A Framework for Exchange Rate Policy in Korea

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I. Introduction

The monetary policy and exchange rate regime that served Korea well for many years ended in crisis in 1997. The regime that collapsed was characterized by a tightly managed nominal exchange rate and domestic financial markets that were controlled by the government and largely closed to international transactions. The practical question for authorities over the next few years is what monetary and exchange rate regime will best promote the objectives of maintaining economic and financial stability as financial markets are liberalized.

Our basic proposal is that the powerful policy tool, interest rate policy, be used to attain a "flexible" inflation target. Flexibility in this context means that the authorities also care about short-run fluctuations in domestic output and employment. The less powerful policy tool, sterilized intervention in the foreign exchange market, would be used to limit day to day changes in exchange rates.

We argue that the government should continue to be an important *participant* in the foreign exchange market but not attempt to establish a *level* for the exchange rate. Our proposal will involve intervention that is triggered by exchange rate volatility but constrained by an announced target for the government's overall net foreign asset position. The objective of this regime is to allow the government to participate in the foreign exchange market in a way that contributes to economic stability and promotes the development of the private sector's participation in foreign exchange and financial markets.

The 1997 crisis was, in our view, caused by the inability of the exchange rate regime to coexist with a more open and competitive financial market. There are many historical precedents for the sequence of financial liberalization, crisis, and reform of exchange rate and monetary policy arrangements. Industrial countries experienced a very similar sequence in the early 1970s and, like Korea today, were forced to adapt to the new reality with very limited information about how the new system would work.

The question now is how exchange rate arrangements should evolve in order to insure a sustained economic recovery. It is important that the interim regime promote economic stability and growth and that it be consistent with a wide range of monetary regimes that might become available in the future.

At present the Korean government has considerable discretion in managing the exchange rate and financial policy. In order to improve policy transparency and credibility, market intervention should be carried out according to a set of rules. The rules proposed in this study have the following three components:

(i) Sterilized intervention – changes in the composition of the central bank's assets between domestic assets (won) and foreign assets (denominated in foreign currencies) will be relied on to moderate volatility in daily nominal exchange rates in excess of three percentage points against a basket of the dollar, Euro, and yen. This rule could be extended to resist cumulative movements of more than 6 percent in one week.

(ii) A target level for net foreign assets (foreign exchange reserve net of foreign currency liabilities and derivative positions) would be established. Deviations in the level of reserves generated in limiting exchange rate volatility would be eliminated over a six-month period according to an announced rule. The target level of reserves should be large enough to meet a bank run initially, but with accumulation of the experience in managing reserves, the level could be adjusted to balance the cost and benefit of maintaining a large stock of foreign assets.

(iii) A flexible inflation-targeting rule would be established. A short-term interest rate would be used as an intermediate target to stabilize output in the short-run and inflation in the long-run

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In the current situation the government has considerable discretion in managing the exchange rate and monetary policy. In our view, rules are needed for three reasons. First, Korea's exchange rate policy is important to its trading partners. It is necessary, therefore, to effectively communicate what the policy is and how it will be carried out. Because the government will be an active participant in the foreign exchange market, it is crucial that its intentions be clear both to private market participants and to its trading partners. One of the attractions of the adjustable peg system was that the government's objectives were clear and summarized by the target for the nominal exchange rate. Indeed it is easy to forget that the Bretton Woods system that served the industrial countries well before their financial markets were liberalized was initially seen as a way to avoid competitive devaluation.

Second, the success of a regime that accepts some level of nominal exchange rate volatility depends on the private sector's ability and willingness to provide liquid and efficient foreign exchange markets. Markets can deal with volatility if market participants are free to profit from trading strategies that exploit volatility. This is more likely if the government's intervention in the market is limited. The market's ability to limit movements in exchange rates away from fundamentals requires clear and steady economic policies. Clearly, markets are likely to function better if the government's objectives and policies are clearly understood and consistently pursued.

Finally, in the absence of a tightly controlled nominal exchange rate the authorities will need to explain their monetary policy objectives and performance in terms of some variable or set of variables other than the exchange rate. We argue below that a flexible target for inflation has many advantages for Korea.

The rules we propose have three components. Changes in the *composition* of the central bank's assets between domestic assets (denominated in won) and foreign assets (denominated in foreign currencies) would allow the central bank to *participate* in the foreign exchange market without altering the monetary base. The objective of this participation, sometimes referred to as sterilized intervention, would normally be to moderate volatility in daily nominal exchange rates in excess of one to three percentage points against a basket of the big three currencies. The rule could be extended to resist

cumulative movements of more than 3-6 percent in one week. This rule would be symmetric for appreciation and depreciation of the won as long as net reserves remain within a normal range. The authorities would not be obliged to intervene if they considered large changes in the rate an appropriate reaction to changes in the economic environment.

A target *level* for net foreign assets (foreign exchange reserves net of foreign currency liabilities and derivative positions) would be established. The statistical definition of net foreign assets follows directly from the objective for intervention. In altering its net foreign asset position the government is imposing a mirror image change in the private sector's net currency exposure. The basic idea is that if private market participants are forced to take a larger net position in a currency they will be less likely to push the exchange rate to levels that are likely to be reversed. Standard accounting practice for measuring currency exposure for private entities are comprehensive in that they consider conventional financial assets and liabilities as well as derivative positions that affect the financial net worth of the firm when exchange rates change. These accounting practices are easily adapted to measure the net foreign currency position of the government.

Altering the intervention rule would reverse deviations in the level of reserves generated in limiting exchange rate volatility. If reserves deviate by more than 25 percent from their target level the intervention rule would become asymmetric. If reserves fall (rise) by more than 25 percent subsequent daily depreciation (appreciation) of the won up to 3 percent would be permitted. If reserves deviate by more than 50 percent the rule would be again adjusted to 3 percent in the direction that moves away from their target level and 0.5 percent in the direction that moves reserves toward their target level.

An asymmetric intervention rule could generate losses for the government. Clearly if the public knows that the government will be a net seller of domestic currency bonds in order to rebuild reserves this will, other things equal, depress the exchange rate. But this is appropriate since the initial intervention artificially supported the currency. Moreover, there is no guarantee that the exchange rate will ever rise to levels that make

the intervention profitable. But there is no one way bet typical of a regime in which the authorities are obliged to defend a currency peg.

We would expect that in establishing its target the government would balance the cost of maintaining a stock of liquid foreign assets against the benefit of being able to mitigate the effects of swings in private capital flows. In the early days of an interim regime the desired stock of reserves might be quite large by historical standards. Recent experience suggests that net reserves of 50 percent of GDP would not be unreasonable.

Changes in the *level* of the central bank' s total assets, and therefore the monetary base, would allow the central bank to determine a short-term interest rate in Korean financial markets. The practice of using a short-term interest rate as an intermediate target to stabilize output in the short run and inflation in the long run has become widely established in both industrial and developing countries. Inflation targeting would be fully consistent with the objective of liberalizing and strengthening domestic financial markets.

II Policy Challenges

II - 1 The Current Account, Net Debt and Capital Flows

We argue above that a simple set of rules for intervention can go a long way toward insuring that Korea's financial market will develop and that Korea's trading partners will not see the exchange regime as injuring their interests. A necessary condition for such rules to be credible is that the current account or, what is the same thing, the change in net debt of the Korean economy generated by private investment decisions must be acceptable to the government of Korea.

The logic of this proposition is simple and unavoidable. If the private sector is free to borrow and lend, market forces will determine the level of the exchange rate, net capital flows and the current account balance. As a participant in international capital markets the Korean government can mitigate the volatility of this process but it cannot hold back the tide of international capital flows unless, of course, it decides to reimpose controls.

Policy makers are sometimes impatient with this constraint arguing, for example, that it is not politically feasible to allow the country to fall into debt or to give up the benefits of export-led growth. We do not believe that a macro policy regime can resolve this potential conflict. The constraint on the government's objective for the current account is not a "theory". It is an identity. If the private sector determines the scale and direction of net capital flows free of controls the government cannot also determine the scale and direction of net capital flows.

We recognize that private capital inflows to emerging markets have not always been beneficial. Financial crises have been a frequent and painful feature of the international monetary system in recent years. The obvious welfare costs of crises has led to a general reevaluation of strategies for opening repressed financial systems to international competition. There is a growing recognition that greater reliance on market forces to coordinate financial markets has apparently contradictory implications for policy makers. On the one hand, liberalization reduces the direct role of the government in domestic credit markets. State owned or directed financial systems have done a poor job of allocating resources, and this blueprint for economic development has been decisively, and rightly, rejected by the government of Korea. It is the complexity of credit allocation that gives market mechanisms the decisive edge over planning.

On the other hand, we have ample evidence that badly structured and poorly regulated private financial markets can also misallocate resources. The limitations and fragility of private credit markets in emerging markets should not have been a surprise. Credit markets in industrial countries are highly regulated and there is a very large and sophisticated literature on the distortions to private incentives that make this regulation necessary. A balanced assessment of these arguments suggests to us that successful liberalization of credit markets will severely limit the government's direct participation in financial markets and at the same time require a substantial expansion of the government's role in supervision and prudential regulation. In the transition to a fully liberalized domestic financial system, restraints on the liability management of resident

financial and nonfinancial institutions may be a useful component of the government's overall strategy. In some circumstances such limitations might take the form of controls and taxes on international capital flows.

An overriding short term challenge facing policy makers in emerging markets is to establish policy regimes that are immune from financial crises. The unhappy fact seems to be that a stable macroeconomic environment may be necessary but not sufficient to coax the desired outcomes from liberalized financial systems. But we want to emphasize the idea that monetary policy should not be assigned the task of offsetting capital movements generated by distorted or inefficient private incentives. Moreover, sterilized intervention may be useful over short time horizons but in most cases intervention "papers over" the problem without altering the incentives behind private capital flows. As a result the authorities can offset private capital flows for a while but it is clear that this encourages more private capital flows.

For similar reasons we are also unconvinced that fiscal policy is an effective policy tool for influencing private capital flows. While fiscal policy might in very special circumstances be used to influence net capital flows we do not believe that the government's net debt position should be determined by developments in international capital markets.

Our conclusion is that if there is a problem with private capital flows the government should directly limit such transactions, and at the same time, work to alter the incentives that may have generated capital flows not in the country's interests. A liberalized financial system means that although the government is not directly setting quantitative restrictions on capital flows it will have to work very hard to insure that net private capital flows are not distorted and are consistent with prudent financial management of private investors and debtors

II - 2 Volatility

Free financial markets are volatile. It would be very helpful therefore if the authorities would clearly link their objective for a market-oriented financial system to their acceptance of an appropriate amount of volatility in financial prices, including exchange rates. The appropriate level of volatility, in turn, depends on the ability of financial and nonfinancial institutions to adjust to this new environment. Although we believe that private market participants will eventually provide the stabilizing speculation needed to insure the performance of a market-determined system, these institutions are not yet fully developed in Korea. There is no doubt that the ultimate success or failure of this interim regime will depend on the behavior of the private sector.

What can the government do to promote stabilizing speculation? The most important ingredient is to allow substantial volatility from day to day in exchange rates. This provides the profit incentives for speculators to smooth rates and the incentive for other market participants to hedge exposures.

The initial weakness of corporate and bank balance sheets following the 1997 crisis has made it difficult for firms to adjust to highly volatile exchange rates. An important tradeoff is that some measure of volatility is *necessary* to make private speculation profitable. But excessive volatility will be a serious problem for financial and nonfinancial institutions with weak balance sheets.

The key to this problem, however, is how balance sheets evolve over time. This will be strongly influenced by expectations about intervention policy. If the authorities are perceived as having an objective for the *level* of the nominal exchange rate, private investors will structure their balance sheets to take advantage of such a guarantee. There is no need for a private firm to hedge dollar liabilities if the government is expected to use its reserves to liquidate all or most of the private sector's dollar liabilities at some floor level for the exchange rate.

The tendency for the private sector to increase its vulnerability to exchange rate changes when it believes that the authorities have an objective for the level of the exchange rates is a very important reason for establishing rules for floating. If the private sector believes that they are insured against depreciation they will borrow in foreign currencies and this will, in fact, make it difficult for the government to stand by when

there is downward pressure on the currency. The rules suggested here would have two positive effects. First, it will send a clear message to the private sector that they are responsible for the financial risks they take on. Second, when the policy is tested by a fall in the exchange rate the government has a clear policy to stick to.

It is never easy to stand by when markets punish firms that have made bad decisions. In our view the only way to insure that private risks are avoided is to allow firms to fail. This, in turn, requires efficient procedures for liquidating firms that make bad decisions. Many observers have argued that this "credit culture" will be difficult to implement in Korea and other emerging markets. We agree but would add that, if this is really the case, liberalized financial markets cannot work. The decision to move to market-determined financial markets is the decision to strictly limit the government's intervention designed to save individual firms from the market's judgment.

II - 3. Exports

One of the most difficult problems with volatility is that export industries that have enjoyed the protection of managed exchange rates are also not well prepared to cope with greater volatility in exchange rates. The key question is whether or not exporters will adapt to the new system and at what cost. Experience in other countries suggests that exchange rate volatility has not reduced the growth of international trade.

But this does not mean that exchange rate volatility will be welcome by exporters. Export industries will carefully observe the government's intervention behavior in order to assess their risks in concentrating on export markets and upon hedging their exposure to exchange rate changes. No business that is accustomed to protection from uncertainty by the government will welcome a more volatile environment. If the government is believed to have an objective to resist appreciation of the currency, firms will exploit the guarantee by focusing on production for export and by not hedging the domestic currency value of receipts. The success of an interim regime will depend on the authorities' ability to balance the needs of exporters and other market participants.

Small and medium sized businesses do not have credit ratings that allow them to use many hedging techniques. In most hedging instruments there is significant counterpart risk and this risk makes participation expensive and, in many cases,

impossible. Options are a good alternative since the firm pays a fee and does not need further credit. But the option exchange itself must be well capitalized to ensure participants that large rate movements will not generate default. The authorities could participate in the options exchange perhaps through a capital infusion

II - 4. The Optimal Stock of Gross Reserves

The optimal stock of gross reserves, or the ratio or gross reserves to GDP, is difficult to quantify. In focusing on the net foreign currency position of the government we have left the optimal composition of gross assets and liabilities and derivative positions in the background. Suppose, for example, that the Bank of Korea borrows dollars and invests in liquid dollar assets. Gross reserves have increased but the government's net foreign currency position has not changed. Thus we would not call this intervention. In fact, the rules for floating outlined above put no constraint on the level of gross reserve assets, gross foreign currency liabilities, and derivative positions but only on the government's net exposure. Nevertheless "borrowing in advance of need" might help stabilize market expectations and discourage speculative runs on the currency. It follows that, within the guidelines set out here, the government is free to balance the advantages of a borrowed war chest against the carrying cost of borrowing long in order to lend short.

Our main point here is that the government of Korea has a legitimate need for reserves and an accumulation of large stocks of gross or net reserves is not a threat to the interests of other countries. To the contrary, an appropriate stock of reserves can be an important contribution to the stability of the international monetary system. The problem is that this objective is difficult to distinguish from the objective of trying to control the level of the exchange rate or the current account balance. This is a legitimate concern both for foreign governments and private investors.

II - 5. A Safety Valve, Concerted Intervention

Allowing exchange rate volatility also opens up the way for noise traders, or worse, for those that would attempt to manipulate the rate of a small open economy for their own advantage. The importance of such behavior in practice has been debated for

as long as there have been markets. We will not settle such matters here much less the more difficult question of the tradeoff between market-determined prices and the costs of destabilizing speculation. But we do need to provide a mechanism for the authorities to react to such behavior when they are convinced it is dominating markets.

