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## **Currency Crises and Capital Controls: A Selective Survey**

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**Abstract:** This survey discusses theoretical models of speculative attack and currency crises, and reviews the empirical evidence. The paper outlines the correspondence of the models to different cases of crisis (e.g. Latin American crises, the ERM breakdown, and the recent Asian crisis), and points to gaps in the theoretical literature for explaining the Asian crisis. The large economic costs resulting from the severe depreciation of Asian currencies and general problems with macroeconomic management in the presence of large capital flows has recently led to proposals for limiting capital flows. The paper reviews the arguments and models for and against capital controls.

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## 1. Introduction

The recent history of the international financial markets is characterized by numerous currency crises. Various countries around the world have come under pressure or faced a crisis at different points in time. The recent counts were the crises in Mexico in 1976 and Argentina, Brazil, Peru and Mexico in the early and mid-80s, the crises in Chile and Argentina in 1980s and ERM in 1992, then the one in Mexico in 1995. Now, in 1997 and 1998, a major part of Asia is under a financial crisis.

Economists, who are doing some catching-up work, are trying to provide analysis of these crises. So far, most of the work focuses on three different but related areas:

### (a) Theoretical analysis of the causes and effects of currency crises

Undoubtedly, most of the work on currency crisis focuses on explaining the causes and effects of currency crisis. Earlier work by Salant and Henderson (1978), Krugman (1979), and Flood and Garber (1984), which often are dubbed as the first-generation models, painstakingly points out how persistent government budget deficits may lead to capital flight and currency crisis. The crises in Chile and Argentina in the 1980s and ERM in 1992 led to the development of second-generation models, which emphasize the existence of multiple equilibria in the foreign exchange markets and the possibility of having crises as self-fulfilling outcomes.

The current crisis in Asia, however, has some features that either were not present or were not so obvious in previous crises. For example, these countries had responsible fiscal policies of the governments, and the economies showed solid fundamentals. Another feature of these economies is that they had been growing with impressive rates for a long period of time. Prior to the crisis, these countries were regarded by many as the model of growth for many developing countries. All of a sudden, they faced new problems in the financial markets that were not expected. It is, therefore, interesting to investigate any possible links between growth and crisis.

### (b) Empirical Studies of Crises

On the empirical side, people have tried to determine whether crises can be predicted. In particular, there has been interest on finding the relationship between a crisis and certain variables of the economy, and whether there exist good leading indicators of a crisis.

### (c) Policy Recommendation

As the analysis of various crises is being developed, a question that easily pops up in people's mind is what the government should do to avoid a crisis. Two approaches can be suggested. First, one can focus on a particular crisis, determine its causes, and try to see whether some of these causes can be eliminated through a change in some government policies. For example, if one looks at the crises in Latin America, one can simply suggest that lowering the government deficits could avoid a crisis down the road. Second, one can

examine the similarities between various crises and determine whether there are some government policies that could diminish the chances of a crisis in the future.

In terms of the second approach, one can note that while all crises can be distinguished in terms of their causes and effects, they do share two common features: (i) a fixed exchange rate regime, and (ii) capital flight and speculative attacks. Corresponding to these two features, two proposals have been suggested: (i) give up the fixed exchange rate regime; (ii) capital control, i.e., strict constraints on the inflow and/or outflow of capital across the borders of a country.

In this paper, we survey some of the more important issues related to currency crises. Our discussion will be based on the three areas described above: the analysis of causes and effects of crises, empirical studies, and policy recommendation.

In analyzing the causes and effects of crises, we begin with the two main areas emphasized in earlier work: the existence of persistent fiscal deficits, and existence of multiple equilibria and self-fulfilling crises. These are discussed respectively in Sections 2 and 3.

We then turn to more recent work that examines other areas: (a) simultaneous existence of a banking crisis and a currency crisis, so called the twin crises (Section 4); (b) herd behavior and its relationship to capital flight and speculative attacks (Section 5); and (c) moral hazard and currency crises (Section 6).

Next, in Section 7, we turn to the work that examines the predictability of crises.

In Sections 8 to 13, we choose to discuss one policy recommendation to avoid a currency crisis that has been proposed before: capital control. We will not mention about the other policy suggestion: the floating of a local currency. It is because a fixed exchange rate versus a flexible exchange rate has long been an important issue in the literature, and we decided not to cover this area.

In Section 8, we provide some basic material about capital account control, including a brief history of capital control. In Section 9, we present some traditional arguments for and against capital control, while Section 10 focuses on more recent arguments. Section 11 explains an alternative recommendation: Instead of liberalizing the capital account in a single step, as some of Asian countries did prior to the crisis, it has been suggested the country the account should be liberalized in several steps. We will present some of the arguments. Section 12 discusses several measures to discourage capital inflow and outflow, so that an economy may not be so risky under the threat of capital flight. Section 13 presents some empirical studies related to capital control, while the last section concludes.

## **2. Domestic Credit Creation and Currency Crises**

For an economy under a fixed exchange rate regime, a currency crisis usually refers to a situation in which the economy is under the pressure to give up either the prevailing exchange rate or the regime. For the former, the economy in crisis in most cases is required to devalue its currency by a substantial amount,<sup>1</sup> and the exchange rate then moves to a new, but at least temporarily fixed, level. For the latter, the alternative regime is a flexible exchange rate one.

In the literature, many models and theories have been suggested to explain the causes and occurrence of a currency crisis. In this section, we focus on the impacts of domestic credit creation on the exchange rate pegged by the government. Models that use these impacts to explain the existence of a currency crisis are sometimes called the *first-generation* models.

### 2.1 A Simple Model of Exchange Rate Determination

To introduce the main features of the first-generation models, let us first lay down a simple model of exchange rate determination. Consider a one-sector, small, open economy. To focus on the monetary side of the economy, we assume that its real side is characterized by full employment, with constant factor endowment and technology. The following equilibrium conditions are used to describe the monetary side of the economy:

$$(1) \quad M_t / P_t = a - bi_t$$

$$(2) \quad M_t = S_t R_t + D_t$$

$$(3) \quad P_t = P_t^* S_t$$

$$(4) \quad i_t = i_t^* + \dot{S}_t$$

where  $M_t$ ,  $P_t$ ,  $i_t$ , are the quantity of (high-powered) money, the general price level, and the interest rate, respectively. Equation (1) is the money demand equation, with the output level always at a fixed level. The two coefficients,  $a$  and  $b$ , are positive numbers. Equation (2) gives the money supply, which consists of foreign reserves (in foreign currency) held by the government/central bank,  $R_t$ , plus domestic credit,  $D_t$ . Variable  $S_t$  is the spot exchange rate, defined as the domestic currency price of foreign currency. Equation (3) is the purchasing power parity, where an asterisk represents a foreign variable, while equation (4) is the interest parity condition, where a dot above a variable represents the rate of change of that variable with respect to time. Assuming perfect foresight, expected rate of depreciation is equal to the actual rate of depreciation. Since we are considering a small economy, foreign variables are treated as given exogenously. This allows us to normalize  $P_t^* = 1$  and  $i_t^* = 0$ .

In this subsection, we assume that the spot exchange rate always adjusts to its equilibrium level instantaneously and costlessly. With no government intervention, the amount of

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<sup>1</sup> Devaluation and appreciation of a currency are usually treated asymmetrically. While a forced devaluation is considered as a crisis, a forced appreciation is not.

foreign reserve is fixed and is denoted by  $R_0$ . The domestic credit is assumed to be increasing at an exogenously given rate of  $\mu > 0$ , i.e.,  $\dot{D}_t = \mu$ .

The increase in domestic credit is the main feature of most currency crisis models. Several reasons can be used to explain why it increases, but the most common one is that the government is running continuous deficits, and that these deficits are financed by printing money (increase in domestic credit).<sup>2</sup>

Combining equations (1), (3) and (4) together, we have

$$(5) \quad M_t = aS_t - b\dot{S}_t.$$

The solution to equation (5) can be found to be

$$(6) \quad S_t = \alpha + \beta M_t,$$

where  $\alpha = b\mu/a^2$  and  $\beta = 1/a$ .<sup>3</sup> Recall that the high-powered money consists of foreign reserves and domestic credit, (2) can be substituted into (6) to give

$$(7) \quad S_t = \alpha\sigma + \beta\sigma D_t,$$

where  $\sigma = 1/(1 - \beta R_0)$ . Equation (7) is represented by line ABCE in Figure 1. The vertical intercept of the line, A, represents  $\alpha/(1 - \beta R_0)$ .<sup>4</sup> Suppose that initially at time  $t = t_0$ , the quantity of domestic credit is  $D_0$ . This is represented by point B. As the domestic credit increases, the currency is devalued and the exchange rate moves up along the line BCE. Note that because of the constant rate of increase in  $D_t$ , Figure 1 can be interpreted as a diagram showing the change in  $S_t$  with respect to time, with  $t$  represented by the horizontal axis.

Because  $D_t$  is changing at a rate of  $\mu$ , the value of  $D_t$  at time  $t$  is  $D_t = D_0 + \mu(t - t_0)$ . Using this equation, the exchange rate will change according to the following equation:

$$(8) \quad S_t = \alpha\sigma + \sigma\beta D_0 + \sigma\beta(t - t_0).$$

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<sup>2</sup> This is what was observed in many Latin American countries, which experienced currency crises of various degrees in the seventies and eighties.

<sup>3</sup> To derive the solution, we conjecture that the solution of the following form:  $S_t = \alpha + \beta M_t$ . Differentiating both sides gives  $\dot{S}_t = \beta \dot{M}_t$ . Substitute this condition into (5), and comparing this with the assumed solution form gives  $\beta = 1/a$  and  $\alpha = b\mu/a^2$ .

<sup>4</sup> To have a positive exchange rate in equation (7), we assume that  $1 - \beta R_0 > 0$ .

Note that the exchange rate given in (8) depends on the initial value of foreign reserve. We can consider an alternative rate that corresponds to another reserve level, conveniently chosen to be zero,  $R_0 = 0$ . This implies that  $\sigma = 1$ . Denote the corresponding rate by  $\tilde{S}_t$ , which is described by

$$(9) \quad \tilde{S}_t = \alpha + \beta D_0 + \sigma \beta (t - t_0).$$

The exchange rate in (9) is represented by line GHJ in Figure 1.

Suppose now that at time  $t = t_0$ , in an unanticipated move, the government chooses to raise the exchange rate from the prevailing level to a higher level. In Figure 1, this policy can be represented by a jump of the exchange rate from point B to F instantaneously. After the jump, the exchange rate is then fixed, as represented by horizontal line  $\bar{S} FC$ .

When the exchange rate is fixed,  $\dot{S}_t = 0$ . Equation (4) implies that  $i = i^* = 0$ , so that equation (1) reduces to

$$(9) \quad \dot{M}_t = a\bar{S},$$

i.e., the equilibrium stock of money is proportional to the given exchange rate. Therefore when the government pegs the exchange rate, the economy accumulates foreign reserve and thus money by running a balance of payment surplus.

## 2.2 Domestic Credit Creation and Currency Crisis

Mexico in 1976, and Argentina, Brazil, Peru and Mexico in the early and mid-80s experienced various degrees of currency crises. These countries chose to peg their currencies against foreign ones. At some points they observed capital flight and speculative attacks on their currencies, which resulted in enormous pressure on the central bank to devalue their currencies.

Continuous government fiscal deficits had been attributed as one major factor of these currency crises. These deficits were financed mainly by printing money, i.e., through an increase in the domestic credit held by the central banks. As Salant and Henderson (1978), Krugman (1979), and Flood and Garber (1984) pointed out, there is an inconsistency between deficit financing policy and the policy of a fixed exchange rate. In the model described above, the money supply that equilibrates the money market is given exogenously.<sup>5</sup> An increase in the central bank's domestic credit will be matched by a drop in foreign reserve. Because the amount of foreign reserve held by the central bank is finite, the government cannot maintain a fixed exchange rate regime indefinitely.

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<sup>5</sup> This feature is an important one in the Mundell-Fleming models of an small open economy with a fixed exchange rate and perfect capital mobility.

Krugman went on to argue that a crisis occurs when the central bank's foreign reserve reaches a minimum level. At this point, the government will have to devalue its currency or give up its fixed exchange rate policy.

Let us make use of the simple model of exchange rate introduced earlier to explain such an inconsistency.<sup>6</sup> Let us assume that at some point, the economy is represented by point F in Figure 1, with the exchange rate fixed at  $\bar{S}$ , while domestic credit is increasing at a rate of  $\mu$ . The increase in domestic credit means that point F shifts to the right along the horizontal line. However, by equation (9), the equilibrium money stock is fixed, meaning that as the economy is creating domestic credit, it is losing foreign reserve by running balance of payment deficits. In other words, because  $\dot{M}_t = 0$ , we have

$$(10) \quad \dot{R}_t = -\dot{D}_t / \bar{S} = -\mu / \bar{S} < 0.$$

Equation (10) suggests that the amount of foreign reserve at any time  $t$  is given by

$$(11) \quad R_t = R_0 - \bar{\mu}(t - t_0),$$

where  $\bar{\mu} = \mu / \bar{S}$ . The change in the foreign reserve over time is illustrated by schedule ABC in Figure 2.

If this situation continues, the central bank will run out of foreign reserve at time  $t = t_x$ , where  $t_x$  is obtained from (11) by setting  $R_t = 0$ :

$$(12) \quad t_x = t_0 + R_0 / \bar{\mu}.$$

At  $t = t_x$ , the value of domestic credit is

$$(13) \quad D_x = D_0 + \mu(t_x - t_0) = D_0 + \bar{S}R_0.$$

As more domestic credit is created, both flexible exchange rates  $S_t$  (with positive foreign reserve) and  $\tilde{S}_t$  (with no foreign reserve) are rising. Specifically,  $S_t = \bar{S}$  when  $t = t_y$ , where from (8),

$$(14) \quad t_y = t_0 + (\bar{S} - \alpha\sigma - \sigma\beta D_0).$$

Similarly,  $\tilde{S}_t = \bar{S}$  when  $t = t_z > t_y$ , where (with  $\sigma = 1$ )

$$(15) \quad t_z = t_0 + (\bar{S} - \alpha - \beta D_0).$$

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<sup>6</sup> The following model is based on Floor and Garber (1984).



It is usually assumed that  $t_y < t_x$ .<sup>7</sup> The value of domestic credit at  $t = t_y$  is equal to

$$(15) \quad D_y = D_0 + \mu(t_y - t_0) = (1 - \mu\sigma\beta)D_0 + \mu(\bar{S} - \alpha\sigma),$$

and that at  $t = t_z$  is equal to

$$(16) \quad D_z = D_0 + \mu(t_z - t_0) = (1 - \mu\beta)D_0 + \mu(\bar{S} - \alpha).$$

Obviously, because the amount of foreign reserve held by the central bank is limited, the present situation cannot continue indefinitely. Suppose that the government decides that this situation terminates when foreign reserve hits a minimum level such as zero, and that it gives up its fixed exchange rate policy and lets the currency float.<sup>8</sup> When the constraint is removed, the exchange rate becomes the same as the shadow rate.

