sake of a comparison with East Asia, our sample period for Latin America is also three years, from the beginning of 1994. We describe below the measures taken in chronological order, from Latin America to East Asia.

### 2.1 Degree of overshooting

First, we observe the movements of exchange rates, both nominal and real. Strictly speaking, the nominal exchange rate is a determinant of the portfolio balance equation in our portfolio approach, while the real exchange rate determines the balance of payments equation. In the event of a financial crisis, both exchange rates “overshoot”, as indicated by the dynamic trajectory of exchange rates following a downward shift of the portfolio balance curve in Figure 1. The instantaneous magnitude of a crisis can be measured by the degree of volatility of both rates when the financial crisis took hold. By definition, the volatility is greater under flexible exchange rates, so that this is not a fair measure for the flexible system in our comparison of the performance of alternative systems. However, we consider the movements of both nominal and real exchange rates as measures representing the initial shocks under flexible rates.

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3 We describe these data in the Appendix.

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**Table 2**

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Variable</th>
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<tbody>
<tr>
<td>Impulse</td>
<td>Nominal Exchange Rate</td>
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<tr>
<td></td>
<td>Real Exchange Rate</td>
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<td></td>
<td>Interest Rates Differential</td>
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<tr>
<td></td>
<td>Depreciation-Adjusted Risk Premium</td>
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<tr>
<td>Propagation</td>
<td>Country Risk</td>
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<tr>
<td></td>
<td>Interest Rates Differential</td>
</tr>
<tr>
<td></td>
<td>Depreciation-Adjusted Risk Premium</td>
</tr>
<tr>
<td></td>
<td>Growth Rate of M2</td>
</tr>
<tr>
<td></td>
<td>Real Value of the IIP deflated by the CPI.</td>
</tr>
</tbody>
</table>

_Financial Statistics_, occasionally supplemented by recent statistics issued by the central banks in each country.
Nominal rate

To normalize the monthly exchange rates, we divided by the exchange rate level on January 1994 for Latin America (Figures 3 and 5), or by that on January 1997 for East Asia (Figures 4 and 6). Figure 3 shows how rapidly the nominal rate of Brazilian real devaluated ahead of the Mexican crisis—more than six times in six months. At the time of the Mexican crisis, however, the real was not so responsive. Though the devaluation of Mexican peso was less dramatic compared with the real, its value was halved in terms of the US dollar in just over a

Figure 3. Nominal exchange rates in Latin America, 1994–1996

Figure 4. Nominal exchange rates in East Asia, 1997–1999
quarter after December 1994. In contrast, the pesos in both Argentina and Chile kept their exchange rates vis-à-vis the US dollar steady.

In Figure 4 we can see a similarly steep devaluation in the nominal exchange rate of the Indonesian rupiah after November 1997. The devaluation was much more drastic than other currencies during the Asian financial crisis. In comparison, the Thai baht and the Korean won were devalued substantially to less than half their former values. For the Indonesian rupiah, there were two troughs in the rate (or two peaks in the dollar exchange rate), one at the beginning of 1998 and the other in June 1998, like “a triple jump”. The first took place at the onset of the crisis, while the second was triggered by the domestic political turmoil later. Since the end of 1998, however, the nominal rate has been steady at around three or four times (in terms of the US dollar) the rate before the crisis. In other words, the rupiah has kept its value, after devaluation, at a third or a quarter of its value relative to the dollar before the onset of crisis.

The real exchange rate

In real terms, it was Mexico’s peso, and not the Brazilian real, that was hardest hit by the currency devaluation among the four Latin American countries (Figure 5). The real exchange rate of the Brazilian real was appreciating, rather than depreciating, by about 20% owing to the country’s four-digit hyperinflation (i.e. real appreciation rather than nominal depreciation). In this sense, Brazil is in a unique situation relative to the other three Latin American countries considered.4

The real exchange rate of the rupiah depreciated by approximately the same degree as the nominal rate. In Figure 6 we can see the triple jump of the real exchange rate more clearly than the nominal rate during the same periods.