It follows that a prudent regime incorporates a safety valve that allows governments to step in and take a strong stand concerning the appropriate level of the exchange rate. Such interventions should be infrequent and, to insure that governments' participation in the market is decisive, it should be the result of a formal agreement among governments, perhaps through regional swap agreements or the BIS. There is some evidence that concerted intervention by governments of industrial countries has been effective in stabilizing exchange rates and we see no reason for limiting such policy moves to industrial countries.

If the exchange rate is clearly being manipulated or if a movement in one direction is thought to be a speculative bubble, the governments involved should be able to agree to a concerted intervention and to share the exchange rate risks associated with such an intervention. In the case of Korea, bilateral negotiations with the big three would not be practical but consultation with other Asian governments would be an attractive alternative.

This consultation process is crucial in defusing a political reaction from trading partners. It would also signal the private sector that the intervention is funded by deep pockets and is likely to be successful in stabilizing the exchange rate. The reserve targets would be relaxed but not eliminated following concerted intervention. If fact, it would be much easier to gather agreement for such an intervention if the terms for unwinding each government's position were set out in advance.

III Inflation Targeting

III - 1 Overview

By assigning the currency composition of the government's net assets to smooth exchange rates we have left free the more powerful policy, namely changes in the

monetary base and associated changes in short-run interest rates. The benefits of freeing this important tool depend on a coherent policy framework. Our suggestion is that flexible inflation targeting with an intermediate interest rate target would be appropriate for Korea. This is an appealing regime for several reasons. First it allows an "additional" role for the exchange rate in policy making. Nominal exchange rate changes have predictable effects on subsequent inflation. It follows that the appropriate policy response to exchange rate depreciation is a tightening of monetary conditions. As emphasized above, the central bank is not backed into a corner of defending a given level for the exchange rate but is, nevertheless, expected to react to mitigate the inflationary and deflationary effects of changes in nominal exchange rates.

Second, by clearly communicating its inflation objectives and forecasts the government provides a clear justification for its nominal interest rate instrument. This will allow the government to build a track record and, in that way, increase its credibility.

Third, the fact that the government will certainly miss its inflation target from time to time is actually an advantage of the system because it provides an opportunity for the government to explain its understanding of what part of the forecast went wrong and why. It is our view that credibility does not come from the particular nominal target chosen. Credibility comes from the demonstration that the government has a consistent policy framework and can explain and learn from past errors in the context of that framework.

The operating procedure associated with inflation targeting is simple to formulate and communicate to the private sector. The first step is to calculate a "normal" real interest rate that is neutral with respect to the business cycle. The second is to quantify an inflation forecast conditional on policy. Third, the inflation forecast plus some part of the percentage difference between the expected and desired inflation rate is then added to the normal rate to obtain the short-term interest rate target. There are many judgments to be made in this procedure and a great deal of discretion and judgement can be incorporated into the process.

Svensson (1998) provides an explicit model of a small open economy and evaluates alternative inflation targeting procedures in the context of the model. There are important issues that would have to be resolved before such a model could be applied to

Korea. In particular the fact that the exchange rate has an immediate effect on output and prices in a small open economy has to be taken carefully into account in designing the regime. These important questions are beyond the scope of this paper but we do provide a very simple description of how our policy regime would react to shocks to the economy in appendix I. [1]

We believe that there are no serious technical barriers to successful inflation targeting in Korea. Moreover, the regime has several advantages. First, the interest rate is clearly visible to the private sector every day. Second, when errors occur the authorities have a simple framework within which errors can be decomposed and can communicate how the procedure will be modified to insure better future performance. Third, and most important, this procedure requires the central bank to pursue the one policy objective it has the power to achieve in the long run, the rate of inflation.

III -2. Credibility and Inflation Targeting

Some observers have argued that exchange rate regimes similar to that described above are unlikely to serve the interests of emerging-market countries. Calvo (2000) and Calvo and Reinhart (2000b), for example, have argued that there are good reasons for countries that started out floating following a crisis to quickly return to a de facto fixed rate regime. This tendency has been called "fear of floating" and is a clear empirical regularity among developing countries. The more difficult question is why this has been such a common phenomenon and what, if any, lessons are applicable for Korea.

One approach is to argue that floating exchange rates are, in fact, not optimal for emerging markets. This argument is based on the idea that a fixed exchange rate is the only credible and verifiable nominal anchor for monetary policy in developing countries. If this is true then there are certainly strong reasons for adopting a fixed exchange rate. Our view is that this assumption does not fit Korea well at all. Countries with histories of high inflation may find it difficult to convince the private sector that they can be trusted to hit an inflation target. But the government of Korea, we believe, would be more credible if it announced an inflation target. An inflation target would provide a superior

[1] We have also developed an extended version of the Svesson model by explicitly introducing the current account which depends on some of the variables that affect exports and imports in appendix I.

anchor for private expectations about monetary policy in Korea because the relationship between the monetary base, short-term interest rates and inflation is much better understood than the relationship between the exchange rate and any variable over which the authorities have control. It is exactly a commitment to defend an exchange rate that has become, in the market's view, over or under valued that makes an adjustable peg regime unstable. Even in inflation-prone countries such as Brazil and Mexico inflation targeting has been quite successful in stabilizing inflationary expectations. Moreover, uncertainty about the level of the exchange rate that is consistent with price stability means that a commitment to a fixed exchange rate might destabilize the price level.

IV Alternative Intermediate Regimes

Although our preferred regime does not call for an important role for the level of the nominal exchange rate we recognize that there are good arguments for a regime in which the exchange rate plays a more central role. In this section we discuss regimes that capture the important elements of such alternatives. .

The central focus of the basket-band-crawl (BBC) regime is three-fold. First and foremost, it is designed to maintain competitiveness. Over time, the exchange rate will depreciate at a pace such that the countries' inflation differential (beyond what is induced by the Balassa-Samuelson-Komyia effect) is offset by nominal depreciation. Second, where there is no dominant trading partner, the reference point is a basket of currencies rather than a single reference currency. Third, there is room for exchange rate fluctuations to free up, within limits, domestic monetary policy and to have some market-based signaling role for exchange rates. Clearly, the regime is not a panacea: domestic monetary and fiscal policies matter for performance, but the arrangement is sufficiently stabilizing for capital markets to elicit substantially stabilizing speculation.

When inflation rates are high, fixed or unchanging nominal exchange rates can not be sustained. This leads to the first part of the proposal: crawling. The notion of crawling was first practiced in Latin America. It clearly involves a trade-off: indexing

the exchange rate means inflation is more nearly perpetuating itself than coming down under the force of a (fixed) nominal exchange rate anchor. However, in exchange, there is no loss of competitiveness and the associated risk of recurrent devaluation crises declines. The higher the rate of inflation, the more important the emphasis on the crawl.

The second part of the scheme is the basket feature: because trade with the dollar block and with Europe is a significant portion of Asian commerce, the rate regime should be diversified. In that way another source of major swings in competitiveness -- external currency movements rather than domestic inflation -- is contained. Any trend inflation and productivity adjustment aside, external currency changes affect the central parity. For the Korean Won, weights might be 0.3 for the US and the ERM and 0.6 for Japan. Whenever the dollar appreciates 10 percent on the Yen and the Euro, there is an offsetting appreciation of the Won by 3 percent on these currencies. As a result, weighted average competitiveness is preserved: a gain in the dollar markets of 7 percent and a loss in the Euro and Yen markets of 3 percent. The adjustment is clearly not neutral across firms, but it is the best that can be done under the circumstances. Firms can go further in seeking stability by using forward contracts. From an inflation point of view, the rule maintains the stability of the average price level.

The basket feature does not mean that there is a need to intervene in all reference currencies. In practice, the foreign exchange market is run in terms of one of the reference currencies, say the dollar. The central dollar rate then is adjusted in terms of the trend factors and the corrections deriving from external rate movements among the basket currencies.

The third feature involves the band aspect. The band idea is a lesson drawn from flexible rate experiments. The lesson comes in two ways. First, that fully flexible rates may not be stable rates, and more so, that the more fundamentals (like monetary policy) are not fully exogenous. Second, market determined rates might play a useful role in signaling the need for realignments of the central parity. Between the market signaling and policy makers learning and reacting, there may be the potential for gradualist change in the central parity. That offers more flexibility than a fixed rate and more stability than a fully flexible rate. It thus tries to blend the best of both worlds.

There are two critical questions in the design of the target zone scheme. One is the issue of the band width. There is no scientific basis to determine a good band width. Williamson (1996) recommends a 7-10 percent range on either side. His basis for these numbers is that less is too little and more is too much. Ultimately, band width has to be calibrated on the stability of the central parity real exchange rate and on the stability of the domestic financial policies. The more stable each of these is, the more stable the expected exchange rate and, hence, the narrower the plausible range of fluctuations and the defensible range. By contrast, if the equilibrium real rate is subject to substantial fluctuation. Wide margins are essential. and even that may not be enough. Clearly, in the latter case, there is an urgent need to bring financial policies under control since that, not intervention, is the only way to stabilize the foreign exchange market. An unstable equilibrium real exchange rate in turn calls for an extra arrangement that makes the real central parity significantly flexible over time. Here is, in fact, a key challenge for regimes that feature the nominal exchange rate as an explicit policy objective.

A key ingredient in getting good performance is a realistic assessment of the equilibrium real exchange rate. This is all the more important, the more significant is structural change in the trade and capital markets. The prevalent model for calculation of real equilibrium exchange rates takes as given a current account target:

$$(1) \qquad x = f(R, Y, Y^*, \ldots) \text{ or } R' = l(x', \ldots\ldots)$$

where R is the real exchange rate, Y and Y^* are home and foreign output, x is the current account, and x' the target level. The dots represent other relevant policy variables. For given paths of output and policy variables that have a bearing on the current account, and for a given current account target, we arrive at the equilibrium real exchange rate, R'. The brief discussion makes clear two points: first, there needs to be a current account target to know what an equilibrium exchange rate is. Without a target concept, anything is possible -- 5 percent of GDP deficits or even 10. As the example of Mexico reminds us, what seems plausible one day -- and is easily rationalized as the wonders of reform and modernization -- the next day is called unsustainable.[2]

[2] It would be interesting to explore the fate of all large deficits. We know from the work of Goldfajn and

There are no hard and fast rules for allowable or sustainable deficits. The more a deficit reflects investment rather than consumption the more plausible the case for allowing it to go forward. The more a deficit is financed by direct investment, the more plausible a larger number. But when everything is said and done, large deficits create vulnerability and that is why a target may be appropriate.

The second point, which is just as important, is that the current account does not depend exclusively on the real exchange rate. Other policies need to be consistent to take weight of the real exchange rate. Thus, we cannot have full employment, a large fiscal expansion, and a small deficit without expecting high real interest rates and a major real appreciation. They might create the right size current account, but they are not sustainable because the real interest rate will attract capital and the real appreciation will harm the traded goods sector. Since these outcomes are inconsistent with medium term stability, any target zone arrangement built around them is bound to be challenged. In that sense, BBC-style exchange rate arrangements -- or any exchange rate arrangement for that purpose -- are not a panacea to deal with bad policy.

Williamson (2000), perhaps the most ardent advocate of intermediate regimes, claims that a well-managed BBC regime could have forestalled the Thai crisis in 1997, although such a regime could not have saved other countries from contagion of the Thai meltdown. Why is the BBC regime unable to ward off the contagion effects? The band element of the BBC makes it potentially crisis prone, that is, the obligation to intervene at the edge of a conventional band can trigger a crisis. For this reason, Williamson (2000) argues that emerging market economies in East Asian may consider moving to an intermediate regime with no obligation to intervene at the edge of the band.

These new intermediate regimes include: the reference rate proposal in which the authorities do not have to defend a parity but are not allowed to push their currencies away from the parity. A soft margin arrangement in which the nominal rate is maintained within a band around a moving average of current and past market exchange rates. And finally, monitoring bands that require hands-off policy within a pre-announced band but allow intervention without obligation to intervene once the rate goes out of the band.

Valdes that large real appreciations have little chance of going away without a crash. One surmises the same fate befalls their mirror image, large deficits. As the bankers say, it is not speed that kills, it is the sudden halt.

The modified versions of an intermediate exchange rate regime may reduce the vulnerability of emerging market economies to speculative attacks. Nevertheless, they are subject to the fundamental objection that they require a judgement concerning the equilibrium real exchange rate. We do not believe that it will be possible to identify an equilibrium exchange rate and in the absence of such knowledge such regimes in practice will evolve to traditional looking fixed exchange rate regimes.

V. The Currency Board Arrangement

V - 1. Overview

The past 20 years have brought a fundamental transformation to monetary management. Independent central banks with transparency and some inflation target, more or less explicit, are now standard. In many emerging economies we also now observe independence of central banks and, where rates are flexible, some variant of an inflation-targeting policy approach.

At the same time, monetary integration is a live theme. In Europe this has become a fact with the creation of the European monetary Union and that experience is growing with the increasing incorporation of countries in the East, a handful as early as 2004 and quite a few on the waiting list beyond. Indeed, membership in the European Union comes automatically with membership in the monetary union and some form of representation at the European Central Bank. But even though membership in the European Union is clearly on the horizon, the larger candidate countries so far remain attached to discretionary exchange rate regimes, forsaking the readily available option and benefits of unilaterally adopting the Euro.

In Asia, the discussion of monetary arrangements is picking up at the behest of Japan. Noting the European developments and some discussion of dollarization in Latin America, and the fragmentation of the region in response to the Asian crisis, Japan is exploring what kind of monetary arrangements might make sense (See Ogawa and Ito, 2000). As a concept, this goes far beyond the discussion of an Asian IMF or the establishment of central bank swap lines that are already in place.

V - 2. Traditional Challenges

Six arguments make up the case against currency board arrangements. They are, respectively, sovereignty, the loss of seigniorage, the loss of monetary policy, the loss of lender of last resort, the loss of fiscal preparedness, and abandonment of the exchange rate. On the surface, each argument is persuasive; on closer scrutiny none really is. Sovereignty is beyond discussion; when it comes to the quality of money the argument does not come up; when it comes to national pride it should not come up in most countries.

The loss of seigniorage is, of course, a critical issue for public finance. The inability to pursue an optimal inflation strategy to extract maximum revenue (as a function of the inflation sensitivity of money demand and the growth rate) limits public sector revenue and forces either spending cuts or recourse to possibly more distortionary forms of taxation. This argument is more appropriate for full dollarization, but even in the case of a currency board it does apply with the only mitigation that interest is earned on foreign exchange reserves. This limits the seigniorage issue to the spread between a country's borrowing and lending rates times reserves -- we can imagine reserves being borrowed to support the currency on a long term basis but invested short term. The spread is a reality and the seigniorage issue accordingly is real. But there is an important offset to the loss of seigniorage from the reduction in public debt service costs that result from reduced interest rate -- more on this below -- and this factor is surely far more significant than the 1 percent or so of GDP in seigniorage loss. Of course, any kind of stability-oriented monetary policy will yield some bonus but currency boards and dollarization presumably command the highest bonus.

The loss of monetary policy is, on the surface, very obvious: if money creation is tightly and mechanically linked to reserve flows, the external balance not the local central bank determine interest rates. But there is surely an illusion here: what central bank in say Latin America can cut interest rates below New York or what central bank in Eastern Europe can go below Frankfurt. Their fondest hope is to get down to these levels and the safest way to get there is to foreswear all and any kind of independence. In principle there might be some scope for deeply undervalued currencies, expected to appreciate, to achieve lower nominal interest rates than New York but achieving such levels of undervaluation is

unseen in the region except in the immediate aftermath of a collapse at which time inflation fears typically abound.

