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International Contagion

Implications for Policy

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What can the international
community do to prevent
financial contagion?

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Summary findings

Chang and Majnoni try to identify and evaluate the public policy implications of financial contagion on the basis of a very simple model of financial crises. In this model, financial contagion can be driven by a combination of fundamentals and by self-fulfilling market expectations.

The model allows the authors to identify different notions of contagion, especially the distinction between “monsoonal effects,” “spillovers,” and “switchers between equilibria.”

They discuss both domestic and international policy options.

Domestic policies, they say, should be aimed at reducing financial fragility — that is, reducing

unnecessary short-term debt commitments. With explicit commitments, the maturity of external debts should be lengthened. With implicit commitments, such as private liability guarantees, they emphasize limiting or eliminating such guarantees, to improve an economy’s international liquidity and reduce its exposure to contagion.

Internationally, they stress the need for improving financial standards, which makes it easier to assess when a country is subject to different kinds of contagion. The effectiveness of international rescue packages depends on the kind of contagion to which a country is exposed.

Implications: The international community should help those countries that are already helping themselves.

This paper — a product of the Financial Sector Strategy and Policy Group — is part of a larger effort in the group to study the determinants and policy implications of international financial contagion. Copies of the paper are available free from the World Bank, 1818 H Street NW, Washington, DC 20433. Please contact Elena Mekhova, room MC9-622, telephone 202-458-5984, fax 202-522-2031, email address emekhova@worldbank.org. Policy Research Working Papers are also posted on the Web at www.worldbank.org/research/workingpapers. Giovanni Majnoni may be contacted at gmajnoni@worldbank.org. March 2000. (34 pages)

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International Contagion: Implications for Policy¹

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1. Introduction

The current debate on financial contagion is by and large motivated by policy questions. What can we do to prevent contagion? *Should* we do anything about it? In this paper we attempt to identify and evaluate the public policy implications of recent research on financial contagion.

It may be useful to state, at the outset, the scope and conceptual approach of our inquiry. With respect to its scope, we intend to limit our discussion to policies that deal with financial contagion across countries. The focus is related to but is narrower than asking what can be done in general to deal with financial and currency crises. In particular, it emphasizes policies designed to deal with external forces.

Conceptually, our approach will be to evaluate policy in the context of an existing theoretical explanation of contagion. Reference to some theory of contagion is needed in order to evaluate the desirability and predict the implications of policy responses. Unfortunately for our purposes, there is no current agreement on what is the “best” explanation for contagion, and different explanations have rather different implications for policy. Hence we need to take a stand on what we believe to be the most adequate explanation of financial contagion, from which we can expand on its implications for policy.

Accordingly, our discussion begins with the statement of a simple theoretical framework that can explain contagion. We describe a very simple model of financial crises that can be driven by a combination of fundamentals and by self fulfilling market expectations.³ The possibility of crises turns out to depend on external factors such as foreign interest rates and the confidence or pessimism of international investors. It is in such a sense that “contagion” may occur. But the model allows us to be more precise and identify different notions of contagion, in particular the distinction between “monsoonal effects,” “spillovers,” and “switches between equilibria” emphasized by Masson (1998).

We then proceed to a discussion of policy alternatives, both at the domestic and the

³ Our premise is that, although recent crises were by and large caused by *financial panics*, bad policy may have played a role in making financial panics possible. For a discussion of the distinction between financial panics and bad policy, see Chang (1999).

international level, inspired by our analytical approach. At the domestic level, we emphasize the need for policies aimed at reducing financial fragility; in the context of the model below, this means reducing unnecessary short debt commitments. These commitments can be explicit, in which case the focus can be in lengthening the maturity of external debt. But they can also be implicit, as in the presence of private liability guarantees. We emphasize that limiting or eliminating such guarantees can be seen as a way to improve an economy's international liquidity situation and reduce its exposure to contagion.

At the international level, we stress the need for improving financial standards. In the context of our theoretical discussion, such improvements help assess when a given country may be subject to the different kinds of contagion. Hence they are crucial to identify when policy reforms or international assistance packages are warranted. We also discuss international liquidity assistance and the question of an international lender of last resort. We show that international rescue packages may be effective or not, depending on the kind of contagion that a country may be experiencing. Hence our analysis illustrates the principle that the international community should help those and only those countries that are already helping themselves.