![Figure 5. Real exchange rates in Latin America, 1994–1996](image-url)

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4 For differences in the dynamic responses of nominal and real exchange rates, see Branson and Henderson (1985, pp. 775–7).
This indicates some of the relevance of exchange rate determination models with short-run fixed prices as in Dornbusch (1976). Price levels of many countries are rather rigid, and the real exchange rate often moves in the same direction as the nominal rate. This indicates that the world is more like the Dornbusch model, or the portfolio balance model discussed below. Exchange rates did overshoot. Though the Dornbusch model is criticized for its lack of microeconomic foundations, it seems to explain the dramatic path of exchange rates better than the non-jumping model of Obstfeld and Rogoff (1995), which has a relatively sophisticated micro foundation. Incidentally, our diagrammatic exposition, which takes both the real and the nominal exchange rate on the same axis in our portfolio approach, can be justified from these observations. One should however study more carefully a striking anomaly of Brazil, that the real exchange rate moves in a different direction from the nominal rate.

### 2.2 Country risk

Second, we observed changes in “country risk” for international investors, which affect the countries concerned as well as foreign investors. In the absence of capital control, an increase in country risks implies that investors require higher rate of return to invest in the country, primarily because of the perceived risks. This is an indication of how investors regard the economic security of the country in question.

When a country is under capital control, the country risk can be seen also as an indicator of the shadow price of the control. In the short run, the capital control aims both to prevent rapid currency devaluation and to sustain the autonomy of monetary policy. However, in the long run, the difficulty in sustaining free capital mobility leads international investors to require a higher risk premium for assets denominated by the currency of the controlled country when they invest money in the country’s assets. Therefore, the increase in currency risk indicators may be interpreted also as the long-run side-effects of capital control.

For an exposition, suppose that a US investor plans to invest either in an asset denominated
by the Malaysian ringgit or in a domestic one denominated by the US dollar. The interest rates are $i$ in Malaysia and $i^*$ in the USA, respectively. We assume that Malaysia imposes a control on capital outflow, which functions like a proportionate “Tobin tax” by a rate $\tau$ on all the capital transactions. Assuming that the investor requires a risk premium $\delta$ for the ringgit asset, we have the following definition of the country risk:

$$i^* + \delta = i - \hat{e}e - \tau,$$

where the exchange rate is in terms of the ringgit to the US dollar. $\tau$ is not the actual tax rate but the tax rate equivalent of the capital control. The no-arbitrage condition is also derived from the equilibrium of the general portfolio balance by countries, and can be called “an interest rate parity condition with country risk adjustment”.

By definition, the risk premium should be measured as $\delta$, that is, as the residual of the interest rates differential $i - i^*$ minus an expected depreciation rate of the ringgit $\hat{e}/e$ minus the tax equivalent of capital control, $\tau$. Our ideal measure of country risk should encompass the degree of capital mobility as well as the risk premium. The degree of capital mobility is represented by a sum of the risk premium and the tax rate. In the world of certainty, we do not have any difficulty in measuring $\delta$ because the actual proportionate change in exchange rate equals $\hat{e}/e$. However, under uncertainty the expected change in the exchange rate is not equal to its actual change. Moreover, the existence of the “forward discount bias” tells us that the interest parity hypothesis cannot be empirically maintained whether it is uncovered or covered. Intuitively, two interpretations of the bias are given: a time-varying risk premium on foreign exchange, and expectation error by investors. Our risk premium measure would express the time-varying risk premium, unless any expectation errors existed. And our story is simple. Instead, if expectation errors in market participants are significantly large and negative in a critical situation, then the risk premium calculated by substituting the expected change in exchange rates by the actual change will fluctuate considerably, and will suddenly become negative when the currency is unexpectedly devaluated. In any case, the ex post depreciation rate would be an insufficient substitute for the ex ante one that is needed in calculating the interest rate parity under the uncertainty about the future exchange rate.

In addition, we cannot observe the tax equivalent $\tau$, either. Nevertheless, Edwards (1999) estimates the tax equivalent of capital controls in Chile, assuming the capital inflow stays there for 180 days, one year and three years, respectively. The estimate is given as

$$\tau = \frac{\lambda i^*}{1 - \lambda} \left( \frac{\rho}{k} \right),$$

where $i^*$ is an international interest rate that captures the opportunity cost of the reserve requirement, $\lambda$ is the proportion of the funds that has to be deposited at the central bank, $\rho$ is the period of time (months) that the deposit has to be kept in the central bank, and $k$ is the maturity of the funds. We can similarly estimate the tax equivalent of capital control in Malaysia. We have to rely on the tax data, however, again on an ex post basis. While the Chilean capital control was exercised ex ante, the Malaysian control did not allow the funds to be repatriated once they were invested there under the belief that there would be no such a tax. Consequently, even if we estimate the ex post tax rate in Malaysia, it may not be the appropriate measure of $\tau$—same problem as for the depreciation rate.