Such a reversal of the exchange rate policy is a crisis for the economy under consideration because the government is forced to abandon its originally set exchange rate policy, after losing a considerable amount of foreign reserve.

Krugman (1979) points out that the fixed exchange rate regime can no longer survive when the amount of foreign reserve held by the central bank reaches a minimum level. This implies that the crisis occurs at  $t = t_x$ . So the change in foreign reserve follows schedule ABC in Figure 2. Flood and Garber (1984), however, argue that if people know in advance of the devaluation, speculation will occur and could force the devaluation to happen earlier. For example, shortly before  $t_x$ , speculators can purchase from the central bank the remaining foreign reserve, denoted as  $R'$ , with an amount of domestic currency of  $\bar{S}R'$ . When the exchange rate is changed to  $S' > \bar{S}$ , where  $S'$  is the corresponding shadow exchange rate, the speculators can sell the foreign reserve back to the central bank, and get a profit of  $(S' - \bar{S})R'$ . This profit may not be much if  $R'$  is small, but the profit rate is very high considering the short duration of time. So devaluation will not occur at  $t = t_x$ , but earlier. However, the same argument can be used to say that devaluation will not occur just earlier than  $t_x$ , but even earlier. As a result, at any time when the shadow exchange rate is higher than the pegged rate, one can argue that devaluation will occur slightly earlier. This means that the crisis will occur when  $t = t_z$ , and the change in central bank's foreign reserve over time is described by ABE in Figure 2. Furthermore, the above analysis implies that there is no discrete jump in the exchange rate.

<sup>7</sup> This is the case considered in most, if not all, papers analyzing the present issue.

<sup>8</sup> The same analysis applies even if the minimum level is positive, but it is usually assumed that this amount is less than  $R_y$ , meaning that the government will not consider giving up the regime before  $t = t_z$ .

However, the path ABE of foreign reserve requires perfect information, costless exchange transactions, unlimited resources owned by the speculators, and a clear policy in terms of when the fixed exchange rate is given up. It should also be pointed out that between  $t_y$  and  $t_z$ , the currency is overvalued (relatively to the existing stock of foreign reserve held by the central bank). Therefore, if the determination of the government in defending the pegged exchange rate is unknown to the public and people do not know the minimum amount of foreign reserve below which the government will give up the exchange rate regime, then it is possible that some investors may start moving the money out of the country at or shortly after  $t_y$ . These may be people who are most pessimistic about the economy or the resolve of the government. This leads to loss of foreign reserve of the government, making devaluation more likely. Very soon, more people may take similar action, and speculative attack occurs. Finally, the capital flight and speculation become so overwhelming for the government to defend the exchange rate anymore. So a possible adjustment path of foreign reserve is described by schedule AFG in Figure 2.

### **3. Speculative Expectations, Multiple Equilibria, and Self-fulfilling Crises**

While the model of currency crisis presented in the previous subsection shows the inconsistency between continuous creation of domestic credit and a fixed exchange rate, it has been pointed out that a currency crisis can also occur without the financing of fiscal deficit through domestic credit creation. The crisis that appeared to be stranger is the experiences of certain European countries in 1992 – 1993. In this period, while maintaining fixed exchange rates, these countries faced severe speculative attacks on their currencies. In August 1993 member countries of the European Monetary System gave in and allowed more flexibility in their currencies, permitting their currencies to move within a band of  $\pm 15$  percent instead of  $\pm 2.25$  percent for most Exchange Rate Mechanism (ERM) rates. However, it is interesting to note that two years later the prices of some of these currencies were at about the level same as before. This means that these European countries were not having any obvious macroeconomic troubles and that currency crises can arise even when economies have sound macroeconomic fundamentals. In other words, these countries do not have the features that are described by the first-generation models.

Looking at the breakdown of the ERM, Obstfeld (1994) suggests the following features of the type of crises experienced by these European countries:

1. There are reasons why the government wants to abandon the peg (to inflate away the debt burden denominated in domestic currency, and to follow expansionary monetary policies in case of unemployment, etc)
2. There are reasons why the government wants to defend the peg, hence a conflict between the two (to facilitate international trade and investment, to gain credibility if

has a history of high inflation, and as a source of national pride or commitment to an international cooperation).

3. The cost of defending the peg rises when people expect the peg would be abandoned, because people *in the past* expected that the exchange rate would be depreciated *now*. Hence, anticipation of devaluation makes the debt-holders and worker unions in the past demand higher interest rate and wages, making debt-burden too high and industries un-competitive at the current exchange rate level.

The important trigger is the expectation of people. If they expect that the currency is going to be devalued in the near future, they could expect enormous pressure on the central bank even though the conditions of the economy are solid. Such expectations may lead them to convert their domestic currency to foreign currency before the devaluation. If sufficient number of people do that with large sums of domestic currency, the central bank could run out of foreign reserve and has to devalue the currency. In this case, the crisis is self-fulfilling. Sometimes the models that emphasize the above characteristics are called the *second-generation* models.

However, Krugman (1998a) supposes that a fixed exchange rate could be costly to defend, if people *now* expect that it will be depreciated *in the future*. The usual channel involves short-term interest rates: to defend the currency in the face of expectations of future expectations may either worsen the cash flow of the government (or indebted enterprises) or depress output and employment.

The model introduced earlier can be used to explain the feature of a self-fulfilling currency crisis. Suppose that the central bank currently owns foreign reserve  $R_0 > 0$ , and that the government is keeping the domestic credit constant,  $\mu = 0$ . From (7), with  $\alpha = 0$ , the flexible exchange rate corresponding to a foreign reserve of  $R_0$  is given by

$$(17) \quad S_t = \beta\sigma D_t,$$

which is illustrated by line OAB in Figure 3.

Let the current domestic credit be  $D_A$ , and let the exchange rate be pegged at  $\bar{S}$ . This is depicted by point A in the diagram. Since the domestic credit is fixed, the economy can avoid the type of crisis as described above, and can stay at point A indefinitely.

Suppose now that currency speculators believe that there is a positive probability that the government will devalue the currency in the near future. Specifically, suppose that the government will let the currency go if the foreign reserve runs down to a minimum level, such as zero, and that the shadow exchange rate will then be equal to the flexible rate.<sup>9</sup>

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<sup>9</sup> When the exchange rate is expected to devalue, the domestic interest rate will rise.

In Figure 3, line CEFG shows the shadow flexible rate under the condition that  $R_0 = 0$ , and it is described by the following equation (with  $\sigma = 1$ ):

$$(18) \quad \tilde{S}_t = \beta D_t.$$

If the speculators have the resources and choose to purchase all the foreign reserve held by the central bank, the government will give up its fixed exchange rate policy, and the exchange rate will jump up to  $S_1 > \bar{S}$ , as represented by point F in Figure 3. Such devaluation occurs despite the fact that the economy is fundamentally solid, with no domestic credit creation due to deficit financing.

In terms of the resources held by the speculators, Obstfeld (1996) distinguishes among three different cases: (a) when the total resources of the speculators are less than  $R_0$ ; (b) when the resource of each speculator are greater than  $R_0$ ; (c) when none of the speculators has resources greater than  $R_0$ , but when two or more of them combined will have resources greater than  $R_0$ . In case (a), devaluation will not occur. In case (b), devaluation will occur when any one of the speculators purchases  $R_0$  from the central bank, causing devaluation. In fact, all of them will try to be the first to do so. In case (c), if sufficient number of speculators believe that devaluation will occur and they rush to purchase foreign reserve, devaluation will definitely occur, even though without speculation the fixed exchange rate regime could have survived indefinitely. If the currency is devalued, the total profit of the speculators is  $(S_1 - \bar{S})R_0$ .

The crisis that occurs in case (c) has two features: (1) there are multiple equilibria. (2) It is self-fulfilling in the sense that it will not occur if none of the speculators act, but will occur if a sufficient number of them act.

Figure 3 also shows that a self-fulfilling crisis can occur when domestic credit is in between  $D_A$  and  $D_E$ . As explained before, if the central bank loses all its foreign reserve, the exchange rate becomes flexible, jumping up to a point in between E and F on CEFG. If the initial value of domestic credit is equal to  $D_E$ , the speculators will earn no profit.

If the initial domestic credit is less than  $D_E$ , no speculation will occur because if the fixed exchange rate breaks down, appreciation of the currency will occur and the speculators lose money. If domestic credit is greater than  $D_A$ , the currency is overvalued. The speculators will have a bigger incentive to attack the exchange rate.

There are some models in which the objectives of the government are spelled out, and multiple equilibria are derived explicitly. See, for example, Obstfeld (1994).

#### 4. Twin Crises: Banking and Exchange Rate Crises

The new generation models emphasize the importance of financial sector and capital flows in currency crises. Hence, the term “**twin crises**”. The frequent occurrence of twin crises (Nordic countries in 1990s, Turkey in 1994, Venezuela, Argentina and Mexico in 1994, Bulgaria in 1996, and Asian countries in 1997) has been a result of banking crisis precipitating a currency crisis, either by an increase in money supply, or by a large scale withdrawal leading to a decrease in money demand. The causation between the balance of payments and banking crises is, however, debatable. Stoker (1995) and Mishkin (1996) argue that *balance of payments crisis leads to banking crisis*. According to Stoker, an external shock, coupled with commitment to fixed exchange rate, leads to loss of reserves. If this loss of reserves is not sterilized, then a speculative attack is followed by a period of abnormally high interest rates leading to credit crunch, increased bankruptcies and financial crisis. Mishkin argues that devaluation could weaken the position of the banks if they have a large share of their liabilities denominated in foreign currency. However, Diaz-Alejandro (1985), Velasco (1987), Calvo (1995) and Miller (1995) argue that *banking crises lead to balance of payments crises*. The argument is that central banks bailout financial institutions by printing money, and this erodes their ability to maintain the prevailing exchange rate commitment. But Reinhart and Vegh (1996) suggest that the *two crises have some common causes*—an example of “perverse” dynamics of an exchange rate based inflation stabilization plan. Since prices are slow to converge to international levels, exchange rate appreciates markedly. Initially, there is a boom in imports and economic activity, which is financed by borrowing abroad. This leads to a widening of current account deficits and financial markets infer that stabilization program is unsustainable, hence the currency is attacked. The increase in bank credit during the boom is financed by foreign borrowings, when capital flows out and asset market crashes, it leads to the collapse of the banking system as well. McKinnon and Pill (1996) show that financial liberalization along with some microeconomic distortions—like implicit insurance deposits—can make boom-bust cycles more pronounced as they lead to lending boom that leads to the eventual collapse of banking system. Goldfajn and Valdes (1997) show that changes in international interest rates and capital inflows are amplified by the intermediating role of banks and how these swings may produce business cycles that ends in bank runs and financial and currency crashes.

However, the stylized facts that these models tend to explain are: (Goldfajn and Valdes, 1997 and Kaminsky and Reinhart, 1996)

1. Banking crises are highly correlated to currency crises.
2. Capital inflows increase steadily before the crisis and fall sharply during the crisis.
3. Banking activity (intermediation) increases some time before the collapse.

Goldfajn and Valdes (1997) model the interaction of liquidity creation by financial intermediaries with capital flows and exchange rate collapses in a two time-period

framework, hence focussing on the role of the financial intermediaries in the currency crises. These intermediaries provide liquidity, which is attractive to foreign investors with short-term incentives for investment, hence helping in capital inflows. However, due to any exogenous shocks, when the foreign investors want to withdraw their deposits, these intermediaries, being locked in illiquid assets, face the risk of failure. Hence, a bank run leads to capital outflows and currency collapse. Their model provides role for the banking system in magnifying the shocks to fundamentals (productivity and interest rates), but does not assume any kind of inconsistency in policy making, like the first and second generation models.

Some of the important results from their model are:

1. Under intermediation, the probability of a run will be positive and non-decreasing with respect to international interest rate.
2. There are proportionally more capital outflows with intermediaries in period 1.
3. There is a trade-off in the sense that intermediation may generate larger inflows, but, at the same time, a higher probability of a run against the country.
4. If devaluations are expected, runs against the intermediary are more likely.
5. The intermediation process generates a transmission and amplification mechanism in which small shocks translate into larger effects.

## **5. Herding and Capital Flight**

In this section, we turn to another explanation of the existence of currency crisis: herd behavior. Herding, which is an example of information cascade, is said to exist when individuals tend to choose actions similar to previous actions chosen by other individuals. In other words, with herding effects, individuals tend to move in conformity, and a small shock to society could lead to a mass shift in the actions of people. In some special cases, people can choose to give up the private information or signals they possess and follow the actions of others, even though the private information or signals they have would suggest them to act otherwise.

A famous example is Keynes' beauty contest example.<sup>10</sup> Earlier work includes the papers by Leibenstein (1950) on the bandwagon effects. Recently, more rigorous models have been suggested to explain herd behavior.<sup>11</sup> Several models that have been introduced to explain investment behavior are mentioned here.

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<sup>10</sup> In a beauty pageant, a judge picks up the girl who he thinks others would pick, rather than who he considers to be the most beautiful.

<sup>11</sup> See, for example, Banerjee (1992), Bikhchandani, et al (1992), and Froot, et al (1992).

Froot, et al (1992) show that speculators with short horizons may herd on the same information, trying to learn what the other informed traders know. These could lead to multiple equilibria, and herding speculators may even choose to study information that is completely unrelated to fundamentals. So, the large perceived penalty for missing a bull market leads managers to follow the pack even if fundamentals do not warrant it; conversely, the penalty of losses during the bear market are lower as all other managers are losing money as well.<sup>12</sup>

Krugman (1998a) suggests similar reasons why herding might occur. First, there is a bandwagon effect, which is driven by the awareness that investors have private information—where investors ignore their own information and thrive on the information of other investors. It has been argued that bandwagon effects in markets with private information create a sort of “hot money” that at least sometimes causes foreign exchange markets to overreact to news about national economic prospects. Second, much of the money invested in crisis-prone countries is managed by agents rather than directly by principals—where the principal-agent problems arise.

The above models usually assume sequential actions by individuals, so that those who take actions later will observe what actions others have taken previously. Calvo and Mendoza (1998) introduce a model in which herding can exist even when individuals have simultaneous decision making. They find that with informational frictions, herding behavior may become more prevalent as the world capital market grows. With globalization, the cost of collecting country-specific information to discredit rumors increases and managers, facing reputational costs, choose to mimic the market portfolio.<sup>13</sup> Hence, small rumors can induce herding behavior and move the economy from a no attack to an attack equilibrium.

Herding is a type of distortion in the economy in the sense that the actions of some individuals can produce externality. This has two implications, both are important in explaining the occurrence of a crisis. First, the actions of a limited number of individuals may produce at best some limiting adverse effect on an economy. The same action of a large number of individuals can make a possible damage unbearable. For example, Obstfeld (1996) argues that in some cases, the attacks by a limited number of speculators on the local currency will not do much harm, as the central bank has enough foreign reserves to defend. However, if a large number of speculators launch similar attacks, the central bank could run out of reserve and the country could face a crisis. Another example is the current crisis in Asia. For countries like Thailand or South Korea, failure of firms in the economy is nothing strange, and as long as the number of failures during any period of time is limited, the economy usually has capacity to absorb these losses. However, if widespread failures exist at about the same time, huge bad loans can be

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<sup>12</sup> As Krugman (1998a) puts it: “I feel worse if I lose money in a Thai devaluation when others don’t, than I will if I lose the same in the general rout.”