2. A Theoretical Framework

Any discussion of the appropriate policy response to international contagion must be based on an analytical understanding of contagion, as given by a model of that phenomenon. In this section we advance a simple framework to illustrate some important aspects and difficulties associated with policy evaluation.

The model is very simple and focuses on a country that needs to roll over some foreign debt. It is similar, in several respects, to the models of Calvo (1988), Obstfeld (1994), and, most closely, Cole and Kehoe (1996).⁴ It delivers a sharp characterization of the different ways in which foreign events may affect the possibility of a crisis, that is, of

⁴ Lambertini (1999) extends Cole and Kehoe (1996) to include capital accumulation and uncertainty.

Masson's (1998) distinction between "spillovers," "monsoonal effects," and "pure contagion."

2.1. A Small Open Economy

Consider a small open economy populated by a representative agent and lasting only one period. The government of this economy inherits some foreign debt that matures at the end of the period. At that point, the amount due for repayment is given by $B > 0$ units of an international currency, say dollars.

At the beginning of the period, the government may attempt to roll over its debt. If so, it sells claims to $B' = B$ dollars, payable at the end of the period, in a competitive auction. The bidders in the auction are a large number of atomistic foreign investors. We assume that foreign investors have access to alternative investments that return $(1+r)$ dollars at the end of the period per dollar invested at the beginning. In other words, the foreign opportunity cost of funds is denoted by $r \geq 0$. All agents are rational and risk neutral. Hence foreign investors will buy the new government debt if and only if its price, denoted by q , is equal to $1/(1+r)$ times their subjective probability that the debt will be in fact honored. We assume that the proceeds from the auction, qB' , are transferred immediately from foreign investors to the government.

It will help to use the notation $B' = 0$ for the case in which the government does not try to roll over the debt. After the auction takes place, the government may decide to default on its obligations ($z = 0$) or not ($z = 1$). The relative cost of default depends on some additional aspects of the economy. The service of the old debt that is not rolled over must be financed with the proceeds of some tax, which is assumed to be distortionary. Hence, under our assumptions, the revenue from that tax is

$$(1) \quad T = zB - qB'$$

Equation 1 implies that, if the government does not default, distortionary taxes can be reduced by a successful rollover of the debt; this is why debt rollover may be desirable. Alternatively, distortionary taxes decrease if there is default on the old debt.

We assume that the service of the new debt B' can be financed with a lump sum tax,⁵ and that defaulting on any portion of the debt is assumed to be costly. As a consequence, the amount available for consumption in this economy at the end of the period is given by

$$(2) \quad c = y - T - F(T) - zB' - |z-1|D,$$

where y is the economy's income (assumed, for simplicity, to be exogenously given), D is the cost of default, $|x|$ is the absolute value of x , and $F(T)$ is the excess burden of the tax T . For simplicity, we shall assume that $F(T) = T^2$.⁶

Finally, it is assumed that the government's objective is to maximize the expected value of the country's end of period consumption. Equilibrium in this model is defined in the obvious way. We can clearly say that there is a *crisis* if, in equilibrium, default occurs.

In this model, if the government can roll over its old debt it will be able to replace distortionary taxes by a lump sum one. However, such a benefit may be reaped only if foreign investors are willing to buy the new debt, which depends on their opportunity cost of funds and their expectations of default. It has already been noted that, in equilibrium, the price of new debt, q , must be equal to the expected value of $z/(1+r)$. There is potential for international spillovers and "contagion," therefore, to the extent that the value of r or the expectations of default depend on events and crises in other countries. We shall come back to such international transmission questions after characterizing the possible outcomes of this model.

2.2. Equilibria

Consider what happens if the government does *not* try to roll over the debt. Then $B' = 0$, and the final outcome depends on whether the government defaults on the old debt B .

⁵ The asymmetry between old and new debt is intended to capture more fundamental costs associated with the failure of rolling over extant debt. It is not hard to find assumptions on the timing of payments, technology, and available taxes that deliver the same result. For example, suppose that the old debt is due while production is still taking place, and that the only available tax at that point distorts production decisions. In contrast, the new debt may be due after the production process is finished, at which point the government can just expropriate some of the output. For a much richer setup, see Cole and Kehoe (1996).