In spite of many qualifications, we calculate two measures of the country risk. The first is the “devaluation-adjusted risk premium”, defined as a residual of an interest rate differential $i - i^*$ minus an ex post depreciation rate $\hat{e}/e$ of the exchange rate of the ringgit. The second
is the interest rate differential itself, \( i - i^* \). The latter is free from the problem of the expectation errors, but it does not take account of the expected depreciation. In that case, the risk premium measure entails the peso problem even while the currency is actually depreciating. Without the expectation errors, the former would be more desirable for our time-varying country risk.\(^5\) Thus, though both indicators are far from perfect in measuring our country risk, we make use of information that these two measures provide. Considering the continuity of our data series, in the actual calculation we use a deposit rate in each country and the US three-month LIBOR.

**Devaluation-adjusted risk premium**

Let us start with the devaluation-adjusted risk premium. Before the Mexican crisis started, Brazil had faced difficulties in raising funds from the international financial market. However, throughout the period of the Mexican crisis, the devaluation-adjusted country risk rapidly decreased from 84% in the third quarter of 1994 to 11% in the fourth quarter of 1996 (Figure 7). In contrast to the improvement in the Brazilian country risk just after a tremendous decrease in the country risk at the onset of the crisis, there was an increase in the Mexican country risk. The peak rate 37% in the second quarter of 1995 was comparable to the country risk of 41% for Brazil at that time.

On the other hand, though the country risk of Chile had been more stable than the above two countries under a flexible rate system, it was on average higher (9.4%) than that of Argentina (3.7%) under the currency board system during most of the period. Surprisingly,

\[\text{Figure 7. Devaluation-adjusted risk premium, Latin America, 1994–1996}\]

\(^5\) Obstfeld and Taylor (1997) analyse the interest rate parity during the Great Depression, when the forward exchange markets were absent. They find that “the Great Depression, perhaps as part of a much broader interwar phase of disintegration, stands out as an event that transformed the world capital market and left interest arbitrage differentials higher and more volatile than ever before.” The non-existence of a well-organized forward market is common in most of the present Asian financial markets.

the risk of Chile was 33% in the first quarter of 1995, greater than the 28% for Brazil. Because Chile had been under capital control since 1991, the increase in country risk triggered by the contagious Mexican crisis must have been reflected in an increase in the risk premium. The risk premium was evaluated by international investors who faced the constraint and the uncertainty generated by the Chilean capital control. However, the risk premium after the crisis became lower than before, down to an average rate of 6.6%.

Like the case of Mexico, in Asian countries we find an enormous decrease in the measure of devaluation-adjusted country risk at the time of each crisis, probably because of the errors in expecting the rapid currency devaluation (Figure 8). In Thailand, the risk premium was 64% in the first quarter of 1998. Similarly, South Korea recorded the highest: 63% throughout the period. In both countries the miscalculation of investors concerning the recovery of the domestic currency produced this ex post risk premium; however, the premia in both countries were reduced in the following quarter. Conversely, in Indonesia, partly because of the political turmoil after the crisis, the ex post risk was very large (181%) in the third quarter of 1998 in spite of the moderate rise in the value of the rupiah. The recovery of the baht also brought about a rebound in the risk premium (50%) for Thailand. At present, the Indonesian premium appears to be decreasing.

In the aftermath of the crisis of Indonesia, Malaysia imposed a control on capital outflows in September 1998. The effect of the capital control can be seen in the risk premium for the third quarter of 1998: the risk premium then was 28%, while in the next quarter it was reduced to 0.6%. From both the Chilean and Malaysian cases, the effects of capital control on the country risk seem to have only a short, though it was certainly effective, life.