The loss of the lender of last rest resort function is intriguing. It is based on the assumption that the central bank, not the Treasury or the world capital market, is the appropriate lender. There is surely nothing encouraging about the scene of money printing to save banks that are facing an external drain -- the brief Turkish experience of December 2000 with this strategy stark reminds us that this is an express train to currency collapse. In that situation, the central bank poured money into failing banks even as that money poured out of the country cutting central bank reserves at the pace of a billion a day and more. At most then the lender of last resort issue has to do with substituting good credit (not money) for bad credit. That is intrinsically Treasury function or, if the treasury can not be a source of good credit, the good part of the banking system if any or the rest of the world. It may be the case that there is not good credit available and that as a result bank closure is inevitable; much better to recognize this than to conceal the fact in a process of money creation that blows up the currency and the good banks, too. Lender of last resort, more often than not, is failed or failing banking policy.

A surprising argument in questioning currency boards is fiscal preparedness. Of course, at an elementary level there is a point here: the central bank must be cut off from the treasury, all back doors must be closed. It is hard to see how a discretionary monetary and exchange rate policy can accommodate a lack of good fiscal situation better than a fixed rate. At the most extreme level this may just be an argument about the government being unable to do without seigniorage revenue. As argued above, the savings on debt service from lower interest rates under a currency board amply compensate and take away much of the sting of this argument. But if it is not that, there is no argument. To believe that inflation and devaluation are constructive solutions to a fiscal problem is contradicted by much of financial history. Indeed, from a political economy point of view one might argue that the favorable political and growth effects following upon a shift to a currency board might offer a quite unique opportunity to implement an important fiscal reform.

The most serious and contentious point about a currency board is the abandonment of the exchange rate. This objection comes in two ways. First, in response to an unfavorable disturbance, a flexible exchange rate offers an easier way of adjusting

relative price levels and hence competitiveness than general deflation. Second, a fixed rate sets up a one-way option that is bound to be a target for speculative attacks.

Consider first the loss of easy relative price flexibility. This argument can be overdone in a number of ways. First and importantly, most disturbances are temporary rather than permanent. As a result they should for the most part be financed rather than adjusted to. But before we even get to that discussion, there is, of course, the question of whether exchange rates are, in fact, a short-run stabilization tool. With low short-run elasticities it is entirely possible that rate movements could destabilize the current account and employment. That view is more relevant the more the discussion focuses on temporary disturbances as the target of rate movements.

But the more substantial issue is to view the response to disturbances in a context of intertemporal optimization including an explicit role for capital markets. In a world where there are international capital markets, cyclical disturbances at home or abroad or temporary terms of trade fluctuations do not require offsetting movements in relative prices so as to maintain current accounts balanced. On the contrary, from a perspective of intertemporal optimization, partial adjustment of consumption or investment and current account financing should be most of the buffer. But if current account adjustment is not part of the script, here is the need for relative price adjustment? Of course, this overstates the point because there will typically be some adjustment of consumption or investment and, as a result, some need for relative price changes to deal with full employment. To some extent this need is met by flexibility of wages and prices but that flexibility may be incomplete, more so in a new regime. That leaves a bit of an exchange rate issue but it also pouts it in a cost benefit perspective. In terms of the models used in new classical economics, the exchange rate can be used as a "fooling device" to create unexpected changes in real factor rewards but these will last only as long as expectations and wags-prices can not adjust.

At the same time, the option to fool agents comes at a cost in the capital market. If recourse to unexpected movements of the exchange rate are part of the regime they will translate into a premium in interest rates and hence the cost of capital. That in turn translates into a loss of competitiveness which must be made up by lower equilibrium real wages (This discussion assumes that capital is mobile and labor is not). The point of the

discussion is to say that the devaluation option has limited scope in labor markets, as new classical economics warns, and it surely has a cost in the capital market. Closing the circle suggests that a regime with the devaluation option translate into lower average equilibrium real wages compared to a hard peg.

For the case of permanent or highly persistent disturbances the role of exchange rates becomes, of course, more prominent. Here it is an issue of adjustment rather than financing. This adjustment of the relative prices would, of course, seem to be favored by exchange rate movements. But it is also true that price-wage adjustment can do much the same. If they can not, because of "rigidities", it stands to reason that the exchange rate will rarely do the job without some complication. That certainly has been the experience of Latin America where inflation-devaluation cycles have been the centerpiece of the monetary regime.[3] If anything, exchange rate has been the dominant instrument of destabilization.

It takes a very special kind of money illusion that accepts real wage cuts from a large and perfectly obvious devaluation but can not generate a fall in wages or prices. Perhaps it says more about the monetary authorities' unwilling to create the conditions for deflation but their willingness and ability to get by with real wage cutting by depreciation and inflation. After all, the wage-price regime is not written in stone but rather is mostly written by the central bank's systematic policy conduct.

V - 3. The Gains from Currency Unions and Boards

The gains from a currency board or dollarization come in the financial area and derive from a far enhanced credibility in the exchange rate and hence inflation performance. The gains come in two forms. First and most obviously, there is a dramatic decline in interest rates with all attendant benefits. That gain is, of course, more important the more debilitated a country is financially (See Giavazi and Pagano, 1998, who called it the gain "from tying one's hands"). In the case of Greece or Italy becoming part of the EMU they were altogether striking and they have been just as much in Argentina. In countries that are not outright fragile, the gains are still significant since in a modern

[3] Martinez, Sanchez and Werner (2000), for example, note that pass-through from the exchange rate to prices is as high as 65 percent, of which 50 percent occurs within 2 quarters.

financial setting a cost of capital difference of a percentage point or two are decidedly relevant. But the gains from abandoning national money are inversely proportional to its quality, past, current and prospective.

As important are the transformation of the financial sector and the lengthening of agents' horizons. With low inflation and stable inflation, and a stable currency, economic horizons lengthen. The lengthening of horizons, in turn, is conducive to investment and risk taking which translates into growth and this closes a virtuous circle. Moreover, once an economy moves out of crisis or state of siege mode, distortions and inefficiencies become far more apparent and can become the target of public policy. There is ample evidence that inflation hurts growth, and high and unstable inflation does so with a vengeance. Hence a monetary regime that delivers and maintains low inflation, other thins equal, will help growth. While these points are quite obvious -- and were behind the case for low inflation targets on the part of central banks in advanced economies -- on the periphery and notably in Latin America they are still to be reaped. In sum, doing away with inflation is a step toward pervasive and deep reform.

V - 4. A Currency Board for Korea?

The preceding discussion on the advantages and disadvantages of the currency board arrangement suggest that the system deserves a careful examination as an alternative regime in the long-run for the East Asian countries instead of dismissing it outright as an arrangement politically unacceptable. The ASEAN plus the three northeast Asian countries have been working together to create a regional arrangement for financial cooperation which may be a first step toward establishing an East Asian currency union.

Although monetary integration in East Asia is far off in the future, the discussion on regional financial cooperation renders credence to the currency board as a viable alternative to either the flexible or intermediate regime for East Asia. However, in the short-run or during the transition period, we seriously doubt that Korea should entertain the idea of adopting a currency board arrangement.

There are two considerations that make a currency board to be an appropriate regime for Korea at this time. The fundamental problem is that Korea may need real exchange rate flexibility to soften the impact of changes in world demand for Korean

output and exports. Moreover, we believe that the Korean authorities do not need to give up real exchange rate flexibility in order to enjoy a credible low interest rate regime. This may be a problem for countries with a history of high inflation but this is not the case for Korea.

VI. Recent Experience in Korea and other Emerging Markets

A number of recent studies have suggested that a nominal exchange rates fixed at untenable levels were one of the major causes of financial crises in emerging markets. The IMF view is that the intermediate regimes may serve as temporary systems, but in the long-run the choice for these countries comes down to either floats or hard pegs. Nevertheless, many countries in East Asia have apparently been reluctant to accept the advice of the IMF and the economic profession in general. Malaysia decided to adopt a fixed exchange rate system in the midst of a crisis, China continues to adhere to what they call a managed floating system, and other East Asian countries intervene extensively to stabilize their nominal exchange rates.[4]

Baig (2000) and Hernandez and Montiel (2001) show that the currencies of the East Asian crisis countries have been relatively more stable since early in 1999, compared to a representative sample of other floating currencies. Their interpretation of this evidence is that the crisis countries have reverted back to the old regime of pegging their currencies to the dollar:

> "Where the authorities of a country do not announce any objectives that would permit a judgment that they had succeeded or failed, but where they nevertheless have views about where the exchange rate ought to be, and are prepared to act on those views. They announce no parity or band, but they typically worry if the rate depreciates a lot, and they intervene, or change interest rates, or sometimes seek to influence the flow of capital, with a view to having an impact on the exchange rate. And they may certainly worry about the exchange rate appreciating so much as to threaten their country's competitiveness, as has been the case in Korea" (Williamson, 2000).

[4] See Park, Chung, and Wang (1999) for the evidence of intervention in Korea.

As can be seen in Figures 1 and 2 and Table 1, the volatility of the nominal exchange rates of the East Asian countries has increased a great deal since 1998, compared to the pre-crisis period (see also appendix I) Nevertheless, the currencies of these countries have been less volatile since January 1999 than the Yen and other floating currencies outside of East Asia (see Table 2A and B). Baig (2000) also shows that while the volatility of exchange rates has increased, that of the interest rates and reserves has decreased in the crisis countries. It is not clear how these two different developments should be interpreted, but an index of exchange rate flexibility (the ratio of standard deviation of exchange rate changes (SDEX) divided by SDEX + standard deviation of the ratio of changes in reserves over lagged monetary base) suggests that Korea and Singapore have returned to the pre-crisis degree of inflexibility.

We have attempted to identify some of the developments that may have caused the increase in instability in the foreign exchange market. One explanation for the increase may be related to the shift from managed to free floating, itself, and a simple statistical test bears out the significance of the regime shift. As shown in appendix I, a regime dummy in a conditional variance equation is shown to be statistically significant and its estimated coefficient is positive (see Table 3).

In addition to the regime shift, deregulation of capital account transactions appears to have contributed to the increased volatility of the won-dollar exchange rate. Capital market opening has increased both the volume and volatility of capital movements in and out of Korea's financial markets. As shown in Table 4, the ratio of the standard deviation of capital flows in the post-crisis period to that of the pre-crisis period is 8.6, suggesting that volatility of capital flows rose markedly since deregulation took effect in 1998

Capital account liberalization has also increased integration of Korea's capital markets into the markets of major international financial centers including New York. As a result of the increased pace of integration, external shocks originating in New York and Tokyo are almost instantaneously transmitted to Korea's financial markets, in particular the equity market. Reflecting the growing trend of integration, for example, the

coefficient of correlation between the U.S. and Korean shock prices rose to 0.57 after the crisis from-0.86 during the pre-crisis period (see Table 5).

Finally, a number of recent studies provide some evidence that foreign portfolio investors operating out of the equity market in Korea have exhibited a tendency to engage in positive feedback trading: buying when the market is booming and selling when it is slumping. These studies also suggest that foreign investors are prone to moving together in a herd in East Asian financial markets (Cho, Kho, and Stulz, 1998, Kim and Wei, 1999, Park and Park, 1999). The positive feedback trading and herd behavior of foreign portfolio investors who hold as a group more than 30 percent of the total valuation of the equity market in Korea are likely to have, in part, been responsible for increasing instability of the stock market, which appears to have spilt over into the foreign exchange market, amplifying volatility of the nominal exchange rate.

VI - 1. Intervention and Policy Objectives

A number of recent studies on exchange rate policies have shown that policymakers in developing and emerging market economies have been reluctant to let their exchange rates fluctuate freely for fear of a large depreciation. One of the policymakers' fears with floating is the devastating effect of the currency as well as maturity mismatch on the balance sheets of banks and corporations laden with a large amount of U.S. dollar-denominated short-term debts (Calvo and Reinhart, 2000a and b, and Eichengreen and Hausmann, 1999, Goldfajn and Olivares, 2000, and Mussa *et al*., 2000).

The central banks of developing countries do not readily allow a sudden and steep depreciation of their currencies, leading their exchange rates to be quite stable. The more serious these balance sheet effects are, the larger is the amount of currency mismatches between dollar-denominated assets and liabilities. According to Calvo and Reinhart (2000a) and Eichengreen and Hausmann (1999), the possibility that the emerging economies face negative balance sheet effects at the time of a large depreciation is high since their banks and corporations usually do not have proper tools to hedge their exchange risks although they have large amount of dollar liabilities. Calvo (2000), Mussa et al. (2000) and Goldfajn and Olivares (2000) also point out that the low

volatility of the exchange rates may encourage more currency mismatches by discouraging hedging attempts.

Another possibility is that a large depreciation may complicate inflation management while it could downgrade their sovereign ratings and consequently reduce their accessibility to international financial markets (Goldfajn and Werlang, 2000, Calvo and Reinhart, 2000b and Hausman *et al*, 1999).

Calvo and Reinhart (2000b) find that the sovereign ratings of developing countries were significantly downgraded following the currency crises, and that the magnitude of their downgrade was far greater than that of developed countries. They thus argue that this credibility problem has been pervasive in developing countries. Since the loss of access to international lending may cause disruptive effects on the developing economies that heavily depend on foreign capital for investment, the central banks minimize the volatility of the exchange rates by intervention in the foreign exchange markets or adjustments in the monetary policies.

The central banks of developing countries that are reluctant to allow higher volatility of exchange rates are concerned about the effects of depreciation on domestic prices. In particular, the central banks of the economies with higher degree of exchange rate pass-through try to minimize the inflationary effects of depreciation by controlling the downward pressure of local currencies. According to the empirical findings of Goldfajn and Werlang (2000) and Calvo and Reinhart (2000b), the degree of pass-through is higher in developing countries than in developed countries. Thus, the fear of floating due to the fear of inflation would be more common in the developing economies. In addition, the central banks would be more concerned about the pass-through and then the volatility of exchange rates if they pursue inflation targets or the economy has a de facto wage indexation. (Goldfajn and Olivares, 2000 and Hausmann *et al*., 1999)

These arguments may be able to account for only a part of the reality. The first three (the balance sheet effect, credibility problem and fear of inflation) are valid only when the value of the local currency depreciates. They are, however, not valid when the exchange rate tends to appreciate and at the same time, show low volatility. Although an appreciation of the local currency improves balance sheets and credibility as well as lowers inflationary pressures, the central banks are likely to intervene to restrain further

appreciation in order not to lose export competitiveness. Thus, it would be more appropriate to argue that the first three factors are the reasons for the fear of large depreciation or devaluation rather than the fear of floating.

A prima facie evidence of market intervention is, of course, the massive accumulation of foreign exchange reserves by buying current account surpluses. The level of reserves increased to 21 percent of GDP and was more than twice as large as the volume of short-term foreign debt (see Tables 6 and 7). Between 1998 and 2000, the current account recorded large surpluses ranging from 12.6 percent to 2.4 percent of GDP each year (see Table 7).

Had the authorities abstained from market intervention, the nominal exchange rate might have appreciated much more than otherwise, possibly choking off the ongoing recovery from the crisis. Therefore, a market intervention designed to mop up current account surpluses could account for the authorities' intervention and the reserve gain.