<sup>13</sup> The details in country credit ratings (CCRs) is assumed to be costly; They find an empirical regularity about the CCRs that new information changes the perceptions of investment conditions significantly in emerging markets than in developed and least developed countries. Also, information gathering requires larger adjustments in mean and variance of the returns on assets in emerging markets than in OECD countries.

created, and financial institutions could face repayment problems if the money originally comes from abroad.<sup>14</sup> Furthermore, if the values of bad loans were not high, these financial institutions can borrow more to ease the cash flow problem, but if the bad loans are high, it is difficult to borrow such large amounts in a short time.

Another externality created by herding is that while certain massive actions may hurt the economy, these actions could be entirely rational from individuals' point of view.<sup>15</sup> Such rational behaviors occur when there are payoff externalities (payoffs to an agent adopting an action increases as the number of agents adopting that action increases) or principal-agent problems (managers have an incentive to hide in the herd so that their actions cannot be evaluated).

Of course, as Flood and Marion (1998) argue, in many cases, herding could explain some part of the currency crises in Asia, but not the whole. First, individuals are less likely to ignore their own or new information in a world where they can adjust their strategies continuously to new information. Second, in case strategic interactions are important, then the cascade story is unsatisfactory, because the potential capital gains arising from the action of one agent does not depend on actions chosen by others.

Wong (1998) applies herding behavior to provide a theory of the formation of bubbles in the housing market in case of Thailand, and explains how the bubbles had caused some of the troubles in the economy. When the growth of the economy creates rising demand of housing, investors respond with more supply. Consecutive periods of high growth reward the more optimistic and aggressive investors with huge profits. These profits and successes prompt pessimistic investors to revise upward their beliefs of the future and become more aggressive. More firms enter the market and ride the bandwagon. Bubbles are then formed when (a) investors get too optimistic; or (b) a widespread failure and bankruptcy of firms in the housing market creates big losses to financial institutions, which in turn could not repay their foreign debts; or (c) a widespread failure and bankruptcy of firms in the housing market creates pessimism and panics in the economy, prompting capital flight and speculative attacks on the domestic currency.

## **6. Moral Hazard and Financial Crises**

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<sup>14</sup> For example, Thailand passed the Bangkok International Banking Facility in 1992, allowing domestic banks and financial institutions to borrow from abroad to finance local investment projects. As capital was available in other countries at very low interest rates, the new policy of Thailand led to huge inflow of foreign capital. Much of this money went to the housing/real estate sector, creating big jumps in supply. When these investments went sour, bad loans were created and these banks and financial institutions did not have the money to repay the loans they borrowed from abroad. The worst part was that most of these foreign loans were denominated in foreign currency such as the yen or the dollar, and usually no hedging against currency depreciation had been made. When the Thai baht was devalued, these financial institutions suffered double hits.

<sup>15</sup> Interested readers are referred to Devenow and Welch (1996) for a summary on rational herding literature.



Moral hazard can occur under asymmetric information because borrowers can alter their behavior after the transaction has taken place in ways that the lender regards as undesirable. In financial markets, however, moral hazard could occur in the absence of asymmetric information; i.e., moral hazard arises from the possibility that investor behavior will be altered by the extension of government guaranteed that relieve investors of some of the consequences of risk taking.

Krugman (1998b) and Corsetti, et al (1998) have proposed moral hazard as a possible explanation for currency crises, especially the Asian crisis of 1997. Krugman considers a case of over-guaranteed and under-regulated financial intermediaries. Since these institutions do not have to put any capital up-front, and have the liberty to walk away at no personal cost in case of bankruptcy, the economy engages in excessive investment. This economy is made worse off by globalization. If it did not have access to world capital market, then excessive investment demand by these intermediaries would show up as high rates of interest, and not as excessive investment. But access to world market allows the moral hazard in the financial sector to translate into real excess capital accumulation.

Corsetti, et al (1998) also recognize moral hazard as a source of over-investment, excessive external borrowing and current account deficits. Unprofitable projects and cash shortfalls are re-financed through external borrowing as long as foreign creditors lend to domestic agents against future bail-out revenue from the government. The government deficits need not be high before the crisis, but refusal of foreign creditors to re-finance the debt forces the government to step in and guarantee the outstanding stock of external liabilities. The government might recourse to seigniorage revenues. Expectations of inflationary financing thus cause a collapse of the currency and anticipate the event of a financial crisis.

In fact, the argument of moral hazard is not only applicable to the intermediaries, but also to the governments. Proponents of moral hazard argue that IMF creates bailout for the governments or investors in the event of a crisis.

However, Radelet and Sachs (1998) do not see the current Asian crisis as a result of carelessness on the part of the investors because they were sure to be bailed out in a crisis. First of all, only state-owned enterprises can be bailed out in a crisis. According to Radelet and Sachs, if the creditors feared a risk of a crisis in Asia, then spread on Asian bonds should have increased, but it did not. If the creditors felt an increasing risk of government-led bailout, then ratings of long term government bonds should have gone down, but they did not either. A large part of the investment went into the risky equity market, and bank loans went to non-financial corporate sector, where the direct government bailout was least possible. Creditors have been aware of weak bankruptcy laws and ineffective judicial systems in Asia. Hence, the foreign investors lent because they anticipated these economies to perform well, and not because they believed that they would be bailed out.

## 7. Predictability of Crises<sup>16</sup>

There are different definitions of crisis that have been used in empirical literature. Some papers use a narrow definition of crisis as a *devaluation of exchange rate*.<sup>17</sup> Other papers use the term crisis in a broader sense, i.e., as *an increase in Market Pressure Index (MPI)*<sup>18</sup>. It is constructed as follows:

$$MPI_{i,t} = \frac{(\% \Delta e_{i,t})}{\sigma_{\Delta e_{i,t}}} + \frac{(\Delta i_{i,t})}{\sigma_{\Delta i_{i,t}}} - \frac{(\% \Delta r_{i,t})}{\sigma_{\Delta r_{i,t}}}$$

where e is the bilateral exchange rate of country “i” with US or Germany; i is the interest rate in country “i” and r is the non-gold international reserves that the central bank has; the changes in exchange rate, interest rate and reserves are weighted by their respective standard deviations. This index is high when there is pressure on the currency and low otherwise. The intuition is that if there is an attack on the currency, either the exchange rate would depreciate, or interest rate would be raised to ward off the attack, or the central bank would sell foreign currency to support the exchange rate. Most papers use probit or logit analysis, where the dependent variable is a discrete measure of crisis, which is also the probability of a crisis. For example, Eichengreen, Rose and Wyplosz (1996a) define the dependent variable as:

$DUMMPI_x = 1$  if  $MPI_x > \mu_{MPI_x} + 1.5 * \sigma_{MPI_x}$ , 0 otherwise;

where  $\mu$  is the mean of the MPI in country x, and  $\sigma$  is the standard deviation of MPI.

Kaminsky and Reinhart (1996) construct the MPI as a weighted average of exchange rate changes and reserve changes, and define crisis as:

$DUMMPI_x = 1$  if  $MPI_x > \mu_{MPI_x} + 3 * \sigma_{MPI_x}$ , 0 otherwise

The exclusion of incidents of speculative pressure on the exchange rate below the arbitrary threshold value has the disadvantage of introducing sample bias into the estimation procedure. Flood and Marion (1998) argue that many models of speculative attack indicate that unanticipated devaluations produce the largest jump in the MPI. The size of jumps in the MPI at the time of attack is reduced by the extent to which the attack is anticipated. Thus, selection of only extreme values of the MPI (as in construction of the dependent variable for probit models) may reduce the share of predictable crises in the sample and reduce the number of crises that are likely to be correlated with fundamental economic determinants. Cerra and Saxena (1998) use Markov Switching Models (MSMs), which make the probability of a crisis continuous and endogenous.

<sup>16</sup> For a comprehensive review on empirical literature, see Kaminsky, Lizondo and Reinhart (1997).

<sup>17</sup> Edwards (1989), Edwards and Montiel (1989), Edwards and Santaella (1993) and Frankel and Rose (1996)

<sup>18</sup> See Eichengreen, Rose and Wyplosz (1996), Sachs, Tornell and Velasco (1996), Kaminsky, Lizondo and Reinhart (1997) and Cerra and Saxena (1998) for construction of this variable.

Radelet and Sachs(1998b) define a financial crisis as a *sharp shift from capital inflow to capital outflow between year t-1 and year t.*

A banking crisis could be defined in either of the two ways: financial distress meaning a situation of insolvency of banks, or financial panic referring to illiquidity in the banking sector. A run on the bank occurs when individual depositors withdraw money from the bank because they fear that “other depositors” are withdrawing money, and not because banks have made bad investments. This immediate withdrawal of funds by all depositors makes the banks illiquid, and the bank run a success.

Kaminsky, Lizondo and Reinhart (1997), Kaminsky and Reinhart (1996) and Kaminsky (1998) use the signals approach, where the idea is that economy behaves differently during crisis and tranquil times. The events that start a crisis will be present in “the leading indicators” before the actual crises and thus will help currency crises. This approach involves monitoring the evolution of a number of economic variables to find whether the variables are behaving in an anomalous way and thus are “signaling” a future crisis. This approach involves specifying a “threshold”, beyond which the variable sends a “signal” of future crisis—the signal could be an accurate one or give a “false alarm”. The 24-month before the crisis erupts is defined as “crisis” times, while the rest of the months are defined as “tranquil” times. The choice of threshold determination involves striking a balance between Type I (Rejecting  $H_0$  when  $H_0$  is true) and Type II (Accepting  $H_0$  when  $H_0$  is false) errors. The sizes of the errors are  $\alpha$  and  $\beta$ , respectively. If  $\alpha$  is 0 (the threshold is too lax), then the indicator will catch all the crises, but will give lots of false signals (noise). If  $\beta$  is 0 (the threshold is too tight), the indicator will never issue a false signal, but it will miss all the crises. Hence, for each variable, the critical region is selected so as to minimize the noise-to-signal ratio:

$$\text{Noise-to-signal ratio} = \frac{\beta}{1 - \alpha}$$

$$\text{where } (1 - \alpha) = \frac{\text{number of months with good signals}}{\text{number of months in the crisis window}}$$

$$\beta = \frac{\text{number of months with bad signals}}{\text{number of months outside the crisis window}}$$

where goods signals are the signals inside the crisis window and bad signals are the signals that are outside the crisis window, and the crisis window is the 24-months preceding the crises.

The most common leading indicators used in the literature are:

1. Over-borrowing cycles: M2 multiplier, domestic credit/GDP, financial liberalization;
2. Bank runs: Bank deposits;
3. Monetary Policy: “excess” M1 balances;

4. Balance of Payments problems: exports, imports, terms of trade, real exchange rate, reserves, M2/reserves, real interest rate differential, world real interest rate, foreign debt, capital flight (deposits of domestic residents in BIS banks) and short-term foreign debt/total foreign debt;
5. Growth slowdown: output, domestic real interest rate, lending /deposit rate ratio, stock prices.

The following shocks signal vulnerability to a crisis:

1. Since crises are preceded by over-lending cycles, signals are associated with large positive shocks to the M2 multiplier, the domestic credit /GDP ratio, excess real M1 balances, and M2/reserves, and high levels of foreign debt.
2. Problems in the capital account can worsen if foreign debt is concentrated at short maturities and there is capital flight. So large positive shocks to these indicators are associated with possible future crises.
3. Large positive shocks to the lending/deposit interest rate ratio and to real interest rates are taken as signals of crises.
4. Large negative shocks to deposits warn of future financial fragility.
5. The weak external sector is captured by large negative shocks to exports, the terms of trade, the real exchange rate and reserves and large positive shocks to imports, the real interest rate differential, and the world real interest rate.
6. The recessions are captured by large negative shocks to output and to the stock market.

## **8. Capital Control: A Remedy?**

The current crisis in Asia has renewed an old debate on whether a country, especially the emerging economies like Thailand, Malaysia, and Indonesia, should limit the inflow and outflow of capital as its economy is growing. People are alarmed by the size of the speculative attacks on local currencies of these countries and the possible damages caused by a sudden outflow of capital on the central bank's foreign reserve stock and the financial and real sides of the economy. All these countries, after months of attacks on their currencies and massive depletion of the reserve stocks, eventually gave up their fixed exchange rate regimes. In the nineties, while these countries were growing impressively, they attracted large amounts of capital from investors all over the world. In 1997, as the prospect of devaluation became more and more likely, everyone tried to move his/her capital out of these countries as soon as possible. That created a huge swing in the direction of movement of capital. While in 1996, the 5-Asian economies (South

Korea, Indonesia, Malaysia, Thailand and the Philippines) received net private capital inflows amounting to \$93billion, in 1997, they experienced an estimated outflow of \$12.1billion, a turnaround in a single year of \$105billion, amounting to more than 10% combined GDP of these economies (Rodrik 1998).

The ease of capital movement across the borders of the countries, which was at a time regarded as the main reason for attracting capital which is used for domestic investment and growth, allowed foreign investors to move their capital out in 1997, and facilitated speculative attacks. It was therefore straightforward to blame these currency speculators and question the wisdom of allowing capital movement in the first place. In fact, Malaysia was the first country in the current crisis (and the only one so far) to turn to a strict control on inflow and outflow of capital.<sup>19</sup>

In the following sections, we will present several issues about capital control and arguments for and against capital control. Before we do that, let us present some background material.

### *8.1 Capital Account Liberalization and Currency Crises*<sup>20</sup>

As mentioned above, in the Mundell-Fleming model for a small open economy with a fixed exchange rate and perfect capital mobility, the money supply that equilibrates the money market is given exogenously. This means that such an economy has no independent monetary policy. Any attempt by the central bank to raise the domestic interest rate above the world rate (plus a risk premium) will invite foreign capital inflow while any attempt to lower the domestic rate below the world rate will lead to capital outflow. On the other hand, if there is a change in the world interest rate, the domestic rate has to change accordingly. As a result, it is argued that there is inconsistency between the policy of simultaneous currency pegging and capital account liberalization for small open economies.

As a matter of fact, all the Asian and Latin American countries that experienced currency crises had various degree of capital account liberalization prior to the crises. A good example is Thailand. The passage of the Bangkok International Banking Facility in 1992 had resulted in a surge in foreign debts, a significant percentage of which went to the housing market. The eventual collapse of the housing market has contributed to the crisis in 1997.<sup>21</sup>

In trying to apply the Mundell-Fleming model to explain the link between capital account liberalization and currency crises for these Asian and Latin American countries, three related points can be noted. First, for most countries, capital mobility is far from perfect: There are transactions costs, information asymmetry, heterogeneity between domestic

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<sup>19</sup> Malaysia adopted this new policy on September 1, 1998.