**Interest rates differential**

In order to determine the possibility of expectation errors in the index of devaluation-adjusted risk premia, we compare the conventional interest rate differential with the depreciation-adjusted risk premium measure. In the presence of the very large expectation

![Figure 8. Devaluation-adjusted risk premium, East Asia, 1997–1999](image)
errors at the onset of the crisis, as seems often to be the case with financial crisis, the \textit{ex post} depreciation-adjusted premium suddenly becomes negative. The depreciation-adjusted risk premium must expose a downward and deep protuberance at the start of the crisis, in contrast with the sluggish movement of the conventional risk premium measured by the interest rates differential. If otherwise—that is, if we observe similar fluctuations between both the depreciation-adjusted premium and the interest rate differential—then both indicators may well be analysed as indicators of the time-varying country risk.

Certainly, according to Figure 9, the Brazilian country risk rapidly improved throughout the Mexican crisis, and thereafter moved parallel to the Mexican risk for a while. However, because there are no signs of any changes in the Mexican interest rate differential, the observed drop in the above risk premium measure at the onset of the Mexican crisis can be judged to have been caused by expectation errors.

The relatively stable but high country risk of Chile is also shown in the interest rate differential. The risk rate was on average higher than that of Argentina. It is likely to reflect the effect of Chilean capital control on the sentiment of international investors who were anxious about the tax-equivalent costs.

Similarly, in Figure 10 we find a very large decrease in the Indonesian devaluation-adjusted risk premium measure, owing to the expectation errors. As well as in Indonesia, the expectation errors seem to occur in Korea, Thailand and Malaysia before the crisis started. The high country risks in Korea and Thailand decreased quarter by quarter. The Indonesian spike in country risk probably reflects concern about the political turmoil following the crisis.

\section*{2.3 Degree of monetary contraction policy}

Third, we focus on the degree of monetary contraction that was necessitated by the currency crisis. Let us consider first the countries under the currency board system, that is, Argentina and Hong Kong. They faced a credibility problem for international investors concerning

\begin{figure}
\centering
\includegraphics[width=\textwidth]{figure9.png}
\caption{Interest rate differentials, Latin America, 1994–1996}
\end{figure}

whether the government would maintain the fixed currency value. Once such credibility is lost, vigorous speculative attacks are likely to take place against the currency. In order to cope with such speculative attacks in the event of a crisis, the government must continue to maintain higher interest rates, or to contract the money supply to the level less than the level that is desirable for the macroeconomy. Consequently, this curtailed money supply during the crisis could be a cause of the adjustment costs, which would have been forgone under flexible rates.

However, this consideration applies to any country, not just those restricted to the currency board system. Whether a country is under the currency board system or a fixed exchange rate, monetary contraction is necessitated by the system when reserves are depleted. This is the advantage of the system that enforces the monetary discipline, but at the same time the contraction may be harmful for the real economy. On the other hand, the flexible rate system leaves monetary policy autonomous, and allows the economy to counteract recession. The flexible exchange rate smoothes the wave of the recession if autonomy is used with discretion. The Indonesian case seems to indicate that the undisciplined monetary expansion at the outset of the crisis left its burden on the economy for many years to come. In this situation, the IMF reinforces economies such as Indonesia with a high interest rate policy. The suppressing effects of such interest rates on real output must not be overlooked.

As an indicator of the growth rate of the money supply, we measured the quarterly percentage change in M2. In Figure 11 we can generally see the successive growth in money supply for most Latin American countries during the crisis. However, two obvious exceptions were Brazil and Argentina. In particular, a decrease in money supply (−13%) in the first quarter of 1995 is conspicuous in Argentina under the currency board system. Under this system the monetary authority, at the onset of the Mexican crisis, probably had to contract the money supply because of the outflow of reserves. On the other hand, Brazil, under a flexible exchange rate, experienced a sharp contraction in its money supply in the second quarter of 1995, probably in an attempt to reduce the high inflation, which reached 2,500% in December 1993.
Figure 12 shows that the East Asian countries too were troubled with monetary policy during their crisis. Indonesia is a case in point. Subsequent to the first wave of the crisis, the Indonesian money supply grew rapidly, at the rate of over 25%. That was partly because of attempts to rescue the insolvent banking sector. However, the monetary expansion did not last very long. In the third quarter of 1998, Indonesia decreased the money supply (−3%) to meet the high interest rate policy required by the IMF.