⁶ The analysis can be extended easily to a convex function F such that $F(0) = 0$, $F'(0) = 0$, and $F'' > 0$.

If it does, $z = 0$ and, by (1), $T = 0$ as well; that is, all taxes are avoided. However, defaulting costs D , and hence final consumption is $c = y - D$. If the government does not default, $T = B$, and final consumption is $c = y - B - B^2$. It follows that default occurs if and only if the direct cost of default is less than the total cost of taxation:

$$(3) \quad B + B^2 \geq D.$$

The resulting level of consumption is $c = y - \min\{B + B^2, D\}$.

If the government attempts to roll over the debt, things are a little more complicated. The final outcomes are affected by the success of that attempt, as reflected in the price of the new debt, which in turn depends on expectations of default. But whether default is optimal for the government depends, in part, on the cost of debt service. Therefore, there may be multiple equilibrium outcomes.

If r is not too large, which will be assumed hereon, there are essentially two possible outcomes given an attempted rollover. First, the attempt may be successful, in the sense that foreign investors expect the new debt to be fully honored, the price of debt is high, and default does not occur. In that case, $z = 1$, and $q = 1/(1+r)$. From (1), $T = B - qB = rB/(1+r)$, where the first equality uses $B' = B$. Using all these facts and (2), it follows that consumption must be

$$(4) \quad c = y - B(1+2r)/(1+r) - (rB/(1+r))^2.$$

For this to be an equilibrium outcome, it must not be profitable for the government to surprise investors with a default. If the government defaults, $z = 0$ and, from (1), $T = -B/(1+r)$ (notice that defaulting implies that the proceeds from the sale of new debt will be transferred to the representative agent as a subsidy). Inserting these facts in (2), it follows that consumption would be $y + B/(1+r) - (B/(1+r))^2 - D$. In equilibrium, this amount cannot exceed that in (4), which is the case if and only if

$$(5) \quad D \geq 2B - (1-r)B^2/(1+r).$$

Hence, if the government attempts to roll over its old debt, it may be successful provided (5) holds. Note that (5) says that the cost of default D must be large relative to the original debt, which is intuitive. Also, (5) becomes more stringent with larger r : if foreign investors need a higher return to purchase new debt, default becomes a more attractive option for the government. The second possibility is that the government attempts a debt rollover but it is not successful, in the sense that q is low and default occurs. In this case, $z = 0$ and, consequently, $q = 0$ also. Default implies that all taxes are zero and that consumption is equal to $y - D$. For this to be an equilibrium, it must be the case that default must in fact be optimal after the auction of new debt. Now, if the price of the new debt falls to zero but there is no default, (1) implies that $T = B$ which, together with $B' = B^7$ and (2), means that consumption must be $y - 2B - B^2$. In equilibrium, this cannot exceed $y - D$, which requires:

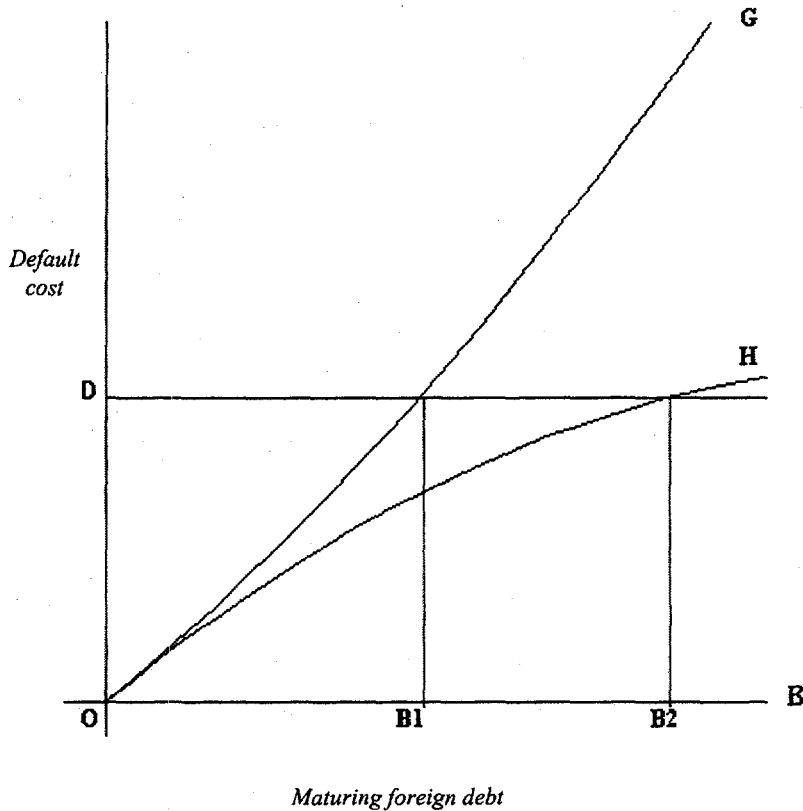
$$(6) \quad D \leq 2B + B^2.$$

In short, what happens if the government tries to roll over its initial debt depends on the relative values of D and B , as given by (5) and (6). The rollover attempt may be successful and a crisis maybe avoided when (5) holds; this must be the case, in particular, if B is sufficiently small. If (6) holds, the attempt will fail and a crisis will ensue. This is necessarily the case if B is “large.” Importantly, both (5) and (6) may hold. In that case, whether a crisis occurs depends on the (self fulfilling) expectations of foreign investors.

Figure 1 illustrates the case of attempted rollover. The initial amount of debt, B , is measured along the horizontal axis. The curve OG is the graph of $2B + B^2$, and OH the graph of $2B - B^2$, which is the right hand side of (5) for $r = 0$. Given the cost of default D , two values for the initial debt, B_1 and B_2 , are determined as in the graph. If B is in the interval OB_1 , (5) holds but (6) does not; hence, an attempted rollover must be successful.

⁷ Note that this assumes that, in the auction, foreign investors acquired a claim to $B' = B$ at a zero price. This seems extreme, but the analysis can easily be amended to correct for this detail. In addition, $q = 0$ is the correct price of the new debt in equilibrium, since in equilibrium the new debt will not be honored.

Figure 1



In contrast, (6) holds but (5) does not when B is greater than or equal to B_2 ; the implication is that an attempted rollover will fail and default will occur. If B is in the interval B_1B_2 , both (5) and (6) hold; there are then two equilibrium outcomes, one with default and one without it, following an attempted rollover.

Which outcome occurs when two of them are consistent with equilibrium is a difficult issue. Here, we shall just assume that, when B is in B_1B_2 , the default outcome occurs with probability p , where p is a number between zero and one. This assumption can be justified formally. One can assume, for instance, that whether foreign investors welcome the issue of new debt depends on the realization of some publicly observable random variable. The important consequence, however, is the same: the good outcome will occur with probability $(1-p)$ and the bad one with probability p . It must be noted that p is arbitrary, as long as it is between zero and one. Hence, p may be a function of any

observable event. When it happens, a crisis is unnecessary, in the sense that there is another possible and better equilibrium outcome.

It is important, at this point, to note that Figure 1 depends on several aspects of the environment. In particular, an increase in r , the opportunity cost of funds demanded by foreign investors, shifts the OH curve up and to the left, but leaves OG undisturbed. The implication is that the point B_2 moves to the left, reducing the region of multiple outcomes and increasing the region in which default must occur.