Have the authorities also intervened when they thought the country's export competitiveness was being eroded or price stability was threatened? The evidence suggests that they have. Measures of market intervention developed by Bayoumi and Eichengreen (1998) and Glick and Whiborg (1997) suggest that policymakers in Thailand and Indonesia have intervened less forcefully. For Korea indices of market intervention hardly changed between the two different exchange rate regimes (Table 2). However, it is normally expected that the regime shift would result in a substantial decrease in these indicators, and this development is not found in East Asia.[5]

Using high frequency data it has also been shown that the Korean authorities have been active in managing the won-dollar exchange rates (Park, Chang, and Wang, 1999). Using the intra-day data over the 10 days from September 10 to 20 in 1999, the authors show that the large change in the nominal exchange rate disappeared within a few minutes. Unlike other free-floating regimes, the intra-day exchange rate movements did not show any volatility clustering, suggesting that the Korean authorities were actively managing the nominal exchange rate.

[5] According to Bayoumi and Eichengreen (1998), the degree of intervention in advanced floater was on average less than 0.3 during the 1980's.

The evidence discussed above suggests that, like many other emerging market economies, Korea, Thailand, and Indonesia have adopted an intermediate exchange rate regime. What have been the objectives of market intervention in these countries? The analysis of intra-day data suggests that market intervention has been geared to stabilize high-frequency exchange rate movements in Korea. But there may have been other motives behind management of the local currency-dollar bilateral exchange rates in the three countries.

Smoothing operations for high frequency exchange movements may be necessary after a crisis, to stabilize market expectations. Under such a circumstance, the authorities' smoothing operations could help market participants establish their expectations on the future movements of both the real and nominal exchange rates by minimizing the effect of noise trading (Hernandez and Montiel, 2001).

If stabilizing the nominal exchange rate is the main objective, then Hernandez and Montiel (2001) argue that the exchange rate smoothing would lead to substantial fluctuations in the stock of foreign reserves around a certain level that is deemed appropriate for intervention and achieving other objectives. However, they do not find any evidence that Korea and other East Asian crisis-hit countries have used their reserves to conduct smoothing operations; instead, the stocks of reserves have exhibited a systematic tendency to increase over time in these countries.

Surprisingly, the volatility of foreign exchange reserves has declined substantially during the post-crisis period in Korea. The Korean authorities, it appears, have not resorted to the use of reserves to moderate the movements of the nominal exchange rate. Instead, they have relied on a few state-owned banks to intervene in the market, using their own holdings of foreign exchange, which are not counted as part of the central bank foreign reserves. Our proposal for a reserve target would clearly require that such operations be included in the authorities' net foreign assets. If their interventions were not effective, the authorities made it known that they would step in through sterilized intervention to reduce instability in the foreign exchange market. When the yen depreciation recently led to a parallel depreciation of the Korean won, the central bank was able to clamp down the market by simply announcing their intention of conducting sterilized intervention.

The three crisis countries may not have been as concerned about stabilizing their dollar exchange rates as much as they about stabilizing either the nominal or real effective exchange rate. These countries may have had good reasons to peg their exchange rates to or to manage them against a basket of the currencies of the countries with which they have established extensive trade relations. Hernandez and Montiel speculate that the East Asian countries may have preferred a basket pegging to fixing to the U.S.dollar because the importance of the U.S. as their trading partner has declined and they may want to use the exchange rate as a nominal anchor.

However, Hernandez and Montiel do not find any evidence that any of the East Asian countries which they analyze were managing their bilateral exchange rates vis-à-vis the U.S. dollar to stabilize a nominal effective exchange rate. They do not identify the currencies included in their basket, but assuming that the basket contains the U.S. dollar, Yen, and the Euro, the authorities would manage the won-dollar exchange rate to offset fluctuations in the U.S. dollar-yen or the U.S. dollar-Euro bilateral exchange rates. When the Yen depreciates, for example, vis-à-vis the U.S. dollar as it has in recent periods, one would expect an intervention to engineer a depreciation of the won-dollar exchange rate so that the nominal effective exchange would remain relatively stable.

Since Korea and other crisis-hit countries in East Asia have followed export-led development strategies and are likely to continue to rely on exports for growth, one might conjecture that Korean policymakers have intervened in the foreign exchange market to stabilize a real effective exchange rate. Once again, Hernandez and Montiel do not find any evidence that may support the conjecture. If the Korean authorities were as sensitive to maintaining export competitiveness as they are often claimed to be, then one might conjecture that they would intervene more actively when the exchange rate appreciates than where it depreciates. To examine this possibility, we have estimated conditional probability that the authorities are more likely to step in to reverse the exchange rate movement, when it appreciates than otherwise. Our estimation results do not provide any evidence to support such an asymmetric pattern of intervention.

In summary, what were the Korean policymakers trying to achieve in intervening in the foreign exchange market? The empirical evidence provided by Park, Chung, and Wang,(1999) and Hernandez and Montiel(2001) suggests that their objectives

have been: i) to stabilize day to day volatility in the won-dollar exchange; ii) to resist appreciation of the real effective exchange rate after the crisis ; and iii) to build a reserve buffer to financial vulnerabilities the economy may have to face while undergoing financial and corporate restructuring.

Although Hernandez and Montiel de-emphasize the significance of the first objective, in a country like Korea where hedging facilities are limited to many firms in the trade sector and expensive, the authorities have been under constant pressure to moderate fluctuations in the won-dollar exchange rate (Park, Chung, and Wang, 1999).

Finally, one advantage of the flexible exchange rate system is that it allows the monetary authorities a measure of independence in conducting monetary policy to attain domestic policy objectives of low inflation with a high level of employment -- which may in turn help stabilize indirectly the nominal exchange rate. As shown in appendix II, there is little evidence that Korea and other East Asian countries have gained any noticeable monetary autonomy. It is not clear, however, whether this lack of independence is the result of market intervention or other developments.

Our interpretation recent experience is that for Korea our proposed regime would be a natural extension of policies that have developed since the crisis. The authorities have intervened in the foreign exchange market but have allowed substantial changes in rates over time. What is needed now is to move forward with a regime that clarifies the objectives and procedures consistent with a managed floating environment.

VII. Concluding Remarks

The purpose of this paper has been to develop a framework for monetary and exchange rate policy appropriate for Korea. Our main conclusion is that Korea should stay with the managed float it introduced in the aftermath of the 1997 crisis, but should add inflation targeting and should make the criterion for sterilized intervention explicit.

Sterilized intervention should be assigned the task of limiting day to day volatility in the value of the won against a well-defined basket of major foreign currencies.

Intervention designed to limit volatility will generate deviations in the government's net reserves from their target level. In this event the intervention rule will become asymmetric so as to move toward the target level for net reserves.

We recommend that changes in the monetary base be assigned the task of hitting a short-term interest rate derived from a Taylor rule. We do not think that the Korean authorities will have difficulties in establishing a credible regime along these lines.

The key assumption behind our proposal is that international capital flows will be consistent with current account balances and the evolution of net debt for Korea that are acceptable to the authorities. This, in our view, will require very active prudential regulation of domestic financial markets in addition to a stable macro policy environment.

While there are good arguments both for intermediate regimes and hard pegs we do not believe that these regimes are consistent with Korea's current circumstances. In the absence of explicit rules for floating and inflation targeting it seems to us likely that that policy will drift toward a return to an adjustable peg regime prone to crises.

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Appendix I. An Open Economy Model

I-1 Some examples of policy reactions under inflation targeting

1.

Suppose a domestic boom increases imports and the current account deficit. If this were not financed by an increase in private capital inflows at the initial interest rate, the nominal exchange rate would tend to depreciate. Our regime would automatically lean against the exchange rate depreciation for three reasons.

First, the fall in the output gap rule would require a rise in the target interest rate.

Second, the exchange rate depreciation would increase actual and expected inflation and the target interest rate would rise.

Third if the exchange rate depreciates rapidly the central bank will be a net buyer of domestic currency. Sterilization would increase domestic credit and reduce international reserves.

It follows that some of the current account deficit would be financed by a decline in reserves. If the exchange rate depreciates slowly and markets remain orderly intervention would not be called for.

2.

The effects of a decline in domestic activity would be symmetric. A domestic recession would generate a current account surplus, a stronger currency, lower domestic interest rates and a fall in reserves.

Over the course of a business cycle international reserves would return to their target level.

3.

Suppose world demand for Korean goods declines because of a fundamental demand shift away from Koreas goods or a decline in activity in the rest of the world. This is sometimes called a change in the terms of trade. If the current account deficit were not offset by an increased capital inflow the exchange rate would tend to depreciate.

In this case an increase in the output gap would tend to lower the domestic target interest rate.

The expected inflation effect would tend to fall with output but rise with the depreciation of the exchange rate. The net effect from the inflation target rule is uncertain.

Intervention would tend to lean against the exchange rate depreciation. The decline in international reserves would finance some of the current account deficit.

4.

A shift toward Korean exports would have symmetric effects. The current account surplus would be associated with exchange rate appreciation and higher domestic interest rates. The surplus would be in part financed by an increase in reserves.

Reserves would return to their target level if the change in the demand for exports was caused by the business cycle abroad but would not return if there was a permanent shift in the relative demand for Korean goods.

A permanent demand shift would generate a permanent deviation from the reserve target and would have to be reversed by asymmetric intervention. Even though intervention is reversed it may not be a mistake since slowing the adjustment in the exchange rate may permit a less costly adjustment to the permanent change in the demand for exports.

5.

Suppose with no cyclical or relative demand shocks that private capital inflows increase because investment in Korea becomes relatively attractive. This is sometimes called the capital inflow problem. This puts upward pressure on the exchange rate and, in turn, generates a current account deficit. The appreciation of the exchange rate limits the capital inflow since it reduces expected profitability.

The domestic output gap will fall and this will tend to raise the target domestic interest rate, reducing domestic expenditure and making room for the current account deficit, but encouraging the capital inflow.

The expected inflation rate would fall and this would require a decline in the domestic interest rate.

Intervention would tend to resist the appreciation and international reserves would rise. In this case the current account is more than matched by a private capital inflow. The international reserves increase is financing a capital inflow rather than a current account deficit. In this case the build up of international reserves would not be automatically reversed and would have to be reversed by asymmetric intervention Again the intervention may not be a mistake since it spreads the real effects of the capital inflow over time.

The important question is whether or not the investment is productive and prudent. That is, the current account deficit is the real transfer that allows an increase in the capital stock and the efficient utilization of foreign savings. If distorted incentives or irrational exuberance generates the capital inflow it would of course be better to completely insulate the economy. The problem is that in deciding to open the capital account the government has given up the only effective way to do this. Exchange market intervention to defend temporary exchange rate pegs are themselves serious distortions for private capital flows. Distortions to domestic credit markets are magnified by capital flows. But capital flows are magnified by sterilized intervention.

6.

If private investment in Korea becomes less attractive the effects are symmetric to those described in 5. Exchange rate depreciation is associated with a current account surplus.

The effects on the domestic interest rate target are uncertain and the depreciation is associated with a decline in reserves.

The fall in reserves is permanent and would have to be reversed by asymmetric intervention

While all the situations outlined above involve changes in current accounts but there is no sensible way to target the current account itself. In practice, we do not observe the shocks that jointly determine the current account, the exchange rate, domestic output and inflation. The best we can do is put in place a policy regime that sets out a predictable government reaction to changes in market conditions.

I-2 A model for a Small Open economy with Inflation Targeting.[6](with Kwan Ho Shin[*])

The very general points made in Appendix 1 can be made more precise with a model of a small open economy with inflation targeting developed by Svensson (1997 and 2000). We extend this model by including explicitly the current account that depends upon income, the real exchange rate, and foreign income. This model will then be used to evaluate viability of a macroeconomic policy regime that espouses free floating, free capital mobility and inflation targeting.

The model consists of a Philips curve, an aggregate demand equation, a policy objective function in the form of the Taylor rule, an interest rate parity condition, and a specification of the current account. We also follow Svensson in specifying

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[6] This model is adapted from Svensson(1997 and 2000).

[*]

determination of the foreign variables in the model. There is an equation describing government expenditure policy (equation 5). Following Fischer (2001), it is assumed that fiscal policy is activated to remove any large imbalances in the current account.

I. Model

1. Aggregate supply (Philips curve)

$$p_t = b p_{t+1/t} + l(y_t - y_t^n) + a_p \hat{q}_t + e_t$$

p_t is domestic inflation in $\log$ in period t ----------(1)

$$p_t = p_t - p_{t-1}$$

where p_t is the log domestic price level

y_t is the log level of output.

y_t^n is the log level of natural output defined as

$$y_{t+1}^n = g^n y_t^n + \hat{y}_{t+1}^n \quad \text{----------(2)}$$

where

$0 < g^n < 1$ and e_t^n is a zero-mean productivity shock

$\hat{q}_t = q_t - 1$ where q_t is the log real exchange rate defined as

$$q_t = s_t + p_t^* - p_t$$

where

s_t is the nominal exchange rate, and p_t^* the log foreign price level.

The disturbance term, e_t obeys

$$e_{t+1} = g_e e_t + \hat{e}_{t+1} \quad \text{----------(3)}$$

where $0 < g_e < 1$ and $\hat{e}_t$ is an i.i.d. random variable with zero mean and variances s_e^2.

In this model, CPI inflation p_t^c is defined as

$$p_t^c = w p_t^f + (1-w) p_t = p_t + w(q_t - q_{t-1}).$$

2. Aggregate demand (IS Curve)

$$y_t - y_t^n = y_{t+1/t} - y_{t+1/t}^n - f(i_t - p_{t+1/t}) + g_t + CA_t + a_y \hat{q}_t + a_y^* y_t^* + h_t^d \quad \text{----------(4)}$$

In equation (6), i_t is the nominal rate interest, which is the instrument of monetary policy, y_t^* the log foreign output level, and g_t the government expenditure. The disturbance term h_t^d is a demand shock that follows:

$$h_{t+1}^d = g_h h_t^d + \hat{h}_{t+1}^d \quad \text{----------(5)}$$

where $0 < g_h < 1$ and $\hat{h}_t^d$ is an i.i.d. random variable with zero mean and variances s_h^2.

3. Taylor Rule

$$i_t = f_p p_t + f_y (y_t - y_t^n) \quad \text{----------(6)}$$

4. Interest parity condition in real terms

$$\hat{q}_{t+1/t} = \hat{q}_t + i_t - p_{t+1/t} - i_t^* + p_{t+1/t}^* - j_t \quad \text{----------(7)}$$

where j_t is a foreign exchange risk premium.

5. Current Account

$$CA_t = -c_y y_t + c_{y^*} y_t^* + c_q q_t \quad \text{----------(8)}$$

6. Government Expenditure Policy

$$g_{t+1} = g_g g_t + c_g CA_t + \hat{g}_{t+1} \quad \text{----------(9)}$$

7. Determination of Foreign Variables

Following Svensson (2000), foreign variables and j_t are assumed to be explained by AR processes:

$$p^*_{t+1} = g^*_p p^*_t + \hat{p}^*_{t+1} \quad \text{----------(10)}$$

$$y^*_{t+1} = g^*_y y^*_t + \hat{y}^*_{t+1} \quad \text{----------(11)}$$

$$j_{t+1} = g_f j_t + \hat{j}_{t+1} \quad \text{----------(12)}$$

where $0 < g^*_p, g^*_y, g_p < 1$ and where $\hat{p}^*_{t+1}$, $\hat{y}^*_{t+1}$, and $\hat{j}_{t+1}$ are i.i.d. random variables with variances, $s^2_{p^*}$, $s^2_{y^*}$ and s^2_j.