Another case is Malaysia before the announcement of capital control on September 1998. The moderate monetary squeeze (−4%) in the first quarter of 1998 was probably intended to
stabilize the currency value. In order to keep the exchange rate as steady as possible, money became endogenous. More interesting still, at the onset of the crisis in December 1997, Hong Kong, and only Hong Kong, undertook a monetary contraction policy, in contrast to the medium monetary expansion ranging from 3% to 8% in other countries. The decrease in the money supply was, however, so subtle (−1%) that Hong Kong was able to avoid the adjustment costs stemming from the monetary contraction necessary to preserve the currency board system. As far as the degree of necessary monetary contraction is considered, Hong Kong’s cost seemed to be relatively small. (In terms of output loss, the story may be different, as will be seen below.) The modest magnitude of the contraction can be contrasted with the immense monetary contraction in Argentina.

2.4 Loss of output and the pace of recovery

Finally, we studied the process of recovery from the recessions following the financial crises. The formal model that we introduced as a portfolio model of exchange rate determination is based on the assumption of full employment and time-smoothing consumption assumption. The identity of nominal and real rates was assumed there. No consideration was given to the output loss or the interactions between exports, imports and terms of trade. Here we would like to break down the process of current account recovery in the wake of the crises.

Our concern was to determine how deep the recessions had been and how long they had lasted. The depth and the duration can be measured approximately by changes in real production after the crisis. We used real values of the index of industrial production (the crude petroleum production for Indonesia and Argentina), deflated by the consumer price index. The real production index is monthly, except for Hong Kong which is quarterly. We also normalize the data of each country by dividing them by the level on January 1994 for Latin America (Figure 13), or by that on January 1997 for East Asia (Figure 14). (An exception is the Brazilian IIP data, which are divided by the level of January 1995 because they are available only from 1995.)

Figure 13 reveals that real production in Argentina and Chile were not affected too
seriously despite the Mexico crisis. At the outset of the crisis, the production indexes fell suddenly, though temporarily, to troughs of $-4\%$ in Argentina and $-13\%$ in Chile. The short substantial decline in Chile could have been caused by a transitory increase in the country risk described in Section 2.2; the trough in Argentina was probably caused to a large extent by monetary contraction described in Section 2.3. We should note that the declines were not drastic in Argentina and Chile, where only the flexible exchange rate system was ineffective.\(^6\)

In contrast, under the flexible rate system, Brazil and Mexico have constantly suffered from serious depressions, never recovering the production level that they had attained before the crisis. In these Latin American experiences, we cannot help questioning the advantage of the flexible exchange rate system over the other two systems.\(^7\) As a whole, the flexible exchange rate system does not seem superior to the fixed rate or the managed rate with capital control.

Indonesia appears to be suffering a similar fate as Brazil and Mexico (Figure 14). Real production has decreased month by month. Of course, given the political instability in Indonesia, the decline in production cannot be attributable only to the flexible exchange rate system. In fact, South Korea has achieved the “V-shaped recovery” earlier than other Asian countries, having begun a robust recovery after the recession of about 18 months. Similarly, Thailand will regain its original production level soon. What made the difference in the depth and duration of recessions in Indonesia and those in other countries under the flexible exchange rate system was (in addition to political turmoil) the large monetary expansion in Indonesia after the beginning of the crisis, described above. The purpose of the expansion was to rescue the insolvent banking sector, which was considered to be a hotbed of the “crony capitalism”. In this sense, the moral hazard created by the government may well

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\(^6\) The only problem is that stagnation has seemed to continue until very recently in these two countries.

\(^7\) The Brazilian economy now seems to be on the rebound, showing something like the Korean style of recovery.
prove to have been a significant aggravation of the crisis, as some authors have advocated (Corsetti et al., 1998).

Moreover, both in Hong Kong under the currency board system and in Malaysia under the capital control, we can observe similar patterns to those countries under fixed or managed rates in Latin America. Though there were moderate and temporary declines in the real production at the onset of the crises in Malaysia and Hong Kong, by and large the two economies were thereafter navigating relatively well. Again, in Asia it is difficult to rank the alternative regimes in a linear order. One cannot claim that the IMF-led formulae were always and necessarily better than others.