<sup>20</sup> IMF (1998) provides further discussion of the theoretical links between capital account liberalization and financial crises.

<sup>21</sup> See Wong (1998) for a theoretical model.

and foreign assets, and administrative requirements. Because of the friction caused by these factors, domestic monetary policy cannot be effective, and domestic interest rates can deviate from foreign interest rates.

Second, not all currency crises reflect inconsistent domestic policies. As the second-generation models emphasize, crises can be self-fulfilling. This seems to be what the ERM breakdown of 1992 suggests.

Self-fulfilling currency crises can be due solely to the actions of speculators, but the existence of domestic difficulties and huge external debts can also trigger self-fulfilling crises. In particular, when an economy is showing signs of difficulties, investors would want to move their capital out of the country and foreign lenders would refuse to provide more loans.

Third, most of these countries experienced not only a currency crisis but also a bank crisis. With the imperfection of and lack of sufficient supervision in the domestic banking system, the ability of domestic banks and financial institutions to borrow from abroad makes the economy vulnerable. Both overborrowing (from abroad) and overlending (to domestic investors) could occur, and any widespread failure of some important sectors could trigger loss of investors' confidence, bank run, and financial crisis. On the other hand, if the problems of the domestic financial institutions are confined to the domestic economy so that foreign lenders regard these problems as short term, domestic financial institutions could raise new capital from abroad to help them solve the illiquidity problems.

## *8.2 A Historical Look at the Capital Account Liberalization*

Exchange rate restrictions were unheard of in the period before World War I. Even during the war, pressures on exchange rate were easily avoided by official reserve holdings and credit operations. The stabilization of exchange rate was relatively easier as there were no historical memories of wars leading to severe realignments. The most memorable war was Franco-German war of 1870, which did not affect the currency of victorious nation, while leaving the currency of the defeated country depreciated by a mere 3½ %.

The failure to establish international monetary stability during the inter-war period led to trade restrictions and capital controls. The sentiments did not change even after World War II. Controls in the post World War II were generally targeted to achieve balance of payments objectives or as a part of broader economic development strategies (in addition, there were restrictions on current international transactions). The exchange controls in the UK were designed to protect sterling in the face of a weak balance of payments problem. The controls in the US in the 1960s were aimed at improving a weak balance of payments by preventing capital transfers abroad. The controls in Japan and France ensured that savings were invested at home than abroad, while those in Germany and Switzerland were aimed at restricting capital inflows to prevent the exchange rate from appreciating.

These restrictions were consistent with members' obligations under the IMF's Articles of Agreement. For example, Article IV, Section 3, states that "Members may exercise such controls as necessary to regulate international capital movement." The rationale was to prevent short-term equilibrating capital movements rather than long-term ones.

However, by 1958, the current account restrictions were removed in Western Europe and industrial countries waited until the end of 1970s to remove the capital controls. The UK suspended all exchange controls in 1979, while Japan dismantled restrictions on capital movements in 1980, Australia and New Zealand in 1983, the Netherlands in 1985, France Sweden and Denmark in 1989, Norway, Belgium and Luxembourg in 1990, Finland and Austria in 1991, Portugal and Ireland in 1993 and Iceland in 1994.

Some of the developing nations have been liberal on capital account, like the Middle East oil exporting countries, Singapore, Hong Kong, Panama and Liberia. Indonesia opened its capital account in 1970, while Uruguay maintained a liberal capital account for a number of years.

## **9. Capital Account Control: Some Conventional Arguments and Counter-arguments**

Capital account control or liberalization is an old issue. Many arguments have been suggested to support capital account control, but many have also been made to argue for capital account liberalization.<sup>22</sup> We present some of the more traditional ones here. In the next sections, we will focus on those that are more relevant to the current Asian crisis.

### *9.1 Volatility of Short-Term Capital*

Proponents of capital controls argue that *controls help limit volatile short-term capital flows* (avoiding balance of payments crises, exchange rate volatility, etc) and provide greater independence of interest rate policy. Financial markets are very liquid and react quickly to shocks, while the real economy is slow to react due to price and wage rigidities and investment irreversibility. Tobin (1978) and Dornbusch (1986) argue that this differential speed of adjustment, together with exogenous excess volatility in financial markets, may induce excess exchange rate volatility (over shooting, bubbles, etc) with negative effects on real economic activity. While Tobin proposes "throwing sand in the wheels" of short-run capital flows by imposing a uniform tax on all foreign exchange transactions, which would discourage very short-term capital flows, but with negligible effects on long run ones, Dornbusch suggests adoption of measures such as dual exchange rate systems, which would partially protect the real economy from fluctuations in the financial markets.

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<sup>22</sup> Some more discussions can be found in Mathieson and Rojas-Suarez (1992), Johnston and Ryan (1994), and Grilli and Milesi-Ferretti (1995).

Opponents of capital controls argue that controls are particularly ineffective in preventing short-term movements, and the degree of insulation of monetary policy is therefore very limited. Large capital movements tend to occur when interest rates and exchange rates are out of line with fundamentals and therefore indicate the need for more timely adjustments in exchange rates and interest rates. Since it is difficult to distinguish between short-term and long-term investment and also between direct and portfolio investment, hence imposing controls on short-term inflows could crowd out the long-term foreign investment.

## 9.2 *Protection of Foreign Reserves*

Proponents of capital controls argue that ***controls support the balance of payments by protecting the foreign exchange reserves by preventing outflows of domestic savings and capital flight.*** Unstable macroeconomic and political environment in many developing economies can reduce the expected private returns from holding domestic financial instruments, and hence risk averse savers may prefer to hold a significant portion of their wealth in foreign assets that are perceived to yield higher or more certain real returns. Controls help retain domestic savings by reducing the return on foreign assets through interest equalization tax or by raising the costs of moving funds abroad) and by limiting access to foreign funds.

Opponents of capital controls argue that because of the scope for avoidance through trade and other channels, capital controls are ineffective in preventing outflows, but can discourage inflows and may not necessarily protect the balance of payments. In addition, even if capital controls limit the acquisition of foreign assets, they may still be ineffective in increasing and sustaining the availability of savings for domestic capital formation. If domestic financial instruments carry relatively uncertain and low real rates of return and residents cannot acquire foreign assets, they often respond by reducing their overall savings or by holding their savings in inflation hedges such as real estate or inventories.

## 9.3 *Limitations on Foreign Ownership of Domestic Assets*

Proponents of capital controls argue that ***controls limit foreign ownership of domestic factors of production.*** These controls prevent either unwarranted depletion of a country's natural resources or the emergence of a monopoly in a particular industry. Equity and income distribution considerations are often cited as justifications for limiting ownership of domestic factors of production and real estate.

Opponents of capital controls view controls as discouraging foreign direct investment. FDI may be an important source of external finance and the acquisition of new technologies.

## 9.4 *Taxation of Domestic Financial Activities, Income and Wealth*

Proponents of capital controls argue that ***controls are needed to maintain the authorities' ability to tax financial activities, income and wealth.*** Since domestic



residents have an incentive to shift some portion of their financial activities and portfolio holdings abroad to avoid taxes on income from interest and dividends, controls are viewed as limiting holdings of foreign assets or to gaining information on the scale of residents' external asset holdings so that these holdings can be taxed.

Opponents of capital controls argue that governments can impose measures such as high reserve requirements that raise the demand for money and, hence, the inflation tax base. But this is detrimental in the long run as it raises rates of interest and hence discourages capital accumulation. Also, restricting foreign investment could slow market development, domestic investment and growth. Controls often breed bribery and rent seeking activities; this mentality could spill over to tax system and provide avenues for expansion of underground economies<sup>23</sup>.

### *9.5 Insulation of Domestic Structural Reform Programs from Foreign Shocks*

Proponents of capital controls argue that ***controls help in stabilization and structural reform programs***. An early opening of capital account can cause a real appreciation, because of high interest rates typically associated with a stabilization plan and increased real exchange rate volatility. These would make trade liberalization more problematic. The credibility of the stabilization program plays a key role in determining the consequences of free capital mobility. For e.g., if a stabilization program lacks credibility, the liberalization of the capital account could lead to currency substitution and capital flight, which could trigger a balance of payments crisis, devaluation and inflation. If the plan is credible, the high interest rates associated with a stabilization program may cause temporary large capital inflows. Sterilization of capital flows makes the interest rates remain high, encouraging further inflows and hence imposing a quasi-fiscal cost on the central bank. In the absence of sterilization, increase in money supply could jeopardize control of inflation. If nominal exchange rate is allowed to appreciate, it may deter trade reforms aiming at lower barriers to imports. Even if there was uncertainty about the likely success of the reform program, a capital inflow could occur if residents temporarily repatriate funds abroad to take advantage of the high real rates of interest.

Opponents of capital controls feel that there are advantages in liberalizing the capital account simultaneously with domestic financial sector reforms. Capital account liberalization will reinforce policies to liberalize domestic interest rates and the domestic economy more generally and to help create a competitive and efficient financial system. The increase in net private capital inflows, which tend to accompany the capital account liberalization, will help to support balance of payments during the period of domestic financial sector liberalization. In addition, capital controls reduce the credibility of government promises that international investors will be able to repatriate their funds.

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<sup>23</sup> There is a huge body of literature (e.g. Calvo, Leiderman and Reinhart, 1995, and Johnston and Ryan, 1994) that provides support for the argument that controls breed corruption and that they are easy to get around with, e.g. Tax on short term borrowing is effective only in the short run, as private sector quickly finds ways to dodge those taxes through over- and under-invoicing of imports and exports and increasing reliance on parallel financial and foreign exchange markets.

An open capital account, with a threat for capital outflows, and of short-term capital flows in either direction, could have a disciplining effect, making the authorities careful in their macroeconomic management.

### 9.6 *Short-term Relief from Speculative Attacks*

While proponents of capital controls argue that ***control program may help government buy time to move the fundamentals to a region where self-fulfilling speculative attacks are less likely***, the opponents hold the view that the possibility that controls might be introduced in the future can generate attacks where none would be observed otherwise.

### 9.7 *Lowering Local Interest Rates*

Proponents of capital controls argue that ***controls help reduce the local interest rates without allowing capital outflows***, so that investment could be encouraged. The opponents feel that capital controls are perceived as an additional risk factor by the investors. Hence, instead of reducing interest rates and limiting outflows, controls would require higher risk premia, and so would lead to higher interest rates to compensate for higher risk.

## 10. The Current Debate on Capital Account Liberalization

Some argue that controls have played an important role in virtually all systems of pegged exchange rates since WW II<sup>24</sup>. The controls give authorities some autonomy to preserve the peg, some space to organize orderly realignments and make it easier to ward off the speculative attacks. Others argue that capital controls were always easy to evade and never played an important role in limiting exchange rate flexibility<sup>25</sup>. Dooley (1995) argues that controls have influenced yield differentials across countries, but there is no evidence that controls have helped governments achieve policy objectives, such as avoiding real appreciation, or that controls have enhanced welfare as the theory suggests. In addition, Johnston and Ryan (1994) and Grilli and Milesti-Ferretti (1995) find empirically that controls do not affect economic variables, like volume and composition of private flows, changes in foreign reserves or level of exchange rate. In fact, controls are associated with higher inflation and lower real interest rates.

Eichengreen et al (1996b) show that capital controls make a difference. Using data for 20 countries<sup>26</sup> over the period 1962-92, they show that capital controls have been associated with significant differences in the behavior of macroeconomic variables such as budget deficits and money growth rates, but not in case of interest rates and foreign exchange

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<sup>24</sup> See Wyplosz (1986) and Giovannini (1989)

<sup>25</sup> See Gros (1987), Gros and Thygesen (1992). However, Johnston and Ryan (1994) argue that they have been effective in developed nations, vis-à-vis developing countries.

<sup>26</sup> The countries included are: US, UK, Austria, Belgium, Denmark, France, Germany, Italy, the Netherlands, Norway, Sweden, Switzerland, Canada, Japan, Finland, Greece, Ireland, Portugal, Spain, Australia, South Africa, India and South Korea. However, their study is concentrated on EMU.

reserves. However, Vinals (1996) argues that this is an evidence of controls being ineffective. In fact, Eichengreen, et al (1996b) find that periods when capital controls are effective are associated with inflation and high trade deficits. This leads Vinals (1996) to argue that capital controls help authorities follow expansionary policies. Since such policies are associated with fundamental imbalances, capital controls eventually lead to exchange market turbulence and to unavoidable devaluations. Hence, controls make “self-fulfilling” attacks justified.

In short, Vinals (1996) believes that “capital controls do not seem to facilitate the defense of exchange rate stability in the short-run but continue to undermine it in the medium term through relaxation of policy discipline and coordination.”

Reinhart and Smith (1997) argue that capital controls of the 1990s are asymmetric (they are imposed to discourage inflows) and are temporary. The temporariness is either pre-announced or the market rightly perceives them to be temporary as they are counter-cyclical. Even if they are intended to be permanent, they end up being temporary as investors find ways to circumvent the controls, making them ineffective. They study the welfare consequences of taxes on capital inflows, and study the shock to the world interest rate that generates a surge in capital inflows. They find that if countries let the controls in effect for longer time period than the world interest rate is in effect, then it becomes costly because it causes the domestic real interest rate to rise once the temporary shock disappears, offsetting the benefits associated with smoothing the shock.

Stiglitz (1998) argues that increase in capital flows to developing countries increased the vulnerability of these economies to crises. He suggests some necessary, but not sufficient, conditions to deal with the capital flow problems. First, there should be more information and greater disclosure, which would avoid triggering and exacerbation of crises. But the caveat is that markets don't fully incorporate all the information as the world is dominated by private-to-private capital flows. Second, emerging markets could create more robust financial markets, more transparent systems of corporate governance, and less error-prone macroeconomic policy. But again, developing countries have less capacity for financial regulation and greater vulnerability to shocks. Third, intervention in case of short term flows, which bring no ancillary benefits, besides trade credits, in an economy where saving rates are already high, but increase the vulnerability of an economy.

Krugman (1998c) also suggests that temporary capital controls could bring a respite for the suffering Asian countries<sup>27</sup>. However, Friedman (1998) thinks that this is the worst possible choice, as the emerging countries need external capital (and the discipline and knowledge that comes with it) to make the best use of their capacities. He suggests either a currency board arrangement or a floating exchange rate. Under the former, a balance of payments deficit automatically shows up in a decrease in high-powered money, and hence the discipline of external transactions is maintained, which is not possible under a pegged exchange rate system. Under the latter, changes in exchange rate absorb the

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<sup>27</sup> Krugman (1998d) became defensive about the capital controls when Prime Minister of Malaysia, Mahathir, imposed controls in Malaysia shortly after his article emphasizing their importance.

pressures that would otherwise lead to a crisis in a pegged exchange rate while maintaining domestic monetary independence. According to Friedman, the present crisis is not a result of market failure, but that of governments intervening in or seeking to supercede the market both internally via loans, subsidies or taxes and other handicaps, and externally via the IMF, the World Bank and other international agencies.