The foreign interest rate i^*_t follows a Taylor rule.

$$i^*_t = f^*_p p^*_t + f^*_y y^*_t + x^*_t \quad \text{----------(13)}$$

The disturbance term, x^*_t obeys

$$x^*_{t+1} = g^*_x x^*_t + \hat{x}^*_{t+1} \quad \text{----------(14)}$$

where $0 < g^*_x < 1$ and $\hat{x}^*_{t+1}$ is an i.i.d. random variable with variance $s^2_{x^*}$.

Solution Technique:

Let $y_t = (p_t, y_t, \hat{q}_t, i_t, y^n_t, g_t, e_t, h^d_t, j_t, p^*_t, y^*_t, x^*_t, i^*_t, CA_t)$

Then the simultaneous equation system (equation (1) through (14)) for the open economy can be represented as follows:

$$y_t = J_1 y_{t+1} + J_2 e_t \quad \text{---------- (s1)}$$

where

$$e_t = (\hat{y}^n_{t+1}, \hat{g}_{t+1}, \hat{e}_{t+1}, , \hat{h}^d_{t+1}, \hat{j}_{t+1}, \hat{p}^*_{t+1}, \hat{y}^*_{t+1}, \hat{x}^*_{t+1}, w_{1t+1}, w_{2t+1}, w_{3t+1})$$

and J_1 and J_2 are appropriately defined parameter matrices. In the error vector, e_t, three terms, w_{1t}, w_{2t} and w_{3t} are added to reflect expectation errors:

$$E(p_{t+1}/t) = p_{t+1} + w_{1t+1}$$
$$E(y_{t+1}/t) = y_{t+1} + w_{2t+1}$$
$$E(q_{t+1}/t) = \hat{q}_{t+1} + w_{2t+1}$$

Since there are five endogenously determined variables ($p_t, y_t, \hat{q}_t, i_t, CA_t$) and nine exogenous variables ($y_t^n, g_t, e_t, h_t^d, j_t, p_t^*, y_t^*, x_t^*, i_t^*$), for the system to generate a unique stable equilibrium, the number of eigenvalues lying inside the unit circle should be equal to the number of endogenous variables (5)[7].

The next step is to premultiply equation (s1) by Q^{-1} where $J_1 = Q\Lambda Q^{-1}$, Λ is a diagonal matrix of eigenvalues, and Q contains the eigenvectors of J_1. The purpose of diagonalization is that it allows us to write the matrix system as a set of first-order equations of a scalar from for $z_t = Q^{-1} y_t$. Then five variables of z_t are solved by forward iterations and the other nine variables of z_t are solved by backward iterations. After finding solutions for z_t, the original variables y_t are restored by multiply Q to z_t.

II. Results of Optimal Policy

[7] Since equation (6) and (8) are not dynamic equations, two out of the five eigenvalues inside the unit circle are equal to zero.

In order to describe the dynamics and to obtain solutions of the model, we have assumed values of the parameters with model that are a prior reasonable (see Table). Diagrams I through IV show changes in the endogenous variables over time to exogenous shocks with different specification of the Taylor rule and with or without activation of fiscal policy. We have examined the following four types of shocks with different reaction functions:

(i) a change in i^*;

(ii) a change in y^n;

(iii) a cost push shock; and

(iv) a demand shock

The reaction functions are :

(i) i=1.5π and (ii) I=1.5π+0.5(y - y^n):

The government expenditure policy function is also activated where the current account deficit rises above 2 percent of y in this impulse response exercises.

In all cases of our exercises, the model is stable and converges to new equilibria. However, this conclusion follows only for a set of parameter values we have selected. As we discuss in the text, it is possible that the model may display multiple equilibria and instability for different sets of parameters.

Table 1. Parameter Values

$b = 1$	$a_y = .1$	$f^*_y = .5$
$l = 1$	$a^*_y = .1$	$c_y = 1.5$
$a_p = .1$	$g_h = .9$	$c^*_y = 1.5$
$g_n = .9$	$f_p = 1.5$	$c_q = 1.5$
$g_e = .9$	$f_y = .5$	$g_g = .9$
$f = 2$	$f^*_p = 1.5$	$c_g = .1$

Figure I. Demand Shock

i=1.5π g=exogenous

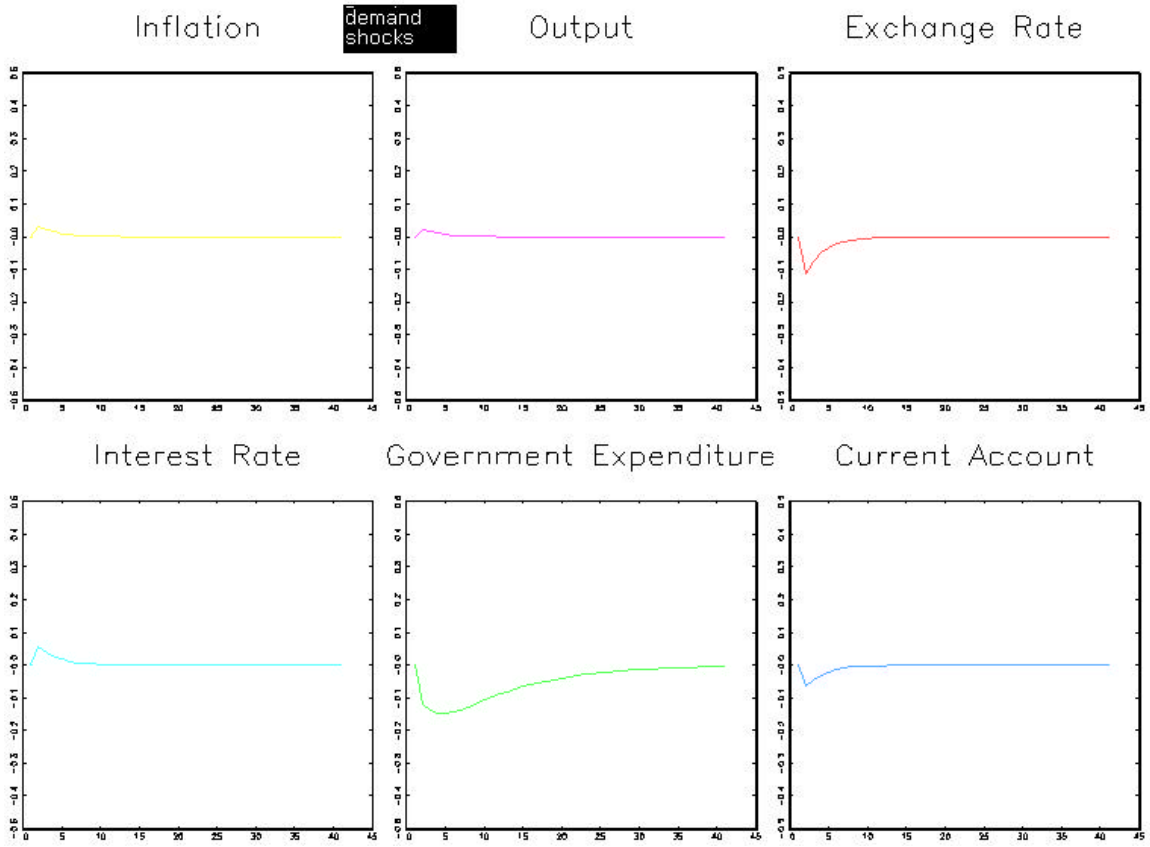


Figure II. Exchange Shock

i=1.5π g=exogenous

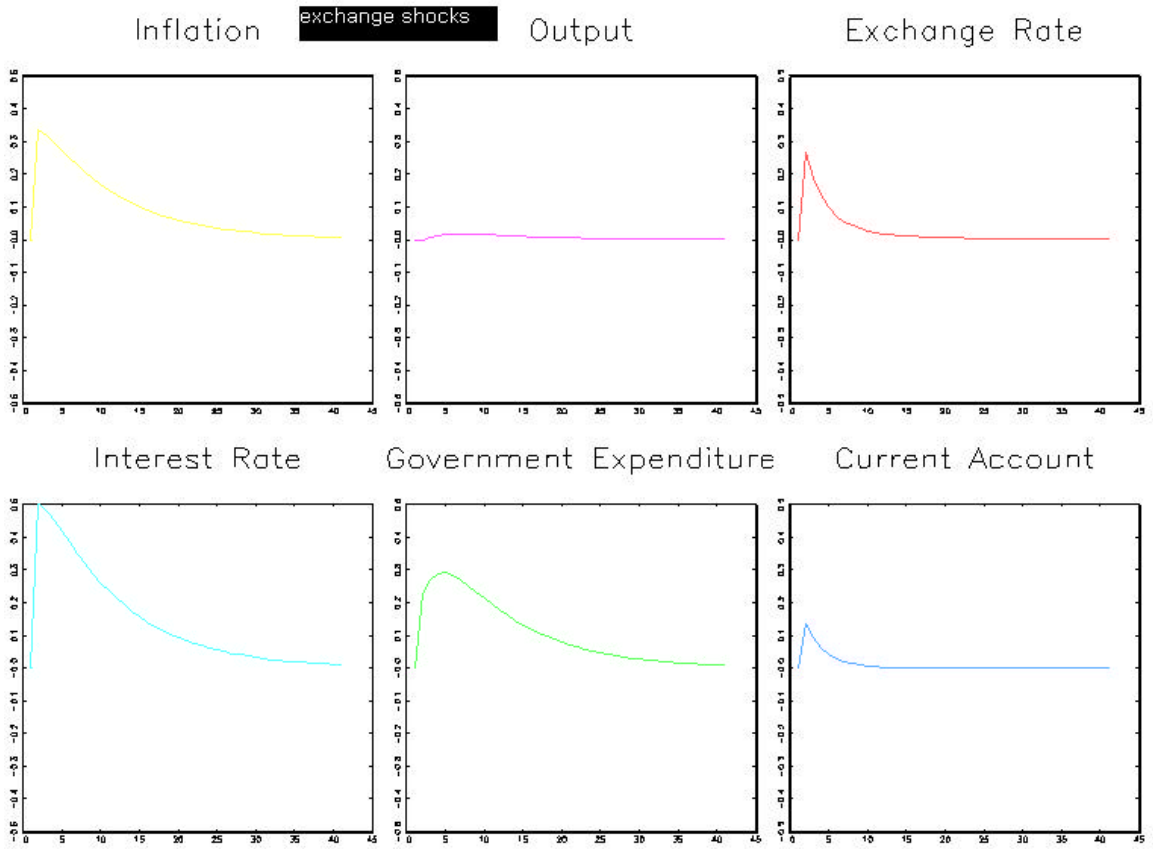


Figure III. y^n Shock

$i=1.5\pi +0\cdot (y-y_n)$ g=exogenous

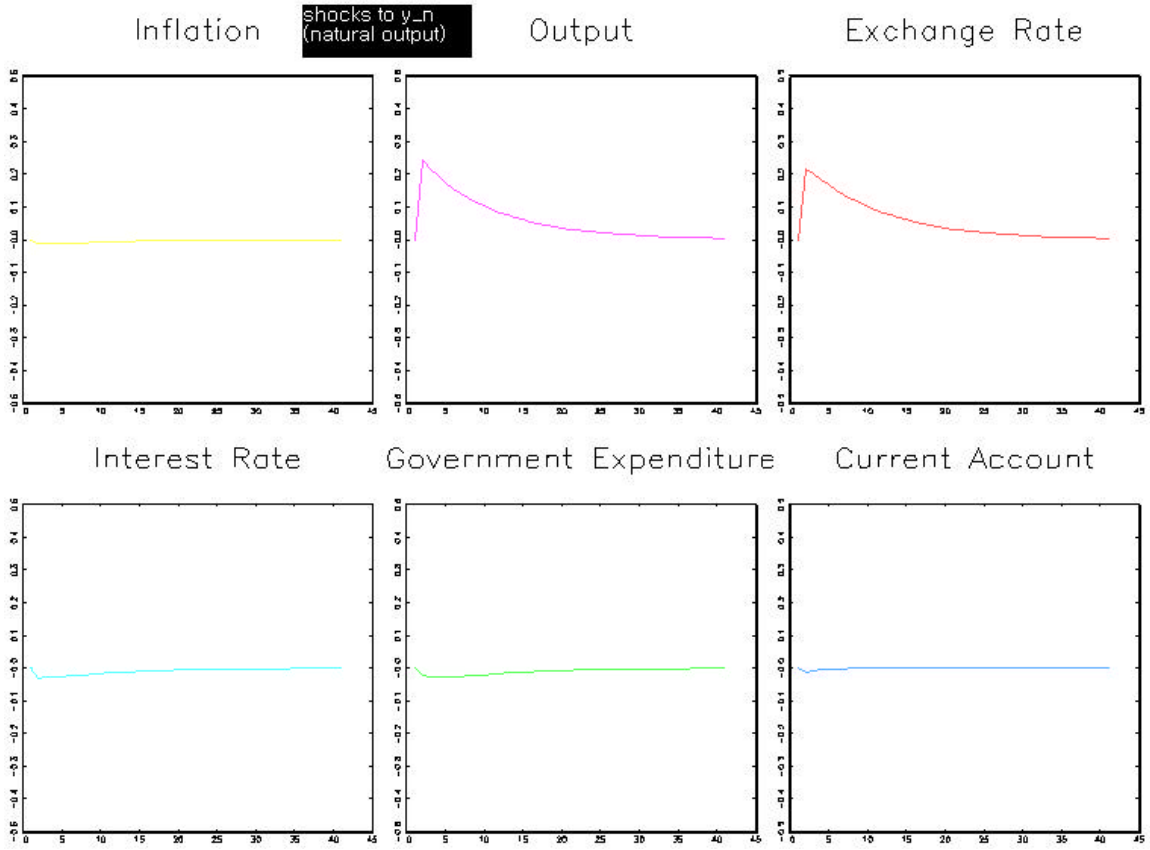
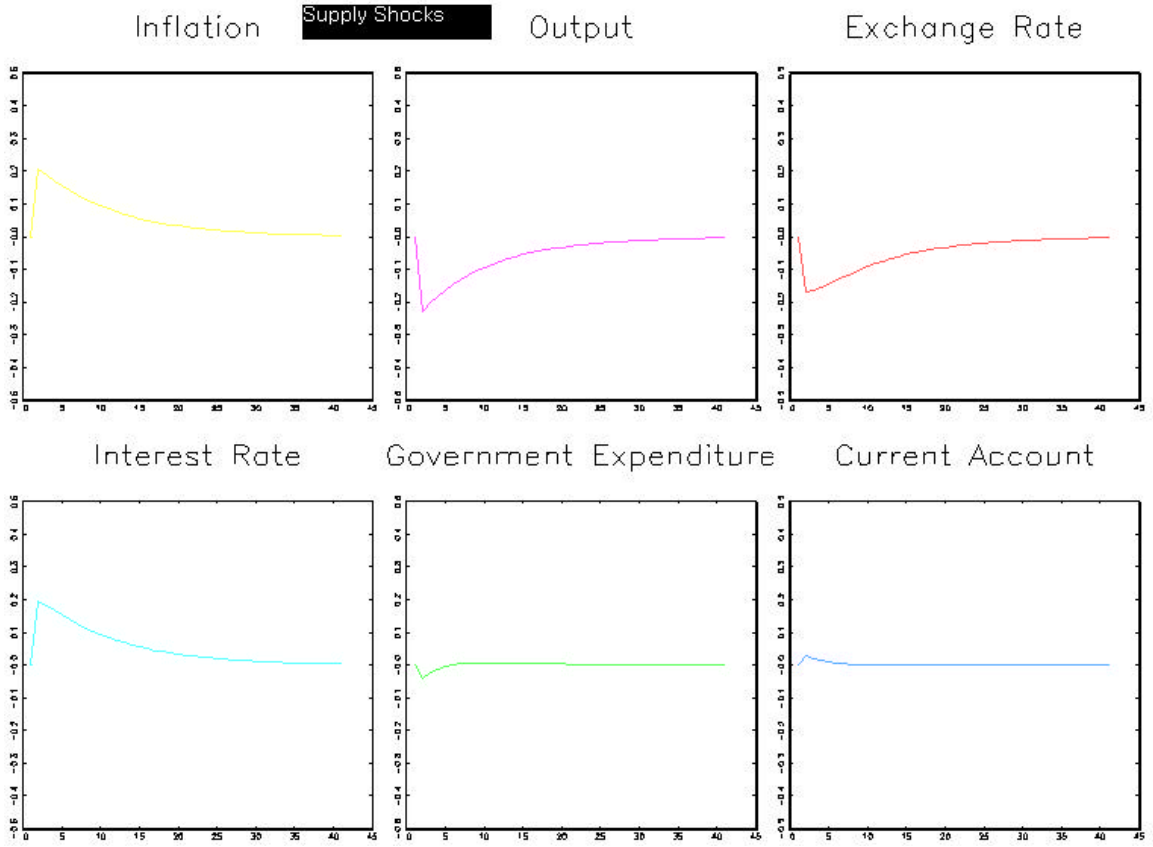