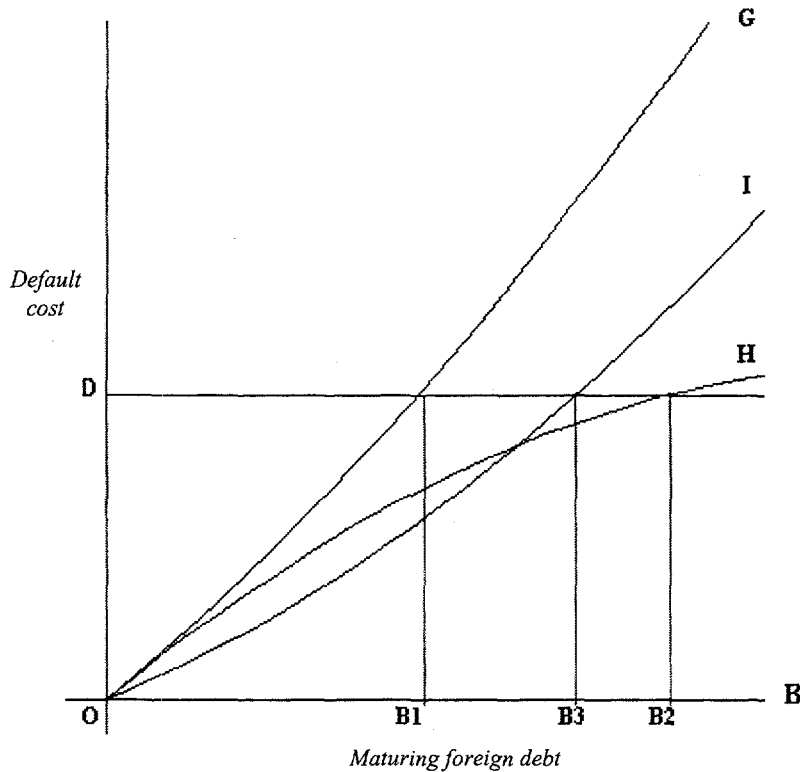
Now we are ready to go back to the initial decision of the government: will the government attempt a debt rollover or not? The answer depends on the initial amount of debt and on the other variables of the model. It is easy to prove that the government will successfully roll over the debt if B is small enough, that is, if B is in the interval OB_1 . Intuitively, rolling over the debt helps avoiding distortionary taxation; the new debt is well received since its size is small relative to the cost of default. The policy implication is that there are countries whose fundamentals are so strong that a crisis cannot occur.

If B is outside OB_1 , the analysis depends on the value of B at which the government, when rollover is not attempted, is indifferent between defaulting or not. That value is denoted by B_3 in Figure 2; it is given by the intersection of the curve $B+B^2$, given by OI, and the horizontal line of height D (recall equation 3). Figure 2 is drawn under the assumption that B_3 belongs to B_1B_2 ; our analysis can be easily amended if that assumption fails.

In the case of Figure 2, it is clear what happens if B is greater than B_2 : if a rollover is attempted, it will fail for sure, and default will occur with certainty. The government is indifferent between trying to roll over the debt or not, and final consumption will be $y - D$ regardless. Hence, a crisis must occur in a country whose fundamentals are very weak.

If B is in B_3B_2 , the analysis is almost as easy. If a rollover is not attempted, the government will default on the old debt and final consumption will be $y-D$. An attempted rollover will fail with probability p , but with probability $(1-p)$ it will succeed and result in higher consumption. Hence the government will attempt to rollover the debt, hoping to be lucky.

Figure 2



Finally, if B is in the interval B_1B_3 , the outcome depends on the value of p . By not attempting a rollover, the government secures a consumption level of $y - B - B^2$. If it attempts a rollover, with probability $(1-p)$ there is no crisis and consumption is given by (4), which is better than $y - B - B^2$. However, with probability p there is a crisis and consumption falls to $y - D$, which is worse. It follows that attempting a rollover is the optimal decision if p is sufficiently small. For simplicity, we shall assume that to be the case.

Summarizing, under the assumptions underlying Figure 2 and assuming that p is small enough, the government will attempt a debt rollover. The rollover will succeed if B is less than B_1 . If B is between B_1 and B_2 , there is a crisis with probability p . A crisis must occur if the initial debt B is larger than B_2 .

2.3. Contagion

Foreign shocks may affect the probability of crisis in the country under analysis through two channels. The first is an increase in r , the opportunity cost of foreign funds. This can be caused by a shift in the monetary policy of industrialized economies, a case that Masson (1998) terms “monsoonal effects.” Alternatively, it may be that a crisis in a different country makes foreign investors demand a higher expected return on their exposure to the country under analysis. This is essentially the case discussed by Valdes (1996) and Kodres and Pristker (1998) and corresponds to what Masson (1998) called “spillovers.”

Regardless of its cause, an increase in r shifts the curve OH up and to the left. A first implication is that, when B was originally close but less than B_2 , the probability of crisis goes up, from p to one. The intuition is that the cost of debt service goes up relative to the cost of default, to the point that promising to honor the new debt is no longer credible.⁸ A second implication is that expected consumption goes down because of the increased cost of servicing the debt.