While Rodrik (1998) advocates capital controls because governments otherwise have to carry out policy based on “what 20 or 30 foreign exchange dealers in London, New York and Frankfurt” think, Henderson (1998) is of the opinion that “foreign exchange markets are a continuing, minute-by-minute election in which everyone with wealth at stake, including residents of the country, gets to vote, an election in which the winners are those countries whose governments have the most pro-growth policies”. In his opinion, capital controls allow governments to hide the damage their policies do, which leads them to even-more-damaging policies.

Rodrik (1998) and Bhagwati (1998b) argue that free trade is not the same thing as free capital flows. Rodrik thinks that financial markets are different from goods and services markets in that the former are prone to market failures arising from asymmetric information, incompleteness of contingent markets and bounded rationality. In fact, Bhagwati suggests that countries like India and China, which still haven’t shed their controls on capital should not do that until they have attained political stability, sustained prosperity and substantial macroeconomic expertise. They should instead concentrate on internal reforms like privatization and external reforms like freer trade. They should allow targeted convertibility for dividends, profits and invested capital for direct foreign investment, as this brings in capital and skill and is more stable than short-term capital flows.

Unlike Stiglitz and Krugman, Bhagwati feels that the free capital economies, which are currently afflicted by panic-driven outflows, should not jump into capital controls. These countries need to restore the confidence. Capital controls, such as in Malaysia, can help lower interest rates to boost the economy, but if diffidence increases, who will borrow to invest?

Like Rodrik, Bhagwati (1998a) feels that the pro-capital free movement has dominated because of the self-interest of Wall Street financial firms, which see the free capital mobility world as an arena to make money. “Wall Street has an exceptional clout with Washington because of networking of like-minded luminaries among the powerful institutions—Wall Street (Altman went from Wall Street to Treasury and bank), the Treasury Department (Secretary Rubin is from Wall Street), the State Department, the IMF and the World Bank (James Wolfensohn, President of the World Bank, was as investment banker; Ernest Stern, managing director of J.P. Morgan, served as an acting president of the World Bank) most prominent among them”.

## 11. Sequencing Capital Account Liberalization<sup>28</sup>

It is widely accepted that capital account liberalization benefits economic growth: by improving the ability to tap savings globally at lower costs; enhancing the domestic agents' portfolio choices; improving resource allocation through increased competition for financial resources; and increasing the availability of resources to support investment, and to finance trade and other activities. Michel Camdessus, Managing Director of the IMF, believes that “the trend towards capital account convertibility is “irreversible”, and all countries have an important stake in seeing that the process takes place in an orderly way.” Since the benefits from free capital markets are undeniable, then the costs and risks need to be minimized. Stanley Fisher, IMF First Deputy Managing Director, feels that there is a consensus that “liberalization without a necessary set of preconditions in place may be extremely risky.” These preconditions are (IMF Survey 1998):

- a sound macroeconomic policy framework; in particular, monetary and fiscal policies that are consistent with the choice of exchange rate regime;
- a strong domestic financial system, including improved supervision and prudential regulations covering capital adequacy, lending standards, asset valuation, effective loan recovery mechanisms, transparency, disclosure, and accountability standards, and provisions ensuring that insolvent institutions are dealt with promptly;
- a strong and autonomous central bank; and
- timely, accurate and comprehensive data disclosure, including information on central bank reserves and forward operations.

The optimal sequencing of capital account liberalization is complicated. Since all countries are different—in their levels of economic and financial development, in their existing institutional structures, in their legal systems and business practices, and in their capacity to manage the liberalization process—there is no single rule for sequence of steps to undertake in financial and capital account liberalization and no guideline for how the process should take. There have been differing views, however, about the sequencing issue. While some believe that capital account should be liberalized following the liberalization of the current account and the domestic financial system, others hold the opinion that there should be simultaneous liberalization of the current and capital accounts. Liberalization of direct investment is seen as a significant part of the real sector reforms, while liberalization of portfolio investment flows is coordinated with financial sector reforms and the development of financial markets and instruments. However, there are certain advantages in coordinating the liberalization in the financial sector and capital accounts:

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<sup>28</sup> This section draws mainly from Johnston (1998), Johnston, et al (1997), IMF (1998), Johnston and Ryan (1994).

- The freedom of international capital flows reinforces the policies to liberalize domestic interest rates and helps create a competitive and efficient domestic financial system. The institutional reforms required could be mutually beneficial to both; e.g., creation of efficient money and foreign exchange markets.
- Since capital account liberalization encourages the return of flight capital and eliminates impediments to inflows of foreign investment, it could support the balance of payments during periods of financial sector liberalization, when lifting of domestic credit controls initially leads to rapid increase in bank credit than deposits, increasing domestic resource pressures as banks run down holdings of excess liquidity, and weaken the balance of payments.
- Many developing and transition economies already have a de facto high degree of currency convertibility, and openness of these economies means that even small changes in the invoicing or timing of exports and imports can result in movements of foreign exchange relative to GDP. Maintaining controls under these circumstances results in pronounced balance of payments statistical discrepancies, which complicate the interpretation of underlying economic trends, and obscures the interrelationships between the domestic and external financial conditions.
- Since the preconditions for capital account liberalization do not seem more onerous than those for domestic financial liberalization, hence the two should take place simultaneously. The direct controls on interest rates and credits need to be replaced by indirect controls, as there is scope for avoidance of direct controls through capital movements. Hence, the adoption of indirect monetary controls should either precede or occur simultaneously with liberalization of capital account. In fact, these reforms should take place early in domestic financial liberalization, as interest rates need to be market determined, and opening of capital account may have little impact on interest rate policy.

If the sequencing is not followed appropriately, then there are potential risks from opening the capital account. Continued reliance on credit controls or high non-interest bearing reserve requirements for monetary controls, and failure to address properly inefficiencies in domestic financial markets resulting in wide spreads between deposit and lending rates, may encourage borrowing abroad rather than domestically. Inappropriate incentives for foreign borrowing may also be provided by the tax system, leading to an overvalued exchange rate and excessive external debt burden.

Even if domestic financial and capital account liberalization do not proceed simultaneously, one should clearly recognize that there is a danger of removing most restrictions on capital account transactions before major problems have been addressed in domestic financial system. The problems include: inadequate accounting, auditing and disclosure practices in the financial and corporate sectors, which weaken market discipline; implicit government guarantees, which encourage excessive, unsustainable capital inflows; and inadequate prudential supervision and regulation of domestic financial institutions and markets, which create scope for corruption, connected lending

and gambling for redemption. If these problems are severe, and still countries open their capital accounts, they run the risk of a crisis. Hence, countries should work towards removing these distortions, when they open their capital accounts. Reliance on temporary selective controls is recommended as a part of the financial regulatory framework. Given the destabilizing effects of short term flows, there may be a case for liberalizing longer term flows, particularly, foreign direct investment, ahead of short term capital inflows. Foreign direct investment has its own economic benefits, including transfer of technology and of efficient business practices.

Hence, capital account liberalization is not an “all or nothing” affair. A comprehensive liberalization of capital transactions and transfers does not mean an abandonment of all rules and regulations connected to foreign exchange transactions. In fact, the individual components of the capital account can be, and usually are, liberalized selectively. Certain areas need to be regulated and strengthened:

1. Prudential regulations related to nonresidents and foreign exchange transactions and transfers.
2. Measures designed to prevent tax evasion and money laundering
3. Reporting by market participants ensuring the timely and accurate compilation of monetary, external debt and balance of payments data.
4. Strengthening the banking sector: Banks are the major intermediaries and channel for capital flows in many developing countries. Their interest rates and credit policies may influence the structure of domestic interest rates and financial markets, and hence the composition of capital flows. For example, wide bank deposit/lending spreads may promote foreign corporate borrowing; or the underpricing by banks of credit and maturity transformation risks may distort the yield curve, and thus the composition of flows. As a result, banking systems may not only be faced with problems of insolvency and illiquidity, but the underpricing of credit and maturity risks can hinder the development of longer term markets due to an underpricing of longer term risks in the economy. Allowing weak banks to expand their balance sheets will lead to banking crises. The reforms for weak banks should focus on capital adequacy, loan loss provisioning, credit assessment, liquidity management, and increasing foreign participation.

## **12. Measures to discourage capital inflows**

Latin America and the Asian countries have been the biggest recipients of capital flows in the 1990s. This does not mean that these countries had an open capital account. They all had some kind of intervention at some point or the other. All the monetary authorities met these inflows by intervening in the foreign exchange market. This would be evident from the following table (table 1 from Calvo, Leiderman and Reinhart, 1995)

| Year                 | Balance of Goods<br>Services, and<br>Private Transfers1/<br>\$ billion | Balance on Capital<br>Account plus Net<br>Errors & Omissions2/<br>\$ billion | Changes in<br>Reserves3/<br>\$ billion |
|----------------------|------------------------------------------------------------------------|------------------------------------------------------------------------------|----------------------------------------|
| <b>Latin America</b> |                                                                        |                                                                              |                                        |
| 1985                 | -5.5                                                                   | 6.5                                                                          | -1.0                                   |
| 1986                 | -19.8                                                                  | 13.2                                                                         | 6.6                                    |
| 1987                 | -11.8                                                                  | 15.0                                                                         | -3.2                                   |
| 1988                 | -13.4                                                                  | 5.7                                                                          | 7.7                                    |
| 1989                 | -10.2                                                                  | 12.7                                                                         | -2.6                                   |
| 1990                 | -8.5                                                                   | 23.6                                                                         | -15.1                                  |
| 1991                 | -20.5                                                                  | 38.9                                                                         | -18.4                                  |
| 1992                 | -34.6                                                                  | 53.4                                                                         | -18.8                                  |
| <b>Asia</b>          |                                                                        |                                                                              |                                        |
| 1985                 | -18.7                                                                  | 22.7                                                                         | -4.0                                   |
| 1986                 | -1.1                                                                   | 25.5                                                                         | -24.4                                  |
| 1987                 | 14.8                                                                   | 24.7                                                                         | -39.5                                  |
| 1988                 | 2.6                                                                    | 8.7                                                                          | -11.3                                  |
| 1989                 | -8.1                                                                   | 17.1                                                                         | -9.0                                   |
| 1990                 | -10.0                                                                  | 31.7                                                                         | -21.7                                  |
| 1991                 | -10.2                                                                  | 48.9                                                                         | -38.7                                  |
| 1992                 | -25.2                                                                  | 46.3                                                                         | -21.1                                  |

1/ Data for Western Hemisphere and Asia from IMF's World Economic Outlook

2/ A minus sign indicates a deficit in the pertinent account. Balance on goods, services and private transfers is equal to the current account balance less official transfers. The latter are treated in this table as external financing and are included in the capital account.

3/ A minus sign indicates an increase.

This table clearly shows that in response to the capital flows, the monetary authorities intervened in the foreign exchange markets to sterilize the inflows. This sterilization process has been discussed below.

Notwithstanding the desire to have capital inflows into the country, they have been a source of concern for most countries that have experienced huge inflows. They have some destabilizing side effects, like appreciation of local currency may lead to a loss of competitiveness for exports, hence giving rise to inflation; lack of proper intermediation of capital flows could lead to resource misallocation; short-term "hot money" flows could lead to reversal at short notice causing a financial crisis. The usual step taken by the central banks to avoid currency appreciation and inflation is to "*sterilize*" the capital inflows. To look at the sterilization process, let's look at the balance sheet of the central bank.

| Assets                | Liabilities        |
|-----------------------|--------------------|
| Domestic Credit (DC)  | Monetary Base (MB) |
| Foreign Currency (FC) |                    |

In the event of capital inflows, there would be a high demand for domestic currency, which would lead to appreciation of domestic currency and loss of competitiveness of exports. To prevent this appreciation, the central bank buys foreign currency (FC), increasing the monetary base (MB) in the economy. Higher money supply in the economy would lead to higher inflation. To prevent this, the central bank wants to sterilize these inflows by keeping the MB constant. This is done by decreasing the domestic credit (DC) through the classical form of open market operation (OMO), i.e., selling treasury securities. But the problem is that this leads to an increase in rate of



interest, which leads to further increase in capital inflows<sup>29</sup>. Unfortunately, most developing countries lack the tools to run this OMO or find it too costly, since the financial system is not fully liberalized and issuing securities to mop up the inflowing liquidity places a heavy debt-service burden on the government or central bank. The central bank loses when it raises its funds by investing in foreign assets, which has lower interest rates compared to what it has to pay on the bills that it sells. This could require re-capitalization of the central bank. The risks increase when much of the capital inflows are in the form of short-term portfolio investment, which is more likely to reverse in case of change of sentiments compared to foreign direct investment.

The impact of freedom of capital movements on monetary and exchange rate policy can be seen through the covered interest parity, which is the consequence of arbitrage between short-term domestic and foreign interest rates, and the discount on the currency in the forward exchange market. The covered interest parity is:

$$i_d = i_f + F_d$$

where  $F_d = \frac{e^f - e^s}{e^s} \times 100$ ,  $i_d$  is the domestic interest,  $i_f$  the foreign interest rate of the same maturity and  $F_d$  the forward discount for that maturity,  $e^s$  is the rate of exchange (units of domestic currency in terms of foreign currency) in the spot exchange market, and  $e^f$  the forward exchange rate on the date of maturity of the interest rate contracts. Hence, where the foreign interest rate and forward exchange rate are predetermined, a country could determine the domestic interest rate or the spot exchange rate, but not both.

With greater capital mobility, short-term interest rates will be determined by the covered interest rate parity condition. If both interest rates and exchange rates are inconsistent with this condition, then there would be incentives for significant short-term capital flows. Hence, monetary and exchange policies are constrained to achieve different macroeconomic targets, when the capital account is open. On the one hand, if monetary policy targets inflation, then exchange rate is not free to be used as an expenditure-switching instrument to achieve current account balance objectives; fiscal policy could be used to achieve savings/investment balance. On the other hand, if exchange rate is targeted to achieve current account balance, or if exchange rate is fixed, monetary policy would have little autonomy to achieve domestic stabilization objectives or to manage the consequences of short-term capital inflows.

Hence countries turn to less conventional measures, like widening the exchange rate bands, intervening in forward exchange markets, or imposing capital controls like variable deposit requirements and interest equalization taxes on foreign borrowings. Then, there are “belt-and-braces” strategy, where indirect monetary policy instruments are combined with some capital controls, and “sand-in-the-wheel” policies, where

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<sup>29</sup> This assumes that capital is perfectly mobile and that domestic and foreign bonds are perfectly substitutable. But OMO is often considered a temporary means of sterilization, which often fails in the presence of persistent inflows.

controls have targeted short-term capital flows, which have often been perceived by authorities as volatile and destabilizing.

**Supplementary Sterilization Measures<sup>30</sup>:** There are several measures that could be used instead of the OMO to control the money supply. Each has its own advantage and disadvantage, as discussed below.