Figure IV. Cost Push Shock

i=1.5π g=exogenous



Appendix II. Volatility of the Nominal Exchange Rate (with Chi-Young Song*)

In this section, we examine whether volatility of the exchange rate has increased in the East Asian countries since the adoption of a free floating regime, and to what extent it has. For this purpose, we have estimated GARCH (generalized autoregressive conditional heteroskedasticity) variances of the daily changes in the exchange rates of Indonesia, Korea, and Thailand. Our empirical examination follows a GARCH (1,1) model that consists of the following two equations:

$$\Delta s_t = c_0 + \sum_{i=1}^{m} a_i \Delta s_{t-i} + u_t, u_t / \Omega_t - (0, h_t) \qquad (1)$$

$$h_t = c_1 + b_1 u_{t-1}^2 + b_2 h_{t-1} + e_t \qquad (2)$$

where s_t is log of the exchange rate of a local currency per U.S. dollar, and Δ is a first difference operator. u_t is an error term of the mean equation and h_t is a conditional variance of u_t. Ω_t represents a set of information available at time t and e_t is an error term of the variance equation. We have estimated equations (1) and (2) for the three East Asian countries which shifted to free floating in 1997 from a managed floating system (a fixed regime in the case of Thailand) and then compare the values of the conditional variances across the different regimes.

Our sample period for the managed floating or fixed regime runs from May 1, 1995 to April 30, 1997, while the sample period for the free floating regime is two years from November 1, 1998 to October 31, 2000. We exclude the first few months of the 1997 crisis from our sample even though the exchanges rates were allowed to freely float in all three countries during this period, because the inclusion of the earlier period of crisis in the free floating regime could overstate the exchange rate volatility and then skew the results. The order of dependent lags in equation (1) follows the Schwarz information criterion.

The results of our estimation of equations (1) and (2) are reported in Table 1. They suggest that the exchange rate volatility under the free floating system is much greater than under the managed floating regime in East Asia. In particular, the increase in volatility has been most conspicuous in Indonesia. According to our estimation, the volatility of the free floating regime in Indonesia is about 129 times as large as it was before. Among the three countries, Indonesia shows the largest increase in volatility of the exchange rate under the free floating regime. There has also been a marked increase in the exchange rate volatility in Thailand. Our results indicate that it increased by more than 19 times. Since the exchange rates in Indonesia and Thailand had been very stable prior to the East Asian crisis, these results for the two countries are not surprising. In contrast, volatility of the nominal exchange in Korea has not increased as much as it has in the other two countries under the free floating regime, while it was the largest before

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the crisis among the three countries. However, the volatility of the won–dollar exchange rate in the free floating system is still more than twice as large as in the managed floating system.

In order to examine the extent to which the regime shift has caused the increase in volatility, we have included a regime dummy (D_t) in equations (1) and (2) which takes the value of one under the free floating system and zero otherwise.

$$\Delta s_t = c_0 + \sum_{i=1}^{m} \alpha_i \Delta s_{t-i} + \delta_1 D_t + u_t, u_t / \Omega_t - (0, h_t) \qquad (3)$$

$$h_t = c_1 + \beta_1 u_{t-1}^2 + \beta_2 h_{t-1} + \delta_2 D_t + \varepsilon_t \qquad (4)$$

The estimation results of the modified GARCH (1,1) model are presented in Table 2. They show that the regime dummy variable in the conditional variance equation is statistically significant and its estimated coefficient is positive for all three countries. Therefore, the shift to floating appears to have contributed to increased instability in the foreign exchange market in all three countries. The impact of the shift was most conspicuous in Indonesia, to be followed by Thailand and Korea. Changes in GARCH variances of the three East Asian countries before and after adopting a free floating system are depicted in Figure 2.

In addition to the exchange rate regime change, the higher volatility could in part be attributed to the increase in volatility of capital flows. Figure 3 depicts monthly net capital inflows to Korea and Thailand since 1991 (we do not have similar figures for Indonesia). Prior to the financial crisis, both countries had been a sharp increase in capital inflows (net). After the crisis, however, on a net basis, capital inflows have displayed a great deal of variability in Korea, whereas a net outflow of capital has continued in Thailand. These changes in capital movement must have contributed to the higher volatility of the exchange rate during the free floating regime.

Appendix III. Exchange Change Rate Regime and Monetary Independence

The question of whether free floating has increased autonomy in the conduct of monetary policy will be examined in this section. Edwards and Savastano (1998) examined the Mexican case and found that the Bank of Mexico systematically adjusted its monetary policy in response to changes in the exchange rate even during the free floating regime. In contrast, Borenzstein and Zettelmeyer (2000) examined the effects of changes in the U.S. interest rate on local interest rates, and found that the magnitude of the effects is much smaller under the free floating regime than the currency board system, indicating a higher degree of monetary autonomy with a more flexible exchange rate regime. Their analysis includes Mexico, Singapore, South Africa, Australia, Canada, and New Zealand for the floating system, and Hong Kong and Argentina for the currency board system.

Extending their approach to the panel data of 47 countries, Golfjan and Olivares (2000) found a similar result.

III-1. Model

In this section, we empirically examine whether the introduction of a free floating system has affected the degree of monetary independence in Indonesia, Korea and Thailand following an approach similar to that of Borenzstein and Zettelmeyer (2000). Our empirical model is specified as :

$$\Delta r_t^i = c + a\,\Delta f_t + e_t^i \qquad (5)$$

where $r_t^i =$ the interest rate of country i at time t, $f_t =$ a foreign shock at time t, $\Delta =$ a first difference operator. The foreign shocks examined in this study are changes in the U.S. interest rate, the log of the U.S. stock prices, and the log of the yen-dollar exchange rate.

In our examination, it will be assumed that the effects of foreign shocks are transmitted through arbitrage dictated by the uncovered interest parity (UIP). Even

though the bond markets are not well developed and incompletely open to foreign investors in all three countries, the UIP could hold if borrowing from international financial markets by domestic residents is permitted.

The UIP condition is:

$$r^i = r^f + (E^e - E)/E \qquad (6)$$

where $r^f =$ the foreign interest rate (U.S. interest rate), $E =$ the exchange rate of domestic currency against the U.S. dollar, $E^e =$ expected exchange rate.

As for the effects of foreign shocks on domestic financial variables, the following developments are expected:

(i) When the U.S. interest rate rises, domestic firms and financial institutions tend to borrow more from domestic sources than from the international financial markets. They will also try to substitute domestic currency debts for dollar denominated borrowings. Consequently the domestic interest rate rises and the domestic currency depreciates.

(ii) In response to the rise in the U.S. stock price, the domestic stock price is also expected to rise, and market participants are likely to speculate that the increase in the expected returns of domestic stocks will induce more capital inflows. Thus, E^e falls and the dollar denominated borrowing will be less costly. As a result, the domestic interest rate falls.

(iii) When the Japanese yen depreciates against the dollar, E^e rises since the current account is expected to deteriorate due to the loss of export competitiveness caused by the weaker yen, making the dollar denominated borrowing more costly. As a result, the domestic interest rate rises.

In a flexible exchange rate system, exchange rates are expected to adjust to the foreign shocks more fully and quickly. Thus, the effects of the shocks on domestic interest rates are weaker when the exchange rate floats freely than when rates are either

fixed or managed. In the fixed or managed floating regime, Δf_t would be statistically significant, whereas its significance may disappear in the free floating regime or the absolute value of its coefficient will be smaller even though it remains significant. This result may indicate the existence of a higher degree of monetary autonomy. If foreign shocks affect the domestic interest rate, it is expected that $a > 0$ for the U.S interest rate and the yen-dollar rate, and $a < 0$ for the U.S. stock price.

The sample period for equation (5) for the fixed or managed floating system runs from May 1, 1995 to April 30, 1997 and for the free floating regime from November 1, 1998 to October 31, 2000. As before, the earlier period of the 1997 crisis is excluded to avoid skewness of the results.

In our empirical investigation, we focus only on days of large foreign shocks instead of using entire daily observations within the sample period. Sample points are the 50 largest changes in f_t in the two different exchange rate regimes. That is, our sample includes only 50 days of largest absolute changes in f_t. Accordingly, sample observations actually used in estimating equation (5) are not in a consecutive order of time. Smaller changes in f_t are disregarded on the ground that market participants would not respond to these changes probably due to a high transactions cost.

The data for the foreign shocks are the U.S. federal fund rate, the Dow Jones Industrial Index, and the close rate of the NY market for the yen-dollar exchange rate. For a domestic interest rates of the three East Asian countries, this study uses their call money market rates.

Table 9 summaries observations of the three foreign shocks. It can be seen that the averages of 50 largest shocks are three or four times larger than those of the entire sample. The standard deviations of the 50 observations are also no less than those of the entire samples. This indicates that the 50 largest observations can be separated out from the others in the sample period.

Any changes in f_t (foreign shocks) may affect the domestic interest rates with a lag. In order to account for the existence of the lag, equation (5) is modified to include lagged terms of f_t .

$$\Delta r^{i}_{t+k} = c + a\,\Delta f_t + \sum_{j=1}^{k} b_j \Delta f^{'}_{t+j} + e^{i}_{t} \qquad (7)$$

Equation (7) indicates that a foreign shock observed at time t could affect the domestic interest rate at t+k. However, a large change in the variable representing the foreign shock between t+1 and t+k could also lead to changes in the domestic interest rate at t+k (Δr^{i}_{t+k}). In order to explain this possible lag effect, another variable $\Delta f^{'}_{t+j}$ is introduced in equation (7). This variable captures the effect of a large change in the foreign shock at time t+j subsequent to the observation of a large foreign shock at time t. Both foreign shocks at time t and t+j are included in the group of 50 largest shocks. If there is no large foreign shock at t + j, then $\Delta f^{'}_{t+j} = 0$.

Equation (7) can also be used to detect the presence of other contemporaneous effects of foreign shocks. For instance, where k = 1 and b_1 in (7) is statistically significant, then Δf_{t+1} captures the contemporaneous effect on the domestic interest of changes in the foreign shock variable for two consecutive days. When k = 2, b_1 gauges one day lagged effect of a change in f_t for two consecutive days. Similarly, b_2 measures the contemporaneous effect of a large change in f_t that follows two days later after an initial foreign shock was observed at time t. If $\Delta f^{'}_{t+j}$'s are statistically significant in equation (7) whereas Δf_t is not in equation (5), this means that domestic interest rates respond to foreign shocks only when the shocks are sustained. The estimation results of equations (5) and (7) are reported in Table 4. In this study, we have estimated equation (7) only for k=1 and 2.

In equation (5), the coefficients of Δf_t are positive as expected in both Korea and Thailand when foreign shocks are represented by changes in the U.S. federal fund rate. In a floating system, the estimates of α are smaller than they were during the managed or fixed exchange rate period, but Δf_t is not significant in either country. None of the independent variables in equation (7) is statistically significant even at the 10 percent level, indicating that the lagged effects of any exogenous external shock on the domestic interest rate are negligible.(see Table 10A)

When the foreign shock variable is represented by the U.S. stock price index(Table 10B), it has no measurable effect on the domestic interest rate in the free floating regime in all three countries. However, a large change in the U.S. stock price produces predictable effect on the domestic interest in the managed floating system in Korea. In the case of Thailand where it was under a fixed exchange rate system, the estimation results show that large changes in f_t that occur every two other days exert significant negative effects on the domestic interest rate as the model predicts. Lagged effects of the U.S. stock price changes on the call rate in Indonesia are also detectable, but the signs of b_1 and b_2 are shown to be positive against the model's prediction.

After the three countries moved to a floating regime in late 1997, the results of estimation of both equations (5) and (7) suggest that changes in the U.S. stock price index have had little effect on the domestic interest rates of these countries. None of the independent variables included in equations (5) and (7) appears to have any explanatory power. However, these results should not be taken at their face values, because stock prices of these countries do move rather quickly in response to changes in the Dow Jones Industrial Index. The statistical significance under the free floating regime reported in Table 4 therefore may reflect the segmentation of capital markets in the countries under consideration.

Our estimation results do not change substantially when the yen-dollar exchange rate is used as an external shock variable(Table 10C). In the case of Korea, estimated equations (5) and (7) do not provide any evidence as to whether there has been any increase in monetary autonomy after adopting a floating rate system. One could detect a one day lagged effect in Indonesia during the floating regime period, but b_1 in equation (7) has a wrong sign. The experience of Thailand is more interesting, however, in that the lagged effects of changes in the yen-dollar rate are pronounced when the exchange rate was very much fixed to the dollar, whereas these effects disappeared with the deregulation of the foreign exchange market.

In summary, it is difficult to determine at this stage the extent to which the effects of a changes in the U.S. interest rate are transmitted to the domestic financial markets of the three East Asian countries in either the floating or managed floating system. Although there is evidence suggesting that the effects of changes in the U.S. stock prices

on the domestic interest rates in East Asia have weakened since these countries moved to a flexible exchange rate regime, this result must be interpreted with caution.

Fluctuations in the yen-dollar exchange rate have had weaker effects on the interest rate in Thailand since it adopted a free floating system. However, a similar shift in the exchange rate regime did not appear to have increased monetary autonomy in Korea. In Indonesia, the shift in fact has amplified the effects of changes in the yen-dollar exchange rate on the domestic economy. In view of the preceding discussion, there is no strong evidence indicating that monetary independence has increased in the three East Asian countries since they moved to flexible exchange regimes.