When multiple outcomes are possible, foreign shocks may also affect the probability of a crisis directly. This is the case that Masson (1998) calls “pure contagion”: foreigners may become more pessimistic about country A after observing a crisis in country B, even if there is no fundamental reason for such a shift. In this model, this would happen if B belongs to B_1B_2 and p goes up following, say, a crisis abroad. Expected consumption would fall, reflecting the increased probability of default.

The distinction between pure contagion, on the one hand, and monsoonal effects and spillovers, on the other, is crucial to assess the policy implications of the model. Under the conditions make pure contagion possible, for example, international assistance in the event of a crisis is Pareto improving. The promise of the international community to help a country in distress may be sufficient to eliminate bad equilibria. It has to be noted that such a promise, as well as other policies that help coordinate expectations on the good outcome, is desirable whether or not there is contagion.

⁸ Even if the auction of the new debt is successful.

If observed contagion is due to monsoonal effects or spillovers, policy evaluation becomes more involved. Distributional considerations are likely to matter. For instance, an increase in the Federal Funds rate may cause r to increase, and the probability of a crisis to go up in the country under analysis. On the other hand, it may be beneficial for the United States for the Federal Reserve to pursue a more restrictive monetary policy. Likewise, if an r increase is the foreign investors' response to a crisis in a different country, as in Valdes (1996) and Kodres and Pritsker (1998), it is hard to see how the associated costs can be avoided. At the least, analysis of this case requires a more detailed description of the constraints of foreign investors.

Finally, susceptibility to contagion depends on initial conditions. It has been seen that a country is less vulnerable to foreign events the smaller the value of B . In this sense, it may seem desirable for the country to restrict its foreign debt. However, this cannot be ascertained unless the determination of B is brought into the discussion. One possibility may be that B was already "excessive" due to erroneous government policies, in particular those providing inefficiently large incentives to foreign borrowing. In such a case, the elimination of such policies would be unambiguously good, reducing distortions and lowering at the same time the likelihood of crises and contagion. In contrast, one may argue instead that a large B may have been consistent with the social good. Then lowering B may lower the probability of a crisis and limit contagion at the cost of introducing other distortions. The rest of the paper elaborates on these observations and relates them to the design of practical policy alternatives.

3. Implications for National Policies

In this section we elaborate on the implications of our discussion on contagion for *domestic* policy actions. The presence of "crisis zones," where multiple equilibria obtain, clearly indicates that there are situations in which it may not be possible to attach a uniquely defined expected outcome to any measure of economic policy. But this does not exonerate national governments from enacting appropriate policies: policy actions are not irrelevant to the extent that they can move the economy out of troubled waters toward safer harbors. While the occurrence of good equilibria in the "crisis zone" rests to a large

extent on actions at the international level, we suggest that it is a national responsibility to select economic policies and structural reforms which may bring the economy out of the area of instability.

The model of the previous section has schematically addressed some variables that affect the position of the economy: its liquid liabilities, the cost of default, its exposure to foreign interest rate shocks. In this section we shall add some flesh to the bone and discuss three specific areas where actions can be taken to move the economy toward the stability zone:

- *Debt management*, or more generally management of public sector liabilities, which may help bringing short term exposures toward levels compatible with a unique equilibrium.
- *Exchange rate* management, which is also a potential device to reduce the impact of foreign interest rate shocks.
- Finally, *structural reforms* directed to improve the resiliency of the financial system in the aftermath of occasion of financial distress.

These three areas are not exhaustive, but have been prominent in the analysis of the different episodes of contagion. Debt management has been pointed out as the triggering factor of the “Tequila crisis;” in that episode, fixed exchange rates also contributed to spreading the crisis. The supply of implicit guarantees has been prominently indicated as the cause of the South East Asian crisis. Finally, the role of exchange rate regimes and of highly leveraged institutions have been selected as causes of contagion spreading from Russia to Latin America.

Policy actions in any of the three areas are probably not sufficient by themselves to take the economy away from crisis zone. We shall try to stress the need for coordination among the three sets of policies in insuring a reduction of the economy exposure to the risk of contagion.