- *Discount Policy and Directed Lending:* This is used to increase the cost or restrict the use of central bank credit. But this policy tool loses its flexibility when rediscounts and loans granted by the central bank are often automatic tools for priority lending in the developing nations. The rediscount ratio cannot be adjusted often, as it would be counterproductive to the goal of providing cheap credit to targeted sectors. So for this to be an effective tool, subsidies through the discount windows will need to be eliminated. Even if that is not the case, still central bank would not like to change the rediscount ratio as the elasticity of the demand for credit is low (i.e. demand for credit would not fall in response to higher rates of interests)

The advantage of changes in discount rate over the OMO is that they would entail a smaller fiscal cost, since discount rates are lower than the market rates. These changes don't impact the local money markets, since they are used as rediscount facilities. This weak link between the discount rate and bank lending rate helps make the sterilization process a success, as the market rates are not raised, which prevents further inflows of capital.

- *Reserve Requirements:* The other way of limiting the credit is through an increase in the statutory reserve requirement, e.g., Columbia followed in 1991. These reserves are either remunerated (where the central bank pays interest on the deposits) or non-remunerated (where commercial banks don't get any return). If the interest paid is close to the market rates, then the cost is similar to open market sales of interest-bearing instruments.

However, this tool has its own limitations. Sometimes banks already hold excess reserves. Then, in the presence of weak banks (which are plenty in developing countries), it would be difficult to implement. Some countries find it hard to raise it further, as it could be already at a high level (in response to sterilizing the flows previously as in Korea and Columbia). Frequent changes could disrupt the efficient management of bank portfolios and send a wrong signal about the banking system. They are considered a tax on banks, and hence could lead to disintermediation (financial activity going outside of the banking sector), which could weaken the control of central bank.

- *Government Deposits:* The public sector deposits could be shifted from commercial banks to the central bank, especially when they form a large part of banks' deposits as in Malaysia and Thailand. As long as the interest paid on government's deposits is

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<sup>30</sup> This section draws from Lee (1997)

lower at the central bank, this measure has an advantage of not imposing fiscal or quasi-fiscal costs<sup>31</sup>.

This tool has a disadvantage though, similar to changes in reserve requirement. If these transfers are frequent, then it would be difficult for banks to manage their portfolios efficiently. This tool is limited by the availability of government deposits, as the government deposits may be held at the central bank by law or some types of public sector deposits may not be within the government's control.

- *Foreign Exchange Swaps*: In the foreign exchange swap, the central bank agrees to sell the foreign exchange against the domestic currency and simultaneously agrees to buy it back at a specified date in the future, using forward exchange rate. Banks that buy the foreign currency could lend it to domestic residents or invest abroad, but the domestic monetary base gets reduced. It gives the banks an incentive to “export” the funds, hence leading to capital outflow to offset the inflow. This is done by pricing the swap in such a way that the difference between the spot and the forward rate is bigger than the interest rate differential between foreign and domestic markets.

The advantage of using swaps over the OMO is that they are highly flexible, and can be varied in length reflecting expectations about duration of capital inflows and the time period for which they need to be offset. Although swaps have a short maturity period, but they could be “rolled over” easily. Unlike the OMO, which require short-term government securities, they can be executed without them, which is helpful in case of countries not running budget deficits.

The swaps have their downside too. They can cause losses for the central bank when it gives favorable margins on interest rate differentials. The effect could be nullified if the foreign exchange sold by central bank is sold back against the local currency. This could become popular with commercial banks, but could be avoided if monitoring and supervision is strengthened, or there are restrictions on how banks can trade the swap proceeds.

- *Wider Exchange Rate Bands*: Widening exchange rate bands in response to capital inflows allows the exchange rate to appreciate, and import prices to fall. Hence, there is a downward pressure on inflation, which reduces the need to sterilize all the capital inflows. This band also increases the risk of devaluation and help reduce the inflow. A wider band gives central bank some flexibility for intervention, especially when there is a reverse in market sentiments.

On the downside, a wider exchange rate band could wrongly signal that the central bank wants to devalue the currency to make exports competitive instead of controlling inflation. Also, if wide changes in exchange rate are well anticipated, then they could provoke large inflows and outflows of capital.

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<sup>31</sup> When the central bank sterilizes, it issues high yielding government securities and acquires low yielding international reserves (e.g. U.S. Treasury Bills). This operation imposes a cost, which is often termed as quasi-fiscal cost.

- *Intervention in Forward Exchange Market:* The central banks could give the domestic investors the opportunity to “hedge” the value of their foreign investments by locking in a forward exchange rate through a forward exchange facility. This could encourage capital outflows. But this may be difficult to use in the absence of a well-developed forward markets.

However, this could be risky and might entail fiscal costs if the central bank incurs financial losses. The central banks have to be careful in not offering excessively favorable premiums above the existing interest differentials.

This tool could be made more effective by encouraging private sector’s demand for forward transactions, enhancing the liquidity and efficiency of the forward market. This was done in Korea by relaxing the documentation criteria for eligibility to make forward transactions.

- *Easing Restrictions of Capital Outflows:* The restrictions on capital outflows could be eased by easing surrender requirement on foreign exchange earnings, allowing local institutions to make investments abroad, or letting non domestic entities to issue local currency bonds in the domestic market. These measures would work if the restrictions had been effective to begin with. This could increase the overall efficiency of the investments made by local institutions, who diversify their portfolios internationally. Exporters can manage their foreign assets efficiently by being able to retain their foreign earnings. The local financial market would be developed if international organizations issue bonds. Remittance of profits and income is simplified, which is a positive signal, meaning that capital can be moved in and out easily, thereby lowering the risk premium on financial assets.

However, easing of capital outflows in practice has encouraged inflows as it increases the confidence in the exchange system.

- *Variable Deposit Requirements:* This measure requires that a certain percentage of foreign currency borrowed by the domestic residents has to be kept with the central bank in interest free, non assignable deposits for a fixed period. This is like a tax on foreign borrowing. It is like the non-remunerated requirement, but it is paid in foreign currency. It does not affect the rate of interest like the OMO, hence does not lead to further inflows.

The advantage is that it penalizes the short-term borrowings more severely, which are mostly perceived as destabilizing. The requirement could be higher on short-term borrowings, hence targeting the “hot money inflows” that are seeking short-term gains. Since the deposits are non-remunerated, hence there is no fiscal cost involved.

This measure has its own disadvantages. Borrowers find ways to circumvent these controls. There is resource misallocation. Borrowers can’t take advantage of lower interest rates in international markets, because the deposit requirement is like a cost,

and hence firms engaged in international trade are penalized. It not only hurts “speculative” investment, but also “genuine” investment.

- *Interest Equalization Taxes*: Unlike variable deposit requirements, this measure could have a direct impact on both inflows and outflows of capital. This is used to level the yields between foreign and domestic securities, discouraging domestic investors to buy foreign assets. Hence, it is tax on capital outflows. But, if it is imposed on capital inflows, then it could be referred to as “capital import tax”. It decreases the return on local assets for the foreign investors, while increases the cost of borrowing for domestic companies.

Its biggest advantage is that it can influence the exchange rate without changing interest rates or intervention in the currency markets. There is a debate about what the tax should be, i.e. should it be higher for short-term transactions than for long-term transfers, or whether public debts should be exempt. This measure has been used by a lot of countries, including the U.S.. However, it should only be used as a temporary measure, otherwise investors find ways to circumvent it.

The disadvantages are that it raises administrative costs of implementation, raises cost of capital and has the tendency to distort allocation of resources.

***Causes and Policy Responses to Capital Inflows***<sup>32</sup>: The threat of overheating in the wake of large capital inflows leads the policymakers to make difficult decisions on the magnitude, sequencing and timing of policy actions. These decisions need to be tailored to recipient country’s economic objectives, exchange rate regime, institutional constraints, and, especially, the causes and composition of the inflows. Since it is difficult to distinguish between temporary and sustainable inflows, judgements must be based on limited information.

There are three categories of causes of capital inflows:

1. autonomous increase in the domestic money demand function
2. increases in the domestic productivity of capital
3. external factors, such as falling international interest rates.

The first two domestic factors are referred to as “pull” factors and the third as “push” factors. The economic impact and the policy response to capital inflows depend on the forces driving them, as well as the recipient country’s exchange rate regime. Under a fully flexible exchange rate, capital inflows (irrespective of the driving force) would lead to appreciation of currency, a drop in the relative price of imported goods, and a shift in consumption away from nontradables—all of which tend to alleviate inflationary pressures. Ceteris paribus, the more flexible the exchange rate, the less likely it is that capital inflows would lead to inflationary pressures. However, under a managed float or a fixed exchange rate, the cause of capital inflows determines whether or not there would be inflationary pressure. If the inflows have been due to increase in money demand function, then they will not be inflationary. But if they increase due to other reasons, then

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<sup>32</sup> This sub-section draws from Haque, Mathieson and Sharma (1997)

foreign reserves will accumulate, which, in the absence of sterilization, would expand the monetary base, increase inflationary pressures and deteriorate external position.

The policymakers could get a rough idea for the cause of inflows from the financial indicators listed in the table below (table 1 from Haque, Mathieson & Sharma, 1997)

| <b>How financial indicators could shed light on capital inflows</b> |                                           |                                                                         |                                                                                        |
|---------------------------------------------------------------------|-------------------------------------------|-------------------------------------------------------------------------|----------------------------------------------------------------------------------------|
| <b>Indicator</b>                                                    | <b>Upward shift of money Demand curve</b> | <b>Increase in productivity of domestic capital (sustained inflows)</b> | <b>External factors; e.g. falling international interest rates (temporary inflows)</b> |
| <b>Asset Prices</b>                                                 |                                           |                                                                         |                                                                                        |
| Interest rates                                                      | Increase                                  | Increase                                                                | Decrease                                                                               |
| Yield Curve                                                         | Flattens                                  | ?                                                                       | Becomes steeper                                                                        |
| Exchange rate                                                       | Appreciates                               | Appreciates                                                             | Appreciates                                                                            |
| Equity prices                                                       | Decrease                                  | Increase                                                                | Increase                                                                               |
| Real estate prices                                                  | Decrease                                  | Increase                                                                | Increase                                                                               |
| <b>Inflation</b>                                                    | Decreases                                 | Increases                                                               | Increases                                                                              |
| <b>Monetary and credit aggregates</b>                               |                                           |                                                                         |                                                                                        |
| Real money balances                                                 | Increase                                  | Likely to decrease                                                      | Increase                                                                               |
| Base money                                                          | Increases                                 | Increases                                                               | Increases                                                                              |
| International reserves                                              | Increase                                  | Increase                                                                | Increase                                                                               |
| Bank credit                                                         | Likely to increase                        | Increases                                                               | Likely to increase                                                                     |
| Foreign currency deposits                                           | Decrease                                  | ?                                                                       | May decrease                                                                           |
| <b>Balance of payments</b>                                          |                                           |                                                                         |                                                                                        |
| FDI                                                                 | ?                                         | Increases                                                               | ?                                                                                      |
| Portfolio investment                                                | Increases, especially in Short term flows | Increases, in both short and long term flows                            | Increases, especially in short term flows                                              |

? indicates that the effect is uncertain.

The appropriate policy responses depend on the causes of inflows, as well as degree of flexibility allowed by the domestic institutional structure and the existing policy stance. It is easier to deal with disruptions caused by the inflows when countries follow relatively balanced macroeconomic policies. The upward pressure on exchange rate can be partly offset by accelerating the pace of trade and exchange liberalization, including easing controls on capital outflows. There are three other ways of dealing with the possible effects of large capital inflows: sterilized intervention, fiscal tightening and exchange rate appreciation. The optimal mix of instruments depends on the country's institutional structure and past policies. For e.g. non-availability of suitable instruments or insufficient development of financial markets could limit sterilized intervention. Fiscal policy is unwieldy for short-term demand management because of the associated formulation and implementation lags. Temporary capital controls could be another way to deal with huge capital inflows.

The appropriate use of each instrument for countries with *balanced macroeconomic policies* is shown in the table below (table 2 in Haque, Mathieson & Sharma, 1997).

**Instruments for managing capital inflows**  
**A matrix for countries with balanced macroeconomic policies**

|                            | <b>Upward shift of domestic Money demand curve</b>       | <b>Increase in productivity of domestic capital (sustained flows)</b>                                                                                                                          | <b>External factors-e.g. falling international interest rates (temporary inflows)</b>                                                                           |
|----------------------------|----------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Sterilization              | May be needed to smooth Fluctuations.                    | May be needed to smooth Fluctuations                                                                                                                                                           | Is appropriate                                                                                                                                                  |
| Exchange rate Appreciation | Equilibrium real effective exchange rate does not change | The warranted appreciation of the equilibrium real effective exchange rate can be achieved partly through nominal appreciation and partly through increases in the prices of non-traded goods. | Equilibrium real exchange rate need not change. Temporary nominal appreciation of the exchange rate may be warranted if there are constraints on sterilization. |
| Fiscal policy              | No policy response is required                           | Fiscal policy tightening is required, especially if the absorptive capacity of the economy is limited relative to the size of the inflows.                                                     | If the constraints on sterilization are too severe and the external competitive position is weak, then some fiscal tightening may have to be considered.        |

When inflows are induced by increase in money demand function (say, due to financial deregulation), no policy response is required, as expansion of monetary base will not be inflationary. However, sterilization may be required to smooth fluctuations in exchange rate and interest rates. Measures might be needed to restrict bank intermediation because increase in money balances is likely to expand bank credit, which could lead to excessive risky lending if the banking system is weak and poorly supervised.

If there is a sustained increase in inflows, say, due to increased productivity of domestic capital, then appreciation of the equilibrium real effective exchange rate (REER) should be achieved through adjustments in goods, factor and asset prices. Over the medium run, a tight fiscal policy may be needed to control increases in domestic absorption, to prevent an excessive appreciation of the REER and to contain the external deficit.

Sterilization is the most recommended response to temporary inflows, say, due to falling international interest rates. However, the ability to sterilize inflows is likely to be limited and short lived if the substitutability between domestic and international assets is high or exchange rate is pegged. Fiscal adjustment is not recommended unless sterilization is severely constrained, as it involves frequent changes in tax and government spending structure, which could lead to additional adjustment costs.

In countries with unbalanced financial policies, short term inflows are likely to be influenced by domestic interest rates and expected changes in exchange rate movements, due to loose fiscal and tight monetary policies. Hence, appropriate mix of fiscal and monetary policies is the best response. But reducing interest rates to decrease speculative inflows could stimulate domestic demand and lead to overheating.

### **13. Empirical evidence**

Empirical work links capital account liberalization and performance of macroeconomic variables. However, the work has been limited by the absence of a clear measure of the degree of liberalization and the intensity of controls. The usual measure is to construct a dummy variable from the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions. However, this variable doesn't measure the intensity of controls, and captures restrictions on capital outflows (since it refers to resident-owned funds only). To account for intensity, some studies have used information on multiple currency practices and/or surrender of export proceeds to form a single index. Then others have used country-by-country descriptions of foreign exchange restrictions. Still others, who use high frequency data, have used onshore-offshore interest differentials, the size of the black market premium and deviations from covered interest rate parity to infer the effectiveness and intensity of controls.