Table 1 GARCH Estimation of Exchange Rate Volatility

Variables	Fixed or Managed Floating			Free Floating		
	Korea	Indonesia	Thailand	Korea	Indonesia	Thailand
c_0	2.25×10^{-4}	$1.77\times10^{-4*}$	1.22×10^{-4}	1.42×10^{-4}	5.42×10^{-4}	3.16×10^{-4}
	(1.790)	(3.501)	(1.350)	(-0.869)	(0.913)	(1.680)
Δs_{t-1}	-0.112^{**}	-0.088^{**}	-0.014	0.068	0.043	-0.039
	(-2.063)	(-2.476)	(-0.156)	(1.322)	(0.807)	(-0.778)
c_1	$8.82\times10^{-7*}$	$4.14\times10^{-7*}$	3.59×10^{-7}	1.16×10^{-6}	$2.75\times10^{-5*}$	$1.57\times10^{-6*}$
	(6.242)	(4.875)	(0.584)	(3.994)	(4.871)	(3.113)
u_{t-1}^2	0.181^{*}	0.150^{*}	0.150	0.259^{*}	0.309^{*}	0.123^{*}
	(4.374)	(5.491)	(1.099)	(8.151)	(6.364)	(4.038)
h_{t-1}	0.733^{*}	0.600^{*}	0.600	0.716^{*}	0.607^{*}	0.812^{*}
	(16.972)	(8.165)	(1.599)	(25.822)	(13.273)	(19.595)
Average of h_t	9.24×10^{-6}	2.14×10^{-6}	1.27×10^{-6}	2.18×10^{-5}	2.77×10^{-4}	2.47×10^{-5}

Note:*,** : Significant at 1%, 5% level

Table2A. Exchange Rate Movement in East Asia

Period	Indonesia		Korea		Thailand		Japan	
	Mean	Stdv	Mean	Stdv	Mean	Stdv	Mean	Stdv
Pre-Crisis	0.02	0.15	0.03	0.25	0.01	0.10	0.08	0.64
Post-Crisis	0.05	1.53	0.01	0.43	0.04	0.52	0.68	0.84

Note: Figures indicate mean and standard deviation of percent changes in exchange rate of local currency against the U.S. dollar.

Table2B. Volatility Change

	Indonesia		Korea		Thailand		Japan	
	Pre-Crisis	Post-Crisis	Pre-Crisis	Post-Crisis	Pre-Crisis	Post-Crisis	Pre-Crisis	Post-Crisis
Depreciation(A)	0.14	1.07	0.20	0.34	0.07	0.36	0.46	0.48
Appreciation(B)	0.12	1.17	0.18	0.28	0.07	0.38	0.46	0.52
A/B	1.67**	0.91	1.11***	1.21*	1.0	0.95	1.0	0.92

Note : (i) Figure indicates standard deviation of daily changes in exchange rates.

(ii) * :

Table 3. GARCH Estimation of Volatility Shift

Variables	Korea	Indonesia	Thailand
c_0	2.09×10^{-4}	1.30×10^{-4}	$1.78\times10^{-4*}$
	(1.769)	(3.127)	(12.613)
Δs_{t-1}	-0.015	0.011	-0.039**
	(-0.392)	(0.342)	(-2.422)
D_t	-3.94×10^{-4}	$4.79\times10^{-4*}$	1.45×10^{-4}
	(-1.904)	(0.785)	(1.044)
c_1	$9.14\times10^{-7*}$	$5.11\times10^{-7*}$	$5.40\times10^{-8*}$
	(11.706)	(10.965)	(6.326)
u_{t-1}^2	0.232*	0.348	0.047*
	(9.213)	(10.143)	(14.535)
h_{t-1}	0.699*	0.506*	0.862*
	(32.153)	(14.347)	(126.982)
D_t	$6.45\times10^{-7*}$	$4.29\times10^{-5*}$	$1.51\times10^{-6*}$
	(3.992)	(8.318)	(10.033)

Note:*,** : Significant at 1%, 5% level

Table4. Volatility of Portfolio Capital Flows

	Indonesia	Korea	Thailand
Absolute Rate of Changes	2.5	8.6	14.7
Absolute Changes	3.1	2.2	0.9

Note: i) Figures indicate ratios of standard deviation in post-crisis period to the corresponding statistics in pre-crisis.
ii) pre-crisis : 1995:05 - 1997:04
post-crisis : 1999:01 - 2000:12
iii) In case of Indonesia, quarterly data are used due to the limited availability of monthly data.

Table5. Financial Integration with U.S.

	Stock Price	Interest rates
Indonesia		
Pre-crisis	0.92	0.30
Post-crisis	0.59	-0.71
Korea		
Pre-crisis	-0.86	0.01
Post-crisis	0.57	0.21
Thailand		
Pre-crisis	-0.88	0.06
Post-crisis	0.31	0.17

Note : i) Figures indicate correlation coefficients of daily rates.

Table6. Foreign Reserves/Short-term Debt

	Indonesia	Korea	Thailand	Taiwan	China	Chile
1998. IV	0.89	1.31	1.15	5.24	4.37	1.68
1999. II	1.45	1.43	1.53	6.46	5.75	1.52
1999. IV	1.33	1.69	2.23	6.24	7.75	2.06
2000. I	1.38	2.19	2.21	6.53	7.45	1.67
2000. II	1.32	2.06	2.32	7.43	7.28	1.63
2000. III	1.35	2.14	2.72	7.33	7.63	1.41

Table 7. Foreign Exchange Reserves and Current Account Balance

Korea				
	Foreign Exchange Reserves (million U.S. dollar)		Current Account Balance (million U.S. dollar)	
		In Percent of GDP		In Percent of GDP
1996	34,037	6.5	-23,005	-4.4
1997	20,368	4.2	-8,167	-1.7
1998	51,975	16.2	40,365	12.6
1999	73,987	17.8	24,477	5.9
2000	96,131	21.0	11,040	2.4
2001(f)[1]	105,191	23.5	6,000	1.3
2002(f)	119,323	23.9	2,000	0.4

[1] estimates by the International Institute of Finance

Source : Institute of International Finance, Inc and the Central Bank Website

Table8A. Degree of Intervention

	Indonesia		Korea		Thailand	
	B-E	G-W	B-E	G-W	B-E	G-W
Pre-crisis	0.92	0.91	0.80	0.77	0.95	0.94
Post-crisis	0.66	0.75	0.80	0.81	0.74	0.76

Table8B. Volatility of international Reserve and Interest Rate

	International Reserves			Interest Rates		
	Indonesia	Korea	Thailand	Indonesia	Korea	Thailand
Pre-crisis	2.85	3.92	2.09	1.22	1.05	2.42
Post-crisis	5.34	1.78	2.24	2.96	0.23	0.37

Table 8C. Conditional Probability of Intervention

	The ratio of depreciation (appreciation)for three consecutive days to two consecutive days	Four consecutive days/ three consecutive days
Indonesia		
Depreciation	0.62	0.58
appreciation	0.39	0.29
Korea		
Depreciation	0.56	0.50
appreciation	0.53	0.46
Thailand		
Depreciation	0.52	0.43
appreciation	0.36	0.41

Conditional Probability ; Detrended Series

	The ratio of depreciation (appreciation)for three consecutive days to two consecutive days	Four consecutive days/ three consecutive days
Indonesia		
Depreciation	0.62	0.53
appreciation	0.47	0.59
Korea		
Depreciation	0.55	0.44
Appreciation	0.45	0.45
Thailand		
Depreciation	0.54	0.36
Appreciation	0.39	0.46

Table 9. Summary of Daily Change in Foreign Shocks

	Fixed or Managed Floating		Free Floating	
	50 Largest observations	Full sample period[1)]	50 Largest observations	Full sample period[2)]
(%p)	*Absolute Changes in U.S. Interest Rate*			
Average	0.79	0.17	0.42	0.11
stdv.[3)]	0.50	0.27	0.22	0.14
(%)	*Absolute Changes in Yen-Dollar Rate*			
Average	0.67	0.19	0.75	0.24
Stdv.	0.29	0.20	0.22	0.22
(%)	*Absolute Changes in U.S. Stock Prices*			
Average	0.72	0.24	1.06	0.37
stdv.	0.20	0.21	0.32	0.32

Source: *Bloomberg*
Note: 1) May 1, 1995-April 30, 1997
2) November 1, 1998-October 31, 2000
3) Standard deviation

Table 10. Effects of Foreign Shocks on Domestic Interest Rates

A. Shocks from U.S. Interest Rate

Independent Variables	Fixed or Managed Floating			Free Floating		
	Dependent Variables					
	Δr_t	Δr_{t+1}	Δr_{t+2}	Δr_t	Δr_{t+1}	Δr_{t+2}
	Korea					
C	-0.221 (-2.483)*	-0.048 (-0.534)	-0.116 (-1.218)	-0.012 (-1.044)	0.006 (0.353)	-0.011 (-0.748)
Δf_t	0.094 (0.991)	-0.031 (-0.296)	-0.079 (-0.680)	0.015 (0.643)	0.003 (0.075)	-0.034 (-0.946)
$\Delta f'_{t+1}$		0.217 (1.261)	-0.219		0.020 (0.386)	0.010 (0.197)
$\Delta f'_{t+2}$			0.336 (0.974)			0.027 (0.272)
	Indonesia					
C	-0.296 (-1.189)	0.200 (0.834)	0.205 (0.583)	0.007 (0.052)	-0.147 (-1.050)	-0.152 (-0.956)
Δf_t	-0.404 (-1.517)	-0.270 (-0.973)	0.342 (0.792)	-0.221 (-0.798)	0.361 (1.117)	0.222 (0.599)
$\Delta f'_{t+1}$		-0.547 (-1.191)	-0.104 (-0.152)		-0.095 (-0.209)	0.544 (1.055)
$\Delta f'_{t+2}$			0.352 (0.275)			0.008 (0.007)
	Thailand					
C	-0.341 (-1.043)	-0.205 (-0.580)	-0.296 (-1.203)	-0.008 (-0.109)	-0.073 (-1.190)	0.167 (-0.367)
Δf_t	0.511 (1.460)	-0.362 (-0.887)	-0.256 (-0.852)	0.227 (1.509)	-0.046 (-0.324)	-0.039 (-0.060)
$\Delta f'_{t+1}$		0.508 (0.753)	-0.350 (-0.738)		0.059 (0.296)	-0.089 (-0.069)
$\Delta f'_{t+2}$			0.129 (0.145)			

Note: **, *** : Significant at 5%, 10% level

B. Shocks from U.S. Stock Prices

Independent Variables	Fixed or Managed Floating Dependent Variables			Free Floating		
	Δr_t	Δr_{t+1}	Δr_{t+2}	Δr_t	Δr_{t+1}	Δr_{t+2}
	Korea					
C	-0.054	-0.033	0.019	0.022	-0.012	-0.003
	(-0.830)	(0.053)	(0.286)	(1.716)***	(-1.182)	(-0.288)
Δf_t	2.548	2.897	-17.707	-1.401	-0.041	0.806
	(0.294)	(0.414)	(-2.042)**	(-1.219)	(-0.046)	(0.821)
$\Delta f'_{t+1}$		-10.135	-23.702		-0.038	-0.394
		(-0.428)	(-0.812)		(-0.024)	(-0.225)
$\Delta f'_{t+2}$			12.858			-3.510
			(0.611)			(-1.213)
	Indonesia					
C	0.242	-0.051	-0.276	-0.006	0.010	-0.052
	(0.683)	(-0.198)	(-1.108)	(-0.060)	(0.354)	(-0.613)
Δf_t	23.008	28.888	-20.611	-0.255	1.836	-6.617
	(0.487)	(0.859)	(-0.628)	(-0.030)	(0.717)	(-0.866)
$\Delta f'_{t+1}$		234.68	99.268		0.916	0.558
		(2.062)**	(0.898)		(0.202)	(0.041)
$\Delta f'_{t+2}$			153.548			1.765
			(1.929)***			(0.078)
	Thailand					
C	-0.164	0.244	-0.055	-0.168	-0.003	-0.040
	(-0.530)	(0.705)	(-0.247)	(-0.889)	(-0.074)	(-0.819)
Δf_t	-36.372	17.372	40.915	17.655	-1.943	5.698
	(-0.880)	(0.381)	(1.385)	(-1.082)	(-0.471)	(1.303)
$\Delta f'_{t+1}$		90.548	-83.390		5.588	-4.378
		(0.587)	(-0.839)		(0.771)	(-0.562)
$\Delta f'_{t+2}$			-175.749			0.823
			(-2.453)**			(0.530)

Note: **, *** : Significant at 5%, 10% level

C. Shocks from Yen-Dollar Exchange Rates

Independent Variables	Fixed or Managed Floating Dependent Variables			Free Floating		
	Δr_t	Δr_{t+1}	Δr_{t+2}	Δr_t	Δr_{t+1}	Δr_{t+2}
	Korea					
C	-0.059	-0.034	-0.010	0.009	-0.004	-0.005
	(-0.798)	(-0.311)	(-0.853)	(0.660)	(-0.288)	(-0.437)
Δf_t	1.024	-21.596	-8.222	1.246	-1.792	0.488
	(0.101)	(-1.409)	(-0.503)	(0.685)	(-0.985)	(0.315)
$\Delta f'_{t+1}$		20.060	0.080		-1.539	1.098
		(0.648)	(0.002)		(-0.336)	(0.290)
$\Delta f'_{t+2}$			3.225			3.142
			(0.089)			(0.524)
	Indonesia					
C	0.143	0.350	-0.203	0.035	-0.159	0.031
	(0.622)	(0.933)	(-0.630)	(0.355)	(-1.328)	(0.230)
Δf_t	-12.797	-12.275	74.783	8.246	-37.084	17.167
	(-0.405)	(-0.234)	(1.689)	(0.649)	(-2.395) **	(0.950)
$\Delta f'_{t+1}$		33.840	-146.230		22.691	-181.296
		(0.319)	(-1.640)		(0.583)	(-4.104) *
$\Delta f'_{t+2}$			-79.048			-56.185
			(-0.809)			(-0.804)
	Thailand					
C	-0.217	0.128	0.032	0.195	-0.161	-0.009
	(-1.940)	(0.514)	(0.258)	(0.934)	(-0.835)	(-0.270)
Δf_t	19.361	-40.598	37.032	10.715	-13.292	3.269
	(1.217)	(-2.264) **	(2.122) **	(0.401)	(-0.532)	(0.752)
$\Delta f'_{t+1}$		36.247	-46.885		-29.806	16.350
		(1.009)	(-1.335)		(-0.475)	(1.538)
$\Delta f'_{t+2}$			1.943			16.328
			(0.050)			(0.971)

Note: **, *** : Significant at 5%, 10% level

Table 5. Effects of Foreign Shocks on Domestic Interest Rates: Dummy Approach
A. Shocks from U.S. Interest Rate

Independent Variables	Fixed or Managed Floating Dependent Variables			Free Floating		
	Δr_t	Δr_{t+1}	Δr_{t+2}	Δr_t	Δr_{t+1}	Δr_{t+2}
	Korea					
C	-0.213	-0.026	-0.143	-0.012	0.009	-0.013
	(-2.438)	(-0.286)	(-1.541)	(-0.879)	(0.609)	(-0.881)
D_t	0.142	-0.010	-0.064	0.012	0.003	-0.023
	(1.632)	(-0.114)	(-0.717)	(1.105)	(0.181)	(-1.361)
D'_{t+1}		0.301	-0.227		0.046	-0.028
		(1.955)**	(-1.448)		(1.785)***	(-1.049)
D'_{t+2}			0.149			-0.009
			(0.597)			(-0.225)
	Indonesia					
C	-0.327	0.120	0.090	0.016	-0.171	-0.156
	(-1.322)	(0.502)	(0.273)	(0.123)	(-1.246)	(-0.981)
D_t	-0.430	-0.328	0.359	-0.153	0.155	-0.052
	(-1.743)***	(-1.376)	(1.117)	(-1.174)	(1.045)	(-0.296)
D'_{t+1}		-0.753	-0.561		-0.219	0.161
		(-1.834)***	(-0.893)		(-0.940)	(0.575)
D'_{t+2}			-0.215			-0.089
			(-0.241)			(-0.210)
	Thailand					
C	-0.302	-0.002	-0.286	-0.014	-0.068	0.174
	(-0.936)	(-0.005)	(-1.201)	(-0.194)	(-1.117)	(0.877)
D_t	0.611	-0.203	-0.109	0.122	-0.025	-0.252
	(1.898)***	(-0.603)	(-0.473)	(1.710)***	(-0.385)	(-1.151)
D'_{t+1}		1.427	-0.217		0.068	-0.113
		(2.455)**	(-0.538)		(0.659)	(-0.324)
D'_{t+2}			-0.153			-0.087
			(0.238)			(-0.164)