3. Closing remarks

It may be premature to give definitive conclusions from the short sample periods and the limited number of countries at our disposal. Nevertheless, we can tentatively assert that no single regime dominates the other and that several features are worthy of attention.

(1) The domestic price levels were rather rigid at the times of shocks and during the resulting initial adjustments in nominal exchange rates. This highlights one favourable aspect to the overshooting exchange rate model with rigid or slow price movements.

(2) Among the countries that adopted the flexible rate adjustment regime after the initial shocks, Korea and Thailand have proceeded relatively smoothly and are about to rebound, or have already rebounded, strongly. Indonesia had the most difficult adjustment process, burdened by the country's political instability. Both Mexico and Brazil suffered from serious recessions that lasted more than two years, and Indonesia is undergoing a similar experience.

(3) Malaysia and Chile, both countries under capital controls, seem to have coped with the difficulties all right. As for the severity of the recovery processes, we cannot say that the IMF-led floating regimes with capital mobility proved superior to those countries with capital controls. Of course, the question remains of how to evaluate the loss of proper intertemporal allocation arising from capital controls, that is, the difficulty of intertemporal substitution of consumption by the public. At present, however, the effects of the controls seem to be short-lived.

(4) As the case of Argentina indicates, the currency board system has its own problems. It is difficult to maintain the credibility of the currency board. The effect of monetary contraction resulting from speculative moves was substantial. This is in contrast with the case of Hong Kong, where the credibility issues hardly existed. Even in Hong Kong, a sudden contraction of monetary policy tightened the money market, sent the short-term interest rate into three-digit percentages, and created a substantial contraction of economic activities.

(5) The resulting adjustment costs under the flexible exchange rate ranged from the worst case of still-stagnating Indonesia to the best case of fast-recovering Korea. Malaysia under the capital control displayed intermediate results. Hong Kong still enjoys the most advanced economic state in East Asia but its adjustment cost has not been negligible. As

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8 The recent de-industrialization of Hong Kong may be a matter of concern.

9 Singapore is another good example, along with Hong Kong, of a very open economy adopting the flexible rate. The comparison between the two countries remains to be further investigated.
for Latin America, Brazil and Mexico achieved unsatisfactory results under the flexible exchange rate system, especially as documented by the slow recovery of real production. Conversely, Argentina and Chile seem to have experienced only a transitory recession in the aftershock of the Mexican crisis.

In sum, it is hard to rank-order the performance of the three alternative regimes. Relatively mild flexible rates with capital control seem all right, but the costs of blocking capital movement may be substantial. The currency board system seems to have worked well, but the recent stagnation of Argentina and Hong Kong casts doubt about its effectiveness. Finally, under the flexible rate, economies seem to have suffered a drastic downturn but they are now recovering vigorously in terms of production. We may say that the bitter medicine of the IMF seems to have worked eventually for the countries receiving grants from the IMF. The approach of the IMF may be justified, given the brisk recent recovery of grant-recipient countries Thailand and Korea. At the same time, the IMF does not seem to be justified in reprimanding Malaysia for blocking capital control, at least not from our statistical data.

Appendix: Data description

(1) Nominal exchange rate: IFS series RF, the period average rates of market rates or official rates, national currency units per US dollar.

(2) Real exchange rate: the real exchange rate index is derived from the nominal exchange rate, adjusted for the changes in consumer prices (IFS line 64) between the domestic country and the USA.

(3) Country risk: the risk premium is the residual that is calculated as the interest rate differential between domestic deposit rates (IFS line 60L) and the US 3-month LIBOR rate (IFS line 60LDD) minus the ex post depreciation rate of the nominal exchange rate. The ex post, or realized, depreciation rate is calculated as the annual rate, that is, the rate of quarterly depreciation rate of the nominal exchange rate multiplied by 4.

(4) Money supply: the money supply growth rate is the quarterly change in M2, that is a sum of money (IFS line 34) and quasi-money (IFS line 35).

(5) Real production: the real production index is derived from the index of industrial production (IFS line 66) deflated by the consumer price, except for the crude petroleum production (IFS line 66AA) for Indonesia and Argentina, an exception that is often made in the literature (Kaminsky and Reinhart, 1999).

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Source: International Financial Statistics (IFS), various issues.


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