Using a dummy variable for controls from Annual Report on Exchange Arrangements and Exchange Restrictions for OECD countries, Epstein and Schor (1992) find that countries with strong left-wing parties and non-independent central banks tend to impose restrictions on capital account transactions. Grilli and Milesi-Ferretti (1995) use a panel of 61 countries and three different measures of controls (restrictions on payments of capital transactions, multiple currency practices, and restrictions on payments for current transactions). They find that countries with low per capita income, a large government, fixed or managed exchange rate, unbalanced current accounts and a central bank with limited independence are more likely to impose capital controls.<sup>33</sup> Using the onshore-offshore interest differentials for 11 OECD countries, Lemman and Eijffinger (1996) show that controls are positively related to domestic inflation, degree of political stability and the level of investment (as controls keep domestic rates of interest low, boosting domestic investment).

Using data for 20 countries<sup>34</sup> over the period 1962-92, Eichengreen, et al (1996b) show that capital controls have been associated with significant differences in the behavior of macroeconomic variables such as budget deficits, trade deficits and money growth rates, but not in case of interest rates and foreign exchange reserves. These differences are more noticeable for the observations from tranquil periods.

Johnston and Ryan (1994) study the impact of controls on capital movements on the private capital accounts of countries' balance of payments using data from 52 countries for the period 1985-92. They find that exchange controls significantly alter the structure of industrial countries' capital accounts, especially by restricting outflows of recorded direct and portfolio investment. However, for developing countries, capital controls do

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<sup>33</sup> Similar results are found by Alesina and Milesi-Ferretti (1995) and Quinn and Inclan (1997), where the former use a broader measure of restrictions, including multiple exchange rates, surrender of export proceeds and current account restrictions, and the latter construct measures of financial openness that combine proxies for current and capital account restrictions.

<sup>34</sup> The countries included are: US, UK, Austria, Belgium, Denmark, France, Germany, Italy, the Netherlands, Norway, Sweden, Switzerland, Canada, Japan, Finland, Greece, Ireland, Portugal, Spain, Australia, South Africa, India and South Korea. However, their study is concentrated on EMU.



not effectively prevent the outflows, and misinvoicing<sup>35</sup> may be used to circumvent the exchange controls.

Bartolini and Drazen (1997) construct an index of capital controls similar to Epstein and Schor (1992) and Grilli and Milesi-Ferretti (1995) for 74 developing countries from 1970 to 1994. The policies of free capital mobility signal governments' future policies. They find that the industrial countries' rates of interest are the main determinants of developing countries' liberalization decisions. When world interest rates are low, emerging markets experience an inflow and engage in a widespread policy of free capital mobility; when interest rates are high, only sufficiently committed countries allow free capital mobility, whereas others impose controls to trap capital onshore, thus signaling future policies affecting capital mobility.

Grilli and Milesi-Ferretti (1995) find that capital controls are associated with higher inflation and lower real interest rates, while there is no correlation between controls and economic growth. In a sample of 23 countries over a period 1975-89 and after controlling for initial per capita GDP, initial secondary enrollment rate, an index of quality of governmental institutions and regional dummies for East Asia, Latin America and sub-Saharan Africa, Rodrik (1998) finds that capital account liberalization does not lead to higher per capita GDP growth, higher investment as a share of GDP or lower inflation.

Quinn (1997) constructs an index of financial and capital account openness for 64 countries to capture the intensity of controls. Controlling for initial income, education and political instability, he finds a positive correlation between capital account liberalization and economic growth. Tamarisa (1998) finds that for 1996, capital controls have acted as a deterrent to trade in developing and transition economies.

Dooley (1996) reviews theoretical and empirical work on controls over international capital movements. The empirical literature suggests that controls have been "effective" in the narrow sense of influencing yield differentials. There is little evidence that controls have helped the governments meet policy objectives, except reducing governments' debt-service costs, and controls don't even enhance economic welfare.

Mathieson and Rojas-Suarez (1992) test the relationship between programs to control capital flight and other fundamental determinants of capital flight. They find that, during episodes of capital outflows in response to increased risk from inflation and default risk, countries with capital controls did not prevent capital flight; at the same time, the private sector's reaction to a deterioration of the fundamentals was delayed.

Cardoso and Goldfjan (1998) study the case of Brazil, by accounting for the endogeneity of capital controls by considering a government that sets controls in response to capital flows. They find that the government reacts strongly to capital flows by increasing

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<sup>35</sup> Misinvoicing of trade transactions measures the extent to which the imports and exports recorded in the balance of payments misrepresent the value of goods shipped. Such mis-invoicing can be an important channel for the circumvention of controls on capital movements; e.g., a company seeking to export capital outside the exchange control regulations might over-invoice its imports and under-invoice its exports.

controls on inflows during booms and relaxing them during times of distress. They also find that controls temporarily alter levels and composition of capital flows, but have no sustained effects in the long run.

## **14. Conclusion**

In this paper, we survey some of the more important issues related to currency crises and capital control. It is hoped that this paper will help the reader get a good idea of the features of various financial crises.

The literature on currency crises and capital control, however, is huge, and this survey is not meant to be exhaustive. There are some issues not covered here because of space constraint, and more issues are constantly arising. The survey is to provide a snap shot of what is currently available.