Note: **, *** : Significant at 5%, 10% level

B. Shocks from U.S. Stock Prices

Independent Variables	Fixed or Managed Floating Dependent Variables			Free Floating		
	Δr_t	Δr_{t+1}	Δr_{t+2}	Δr_t	Δr_{t+1}	Δr_{t+2}
	Korea					
C	-0.053	-0.033	0.027	0.023	-0.011	-0.004
	(-0.812)	(-0.613)	(0.416)	(1.796)***	(-1.075)	(-0.362)
D_t	-0.007	0.022	-0.131	-0.022	4×10^{-5}	0.009
	(-0.107)	(0.412)	(-1.998)**	(-1.780)***	(0.004)	(0.869)
D'_{t+1}		-0.094	-0.178		-0.017	0.011
		(-0.545)	(-0.847)		(-0.725)	(0.439)
D'_{t+2}			0.137			-0.033
			(0.796)			(-1.034)
	Indonesia					
C	0.229	-0.091	-0.300	-0.006	0.009	-0.050
	(0.644)	(-0.363)	(-0.841)	(-0.059)	(0.305)	(-0.589)
D_t	0.214	0.282	0.891	-0.002	0.025	-0.083
	(0.601)	(1.122)	(1.126)	(-0.019)	(0.882)	(-0.980)
D'_{t+1}		0.811	0.891		0.013	0.019
		(2.243)**	(1.126)		(0.190)	(0.097)
D'_{t+2}			1.358 (2.096)**			0.023 (0.094)
	Thailand					
C	-0.141	0.235	-0.033	-0.160	-0.006	-0.038
	(-0.457)	(0.674)	(-0.152)	(-0.848)	(-0.137)	(-0.771)
D_t	-0.359	0.202	0.329	-0.220	-0.021	0.036
	(-1.160)	(0.580)	(1.494)	(-1.166)	(-0.458)	(0.741)
D'_{t+1}		0.488	-0.827		0.088	-0.103
		(0.437)	(-1.172)		(0.813)	(-0.884)
D'_{t+2}			-1.588			0.104
			(-2.746)*			(0.742)

Note: **, *** : Significant at 5%, 10% level

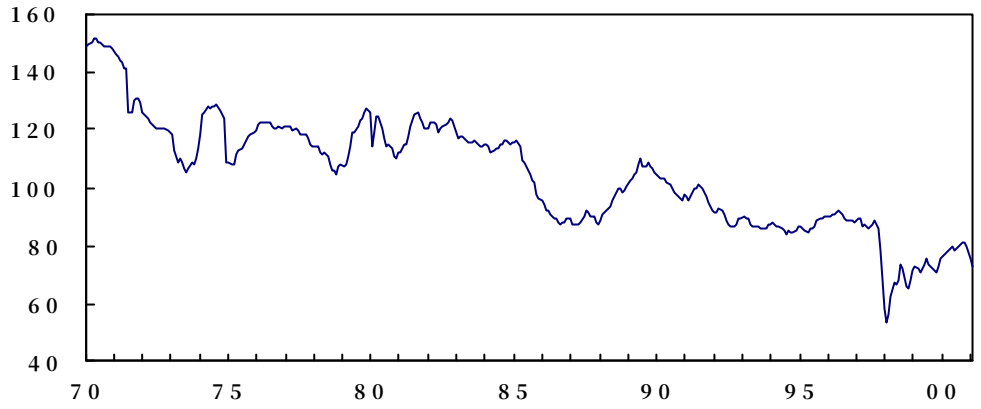
C. Shocks from Yen-Dollar Exchange Rates

Independent Variables	Fixed or Managed Floating			Free Floating		
	Dependent Variables					
	Δr_t	Δr_{t+1}	Δr_{t+2}	Δr_t	Δr_{t+1}	Δr_{t+2}
	Korea					
C	-0.067	-0.042	-0.104	0.009	-0.003	-0.005
	(-0.916)	(-0.385)	(-0.916)	(0.620)	(-0.246)	(-0.430)
D_t	0.074	-0.145	-0.115	0.007	-0.014	0.007
	(1.014)	(-1.320)	(-1.009)	(0.525)	(-1.021)	(0.611)
D'_{t+1}		0.175	0.264		-0.017	0.003
		(0.680)	(0.977)		(-0.443)	(0.102)
D'_{t+2}						0.053
						(1.124)
	Indonesia					
C	0.139	0.346	-0.174	0.031	-0.137	0.012
	(0.605)	(0.926)	(0.550)	(0.313)	(-1.103)	(0.077)
D_t	-0.045	-0.143	0.538	0.043	-0.197	0.117
	(-0.196)	(-0.378)	(1.694)***	(0.431)	(-1.590)	(0.777)
D'_{t+1}		0.052	-1.092		0.102	-1.013
		(0.059)	(-1.457)		(0.306)	(-2.518)**
D'_{t+2}			-0.167			-0.078
			(-0.211)			(-0.127)
	Thailand					
C	-0.121	0.063	0.053	0.192	-0.160	-0.012
	(-0.777)	(0.504)	(0.419)	(0.924)	(-0.831)	(0.381)
D_t	0.175	-0.341	0.203	0.116	-0.111	0.028
	(1.121)	(-2.691)*	(1.588)	(0.558)	(-0.579)	(0.859)
D'_{t+1}		0.134	-0.234		-0.243	0.149
		(0.453)	(-0.778)		(-0.473)	(1.690)
D'_{t+2}			0.051			0.070
			(0.061)			(0.523)

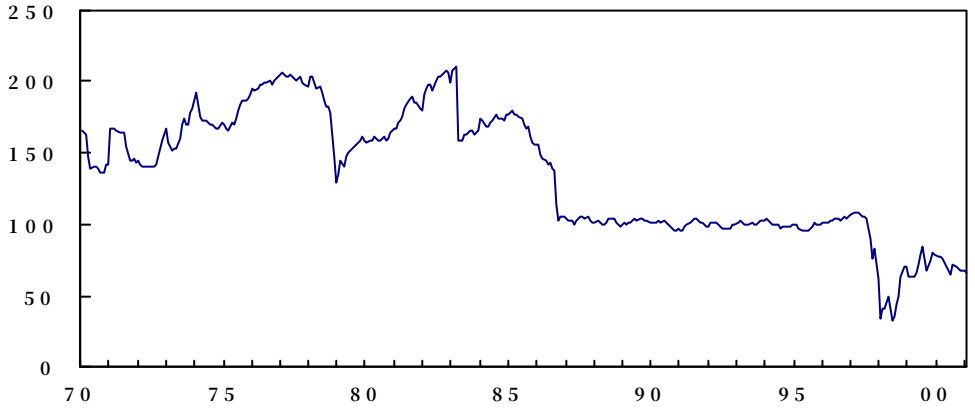
Note: **, *** : Significant at 5%, 10% level

Figure 1 . Real Exchange Rate Movement in the East Asian Crisis Countries

A. Korea



B. *Indonesia*



C. Thailand

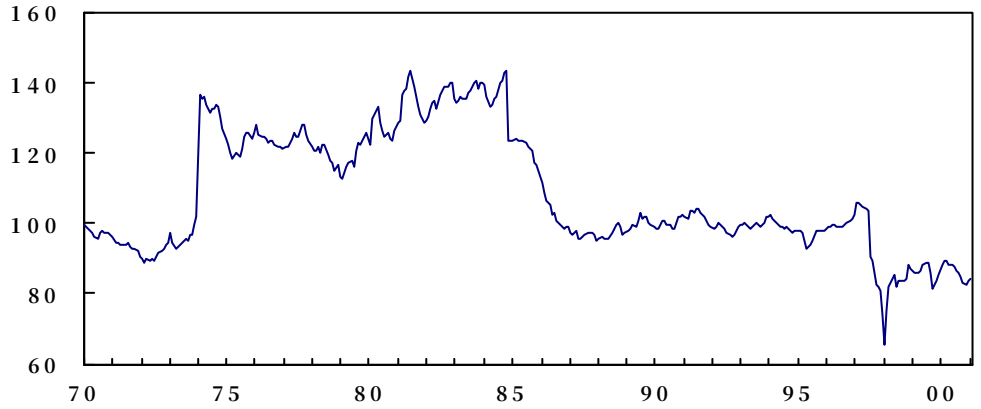


Figure 2. Daily GARCH Volatility of Exchange Rate in East Asia

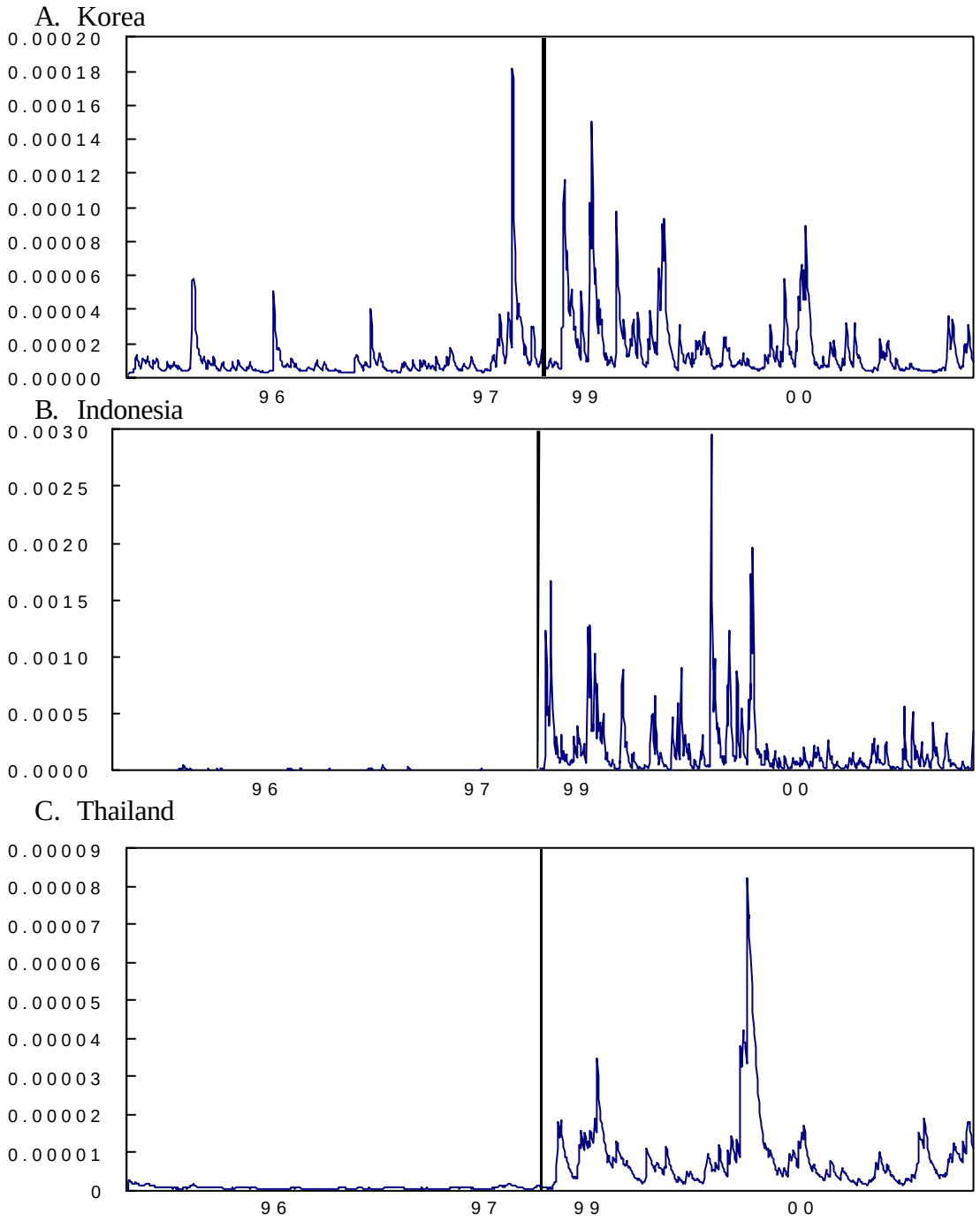
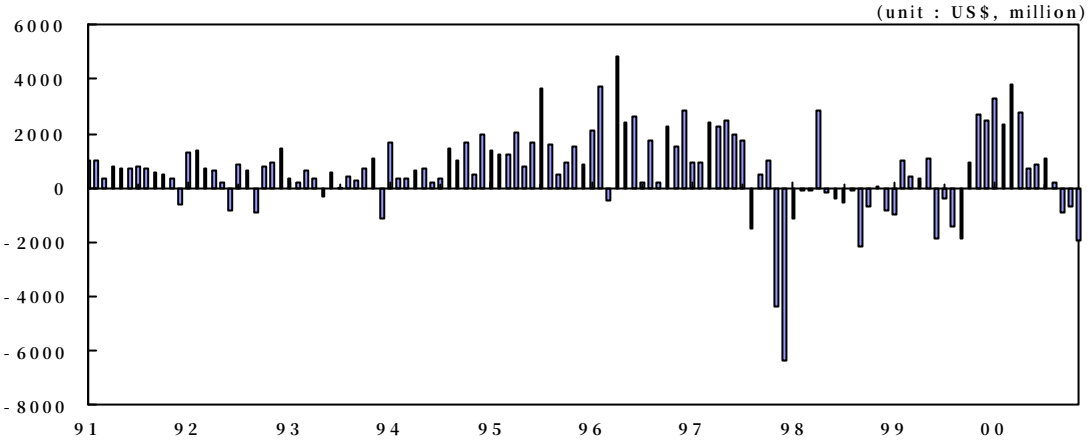
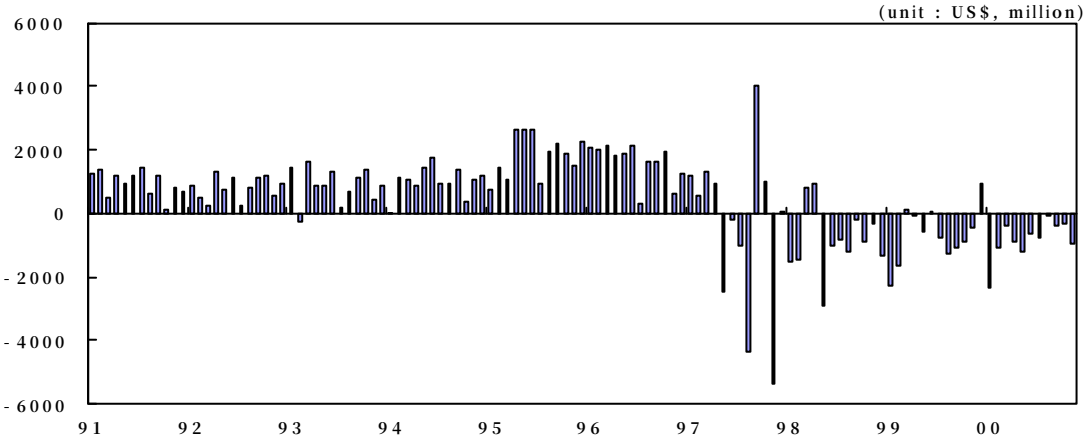


Figure 3. Capital Inflows in East Asian Countries

A. Korea



B. Thailand



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