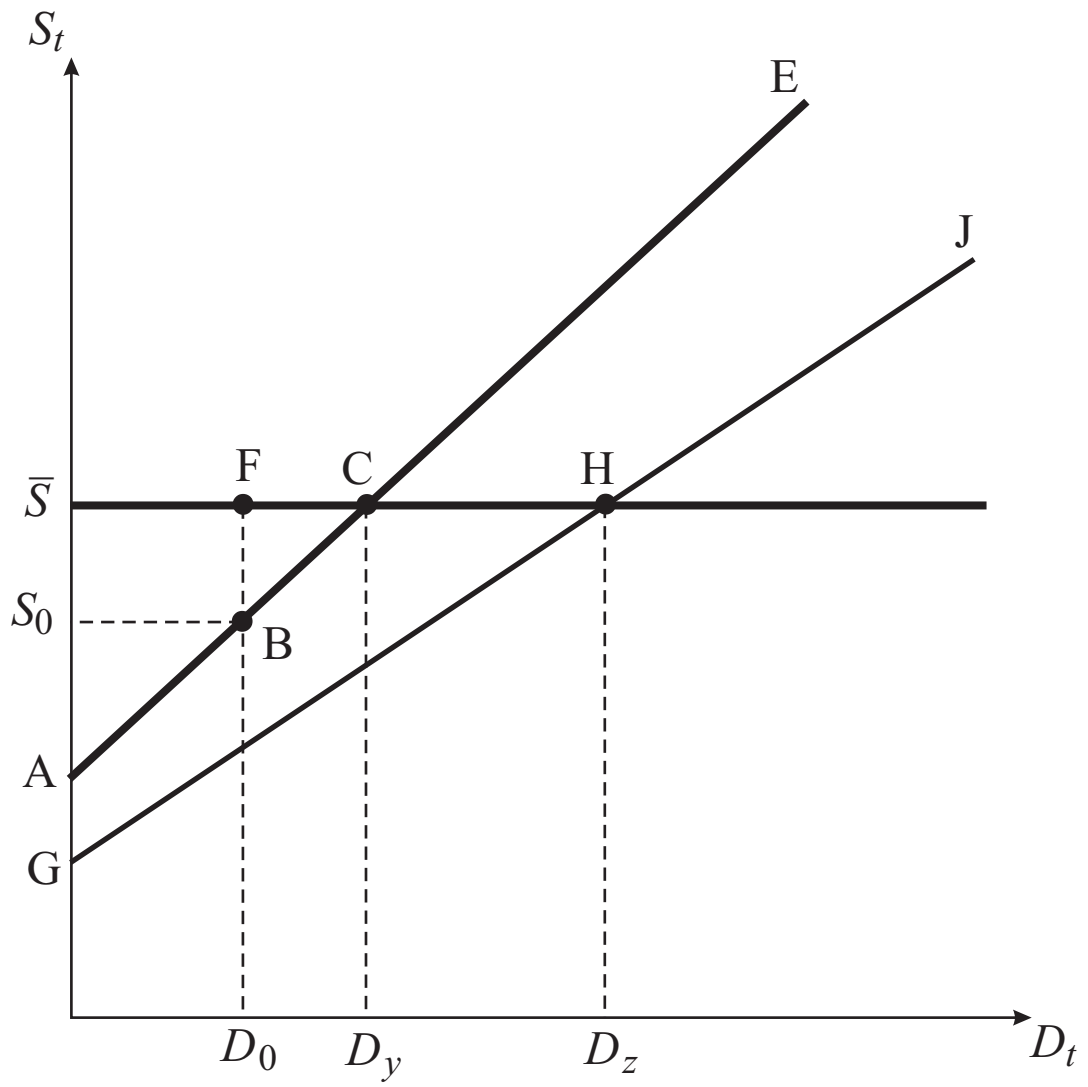


Figure 1

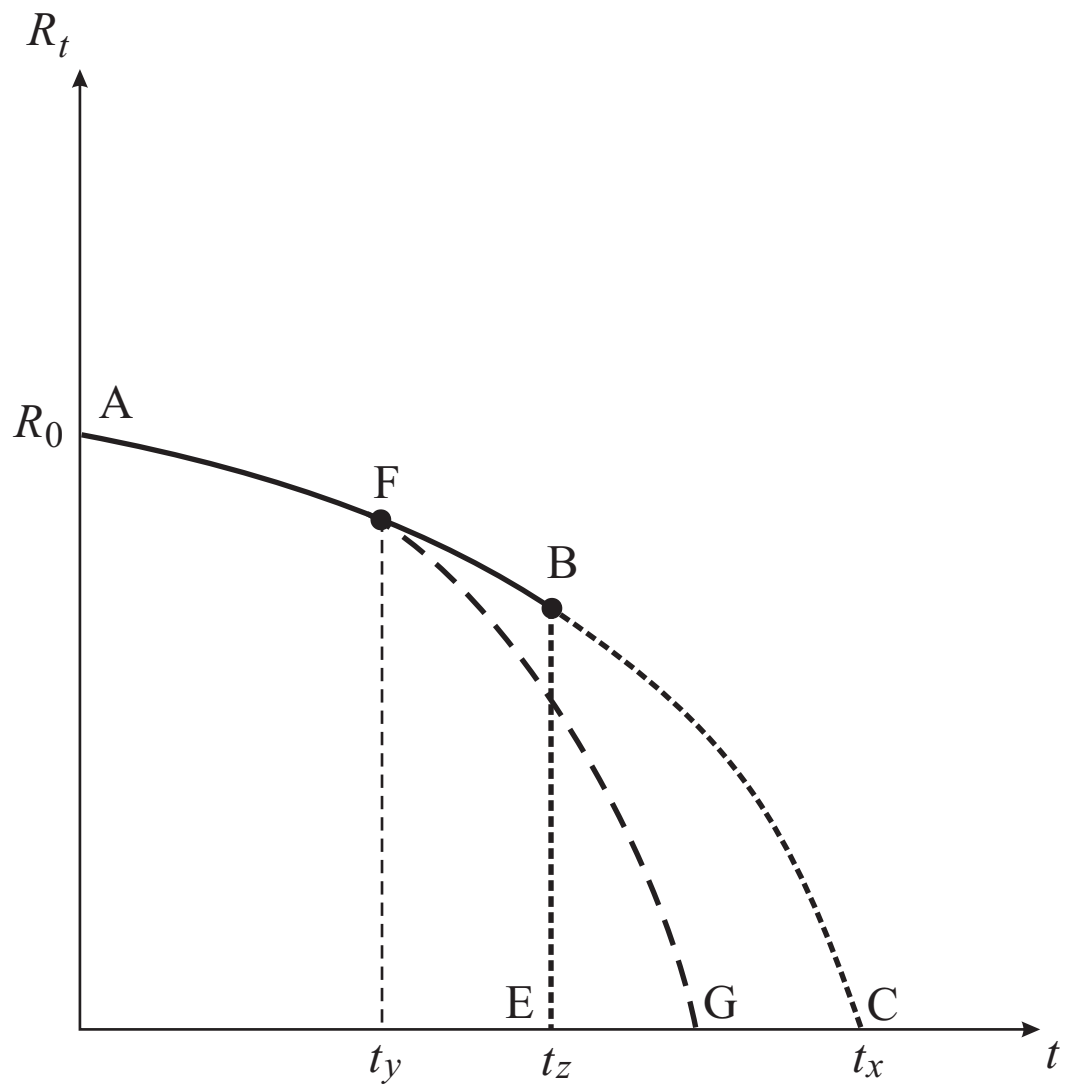


Figure 2

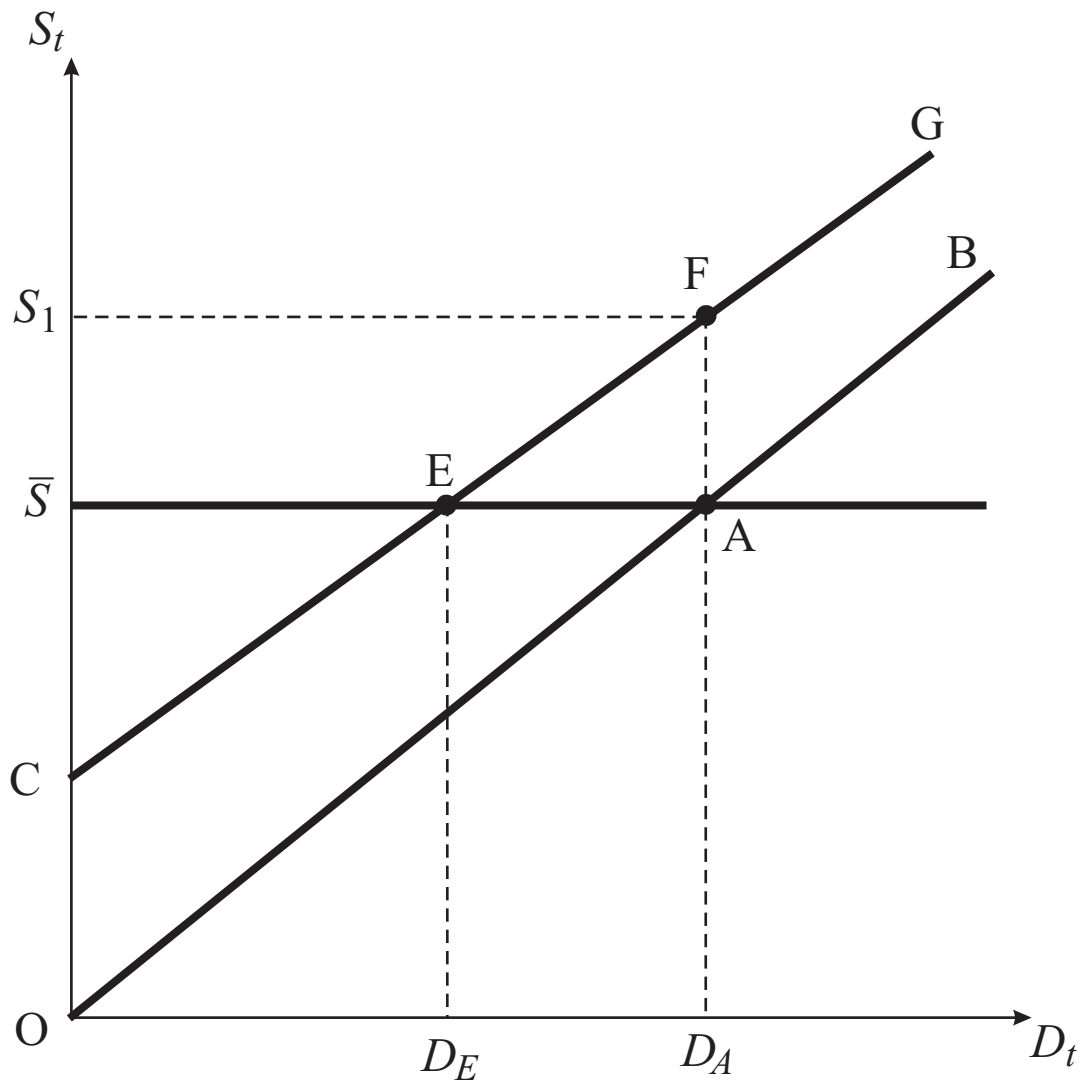


Figure 3

## References

- Agenor, Pierre-Richard, Jagdeep Bhandari and Robert Flood, 1992. "Speculative Attacks and Models on Balance of Payments Crises", *IMF Staff Papers*, Vol. 39, No. 2, June 1992.
- Banerjee, Abhijit, 1992. "A Simple Model of Herd Behavior", *The Quarterly Journal of Economics*, Vol. CVII, No. 3, August 1992, pages 797-817.
- Bartolini, Leonardo and Allan Drazen, 1997. "When liberal policies reflect external shocks, what do we learn?", *Journal of International Economics*, Vol. 42, pages 249-73.
- Bhagwati, Jagdish, 1998a. "The Capital Myth: The Difference between Trade in Widgets and Dollars", *Foreign Affairs*, Vol. 77, No. 3, May/June 1998.
- ....., 1998b. "Yes to Free Trade, Maybe to Capital Controls", *The Wall Street Journal*, page A-38, 11/16/1998.
- Bikhchandani, Sushil, David Hershleifer, and Ivo Welch, 1992. "A Theory of Fads, Fashion, Custom, and Cultural Change as Informational Cascades", *Journal of Political Economy*, pages 992-1026.
- Calvo, Guillermo, 1995. "Varieties of Capital Market Crises", *mimeo*, University of Maryland.
- Calvo, Guillermo, Leonardo Leiderman and Carmen Reinhart, 1994. "The Capital Inflows Problems: Concepts and Issues", *Contemporary Economic Policy*, Vol. 12, pages 54-66.
- Calvo, Guillermo and Enrique Mendoza, 1998. "Rational Herd Behavior and the Globalization of Securities Markets", *mimeo*, University of Maryland.
- Cardoso, Eliana and Ilan Goldfjan, 1998. "Capital Flows to Brazil: The Endogeneity of Capital Controls", *IMF Staff Papers*, Vol. 45, No. 1, March 1998, pages 161-202.
- Cerra, Valerie and Sweta C. Saxena, 1998. "Contagion, Monsoons and Domestic Turmoil in Indonesia: A Case Study in the Asian Crisis", *mimeo*, International Monetary Fund.
- Chang, Roberto and Andres Velasco, 1998. "The Asian Liquidity Crisis", *Federal Reserve Bank of Atlanta, Working Paper Series*, WP 98-11.
- Corsetti, Giancarlo, Paolo Pesenti and Nouriel Roubini, 1998. "Paper Tigers? A model of the Asian crisis", *mimeo*, NYU.
- Devenow, Andrea and Ivo Welch, 1996. "Rational herding in financial economics", *European Economic Review*, Vol. 40, pages 603-15.
- Diaz-Alejandro, Carlos, 1985. "Good-bye Financial Repression, Hello Financial Crash", *Journal of Development Economics*, Vol. 19.
- Dooley, Michael, 1996. "A Survey of Literature on Controls Over International Capital Transactions", *IMF Staff Papers*, Vol. 43, No. 4, December, pages 639-87.
- Dornbusch, Rudiger, 1986. "Special Exchange Rates for Capital Account Transactions", *World Bank Economic Review*, Vol. 1, September, pages 3-33.
- Edwards, Sebastian, 1989. *Real Exchange Rates, Devaluation and Adjustment: Exchange Rate Policy in Developing Countries*, MIT Press.

- Edwards, Sebastian and Peter Montiel, 1989. "Devaluations, Crises, and the Macroeconomic Consequences of Postponed Adjustment in Developing Countries", *IMF Staff Papers*, Vol. 36, pages 875-903.
- Edwards, Sebastian and Julio Santaella, 1993. "Devaluation Controversies in the Developing Countries: Lessons from the Bretton Wood Era", in *A Retrospective on the Bretton Woods System: Lessons for International Monetary Reform*, edited by Michael Bordo and Barry Eichengreen, University of Chicago Press.
- Eichengreen, Barry, Andrew Rose and Charles Wyplosz, 1996a. "Contagious Currency Crises: First Tests", *Scandinavian Journal of Economics*, 98(4), 463-84.
- ....., 1996b. "Is there a safe passage to EMU? Evidence on Capital Controls and a Proposal", in *The Microstructure of Foreign Exchange Markets*, edited by Jeffery A. Frankel, Giampaolo Galli and Alberto Giovannini.
- Epstein, Gerald and Juliet B. Schor, 1992. "Structural Determinants and Economic Effects of Capital Controls in OECD countries", in *Financial Openness and National Autonomy: Opportunities and Constraints*, edited by Tariq Banuri and Juliet B. Schor, Oxford: Clarendon Press.
- Finance and Development, 1997. "Capital Flows Sustainability and Speculative Attacks", December, 1997.
- Finance and Economics, 1998. "Keeping the hot money out".
- Flood, Robert and Peter Garber, 1984. "Collapsing Exchange Rate Regimes: Some Linear Examples", *Journal of International Economics*, Vol. 17, pages 1-17.
- Flood, Robert and Nancy Marion, 1998. "Perspectives on the Recent Currency Crisis Literature", *IMF Working Paper*, WP/98/130.
- Frankel, Jeffery and Andrew Rose, 1996. "Currency Crashes in Emerging Markets: An Empirical Treatment", *International Finance Discussion Paper No. 534* (Washington, Board of Governors of the Federal Reserve).
- Friedman, Milton, 1998. "Markets to the Rescue", *Wall Street Journal*, 10/13/98.
- Froot, Kenneth, David Scharfstein, and Jeremy Stein, 1992. "Herd on the Street: Informational Inefficiencies in a Market with Short-Term Speculation", *Journal of Finance*, 47(4), September 1992, pages 1461-84.
- Goldfajn, Ilan and Rodrigo Valdes, 1997. "Capital Flows and the Twin Crises: The Role of Liquidity", *IMF Working Paper*, WP/97/87.
- Grilli, Vittorio and Gian Maria Milesti-Ferretti, 1995. "Economic Effects and Structural Determinants of Capital Controls", *IMF Staff Papers*, Vol. 42, September 1995, pages 517-51.
- Gros, Daniel, 1987. "The effectiveness of capital controls: Implications for monetary autonomy in the presence of incomplete market separation", *IMF Staff Papers*, Vol 34, pages 621-42.
- Guitan, Manuel, 1998. "The Challenges of Managing Capital Controls", *Finance and Development*, June, IMF Publication, pages 14-17.
- Gupta, Poonam, 1997. "Twin Crises: Models and Evidence", *mimeo*, University of Maryland.
- Haque Nadeem Ul, Donald Mathieson and Sunil Sharma, 1997. "Causes of Capital Inflows and Policy Responses to them", *Finance and Development*, IMF Publication, March 1997, pages 3-6.

- Henderson, David R., 1998. "Let capital flow freely", *The Wall Street Journal*, 09/10/1998.
- International Monetary Fund Occasional Paper, 1998. "Capital Account Liberalization, Theoretical and Practical Aspects", No. 172.
- International Monetary Fund Survey, 1998. "An Irreversible Trend: Seminar Discusses the Orderly Path to Capital Account Liberalization", Vol. 27, No. 6, pages 81-84.
- Issard, Peter, 1995. *Exchange Rate Economics*, Cambridge University Press.
- Johnston, Barry R., 1998. "Sequencing Capital Account Liberalizations and Financial Sector Reforms", *IMF Paper on Policy Analysis and Assessment*, PPAA/98/18.
- Johnston, Barry, Salim M. Darbar and Claudia Echeverria, 1997. "Sequencing Capital Account Liberalization: Lessons from the Experiences in Chile, Indonesia, Korea and Thailand", *IMF Working Paper*, WP/97/157.
- Johnston, Barry and Chris Ryan, 1994. "The Impact of Controls on Capital Movements on the Private Capital Accounts of Countries' Balance of Payments: Empirical Estimates and Policy Implications", *IMF Working Paper*, WP/94/78.
- Kaminsky, Graciela, 1998. "Banking and Currency Crises: The Early Warnings of Distress", *International Finance Discussion Paper* No. 629, Board of Governors of the Federal Reserve System.
- Kaminsky, Graciela, Saul Lizondo and Carmen Reinhart, 1997. "Leading Indicators of Currency Crises", *IMF Working Paper*, WP/97/79.
- Kaminsky, Graciela and Carmen Reinhart, 1996. "The Twin Crises: The Causes of Banking and Balance of Payments Problems", *mimeo*, Board of Governors of the Federal Reserve System, Washington, D.C..
- ....., 1998. "Financial Crises in Asia and Latin America: Then and Now", *American Economic Review, Papers and Proceedings*, Vol. 88, pages 444-448.
- Krugman, Paul, 1979. "A Model of Balance-of-Payments Crises", *Journal of Money, Credit and Banking*, Vol. 11, No. 3, August 1979, pages 311-325.
- ....., 1996. "Are currency crises self-fulfilling?", in *Macroeconomics Annual*, NBER, Massachusetts, Cambridge.
- ....., 1998a. "Currency Crises", *mimeo*, MIT.
- ....., 1998b. "What happened to Asia?", *mimeo*, MIT
- ....., 1998c. "Saving Asia: It's time to get radical", *Fortune*, 09/07/1998.
- ....., 1998d. "An Open Letter to Prime Minister Mahathir", *Fortune*, 09/28/1998.
- Lee, Jang-Yung, 1997. "Sterilizing Capital Inflows", *IMF Economic Issues* #7.
- Leibenstein, H., 1950. "Bandwagon, Snob, and Veblen Effects in the Theory of Consumers' Demand," *Quarterly Journal of Economics*, 64 (2): 183-207.
- Lemmen, Jan J.G. and Sylvester C.W. Eijffinger, 1996. "The Fundamental Determinants of Financial Integration in the European Union", *Weltwirtschaftliches Archiv*, Vol. 132, No. 3, pages 432-56.
- Mathieson, Donald J. and Liliana Rojas-Suarez, 1992. "Liberalization of the Capital Account: Experiences and Issues", *IMF Working Paper*, WP/92/46.
- McKinnon, Ronald and Huw Pill, 1996. "Credible Liberalization and International Capital Flows: the Overborrowing Syndrome", in *Financial deregulation and*



- integration in East Asia*, edited by Takatoshi Ito and Anne Krueger, Chicago University Press: 7-42.
- Miller, Victoria, 1995. "Central Bank Reaction to Banking Crises in Fixed Exchange Rate Regimes", *mimeo*, Universite de Quebec a Montreal.
- Mishkin, Frederic, 1996. "Understanding Financial Crises: A Developing Country Perspective", in *Annual World Bank Conference on Development Economics*, World Bank, Washington D.C., pages 29-62.
- Obstfeld, Maurice, 1986. "Rational and Self-Fulfilling Balance of Payments Crises", *American Economic Review*, 76 (1): 72-81.
- ....., 1994. "The Logic of Currency Crises", *Banque De France, Cahiers Economiques et Monetaires*, No. 43, pages 189-213.
- ....., 1996. "Models of currency crises with self-fulfilling features", *European Economic Review*, 40: 1037-47.
- Quinn, Dennis, 1997. "The Correlates of Change in International Financial Regulation", *American Political Science Review*, Vol. 91, No. 3, September, pages 531-51.
- Quinn, Dennis and Carla Inclan, 1997. "The Origins of Financial Openness: A study of current and capital account liberalization", *American Journal of Political Science*, Vol. 41, No. 3(July), pages 771-813.
- Radelet, Steven and Jeffery Sachs, 1998. "The East Asian Financial Crisis: Diagnosis, Remedies, Prospects", *mimeo*, Harvard Institute for International Development.
- Reinhart, Carmen M. and R. Todd Smith, 1997. "Temporary Capital Controls", *mimeo*, University of Maryland.
- Reinhart, Carmen M. and Carlos A. Vegh, 1996. "Do Exchange Rate-Based Inflation Stabilizations Sow the Seeds of their Own Destruction?", *mimeo*, International Monetary Fund.
- Rodrik, Dani, 1998. "Who needs Capital Account Convertibility?," in *Should the IMF Pursue Capital Account Convertibility?*, edited by Peter Kenen, *Essays in International Finance*, No. 207 (May), International Finance Section, Department of Economics, Princeton University.
- Sachs, Jeffery, Aaron Tornell and Andres Velasco, 1996. "Financial Crises in Emerging Markets: The Lessons of 1995", *Brooking Papers on Economic Activity*, No. 1, 147-217.
- Salant, Stephen and Dale Henderson (1978), "Market Anticipation of Government Policy and the Price of Gold", *Journal of Political Economy*, 86: 627-48.
- Stiglitz, Joseph, 1998. "Boats, Planes and Capital Flows", *Financial Times*, 03/25/1998.
- Stoker, James, 1995. "Intermediation and the Business Cycle under a Specie Standard: The Role of the Gold Standard in English Financial Crises, 1790-1850", *mimeo*, University of Chicago.
- Tamarisa, Natalia T., 1998. "Exchange and Capital Controls as Barriers to Trade", *IMF Working Paper*, WP/98/81.
- Tobin, James, 1978. "A Proposal for International Monetary Reforms", *Eastern Economic Journal*, Vol. 4, pages 153-59.
- Velasco, Andres, 1987. "Financial and Balance of Payments Crises," *Journal of Development Economics*, 27: 263-93.

- Vinals, Jose, 1996. "A Comment: In response to Eichengreen, et al (1996b)," in *The Microstructure of Foreign Exchange Markets*, edited by Jeffery A. Frankel, Giampaolo Galli and Alberto Giovannini.
- Williamson, John, 1997. "Orthodoxy is Right: Liberalize the Capital Account Last," in *Capital Controls in Emerging Economies*, edited by Christine P. Ries and Richard J. Sweeney, Westview Press.
- Wong, Kar-yiu, 1998. "Housing Market Bubbles and Currency Crisis: The Case of Thailand," *mimeo*, University of Washington; available at <http://weber.u.washington.edu/~karyiu/>.
- Wyplosz, Charles, 1986. "Capital Controls and Balance of Payments Crises," *Journal of International Money and Finance*, 5: 169-79.