From an intuitive viewpoint we can characterize contagion as the spread of virus to a weakened organism. In our approach, the viruses are foreign interest rate shocks and destabilizing expectations, and the weakened organism is an economy located in the crisis zone. We focus on how to strengthen a weakened economy and make it less vulnerable;

hence the discussion of policies to address contagion will share common elements with policies devised to prevent financial crisis in general. In both cases sound policy actions are those that shift the economy leftward toward the stability area in Chapter 1.

3.1. Liability Management

As already noted, our theoretical framework implies that the possibility of crises and contagion is exacerbated with the need to roll over existing debt. This implies that prime attention should be devoted to the management of foreign liabilities.

While the model took inherited short-term debt as given, for policy purposes we need to discuss in detail how an economy "inherits" its debts. To a large extent, inherited debt can be seen as the legacy of previous policy choices, which implicitly or explicitly selected a specific maturity composition, a currency composition and also a determined level of "off-balance" liabilities. In addition, we may gain further policy insights by looking at overall public sector liabilities, as they result from the consolidation of central bank's and government's balance sheets. This is because relevant choices of economic policy, such as the selection of public debt financing programs or exchange rate regimes, are not taken independently by the government or by the central bank.

Liability management may affect the amount of debt, which is due at the end of the "current" period and is held by foreign investors, by changing its maturity and currency composition. A longer maturity of the outstanding debt reduces the fraction of the total debt that needs to be refinanced each year and, with reference to Figure 1, will shift leftward the position of the economy along the horizontal axis. For instance, if we consider a one-year funding period and the average maturity is increased from two to four years, the yearly rollover shrinks from one half to one fourth of the total outstanding debt.⁹

The average maturity is often a consequence of the past inflation history but need not be. Countries that have experienced high inflation have hardly long term fixed rate instruments, but demand for those assets could be increased by providing medium/long

⁹ So, if TB denotes the total outstanding bonds in the hands of foreign investors and m their average maturity, $B = TB/m$.

term instruments with suitable forms of financial indexation. Although indexation may negatively affect the debt burden by rapidly spreading to longer maturities the effects of temporary increases of short-term interest rates, it has a highly beneficial liquidity effect. The currency composition of the debt is also relevant to determine the initial need for international liquidity. Our theoretical discussion has been mainly concerned with the spread of contagion in a fully “dollarized” economy. But the existence of domestic currency implies that there is some room for choice in the currency denomination of debts. If at least part of the debt can be denominated in domestic currency, variations of exchange rates will change the debt burden and the level of consumption. Particularly, a depreciation of the domestic currency will, to the extent that some of the maturing debt is payable in domestic currency, ease the need for international liquidity and reduce the possibility of a crisis. Obviously, holders of domestic currency denominated debt would have to be compensated *ex ante*; however, such a currency risk premium may be worth paying as the cost of insurance, since currency depreciation is typically associated with economic contraction.

It should be clear that what matters for policy is the total amount of resources which will need to be financed; such resource include maturing debt, but also other government commitments. In particular, the accounting of relevant liabilities should include public contingent liabilities, generated for example by implicit or explicit deposit insurance or by social security disbursements. This is the case to the extent that such commitments may become due and increase the amount that needs to be funded in the short run. A sudden infusion of capital to the banking system, for instance, may require additional “end of period” financial resources, which if not available on the domestic market, need to be funded abroad. Incidentally, this consideration may be relevant to analyze the consequences of the large supply of financial guarantees that is often considered a main trigger of the East Asian crisis.

Finally, we may want to extend the notion of liability management to the full public sector, as represented by the consolidation of the balance sheets of the government and of the central bank, by considering the net foreign position of the public sector as a whole. This extension will enable to bring into the discussion problems generated by the relation

between foreign currency reserves held by the central bank and the stock of maturing foreign currency debt that was a critical cause of the Mexican crisis in 1994.

Figure 1 helps visualize some consequences of liability mismanagement on the exposure to financial contagion. The figure makes it clear that it is very risky to rely on the fiscal discipline effect that may be generated by large amounts of foreign currency denominated short term debt (Cole and Kehoe, 1996). In fact, a high level of short term debt brings the economy toward the area of multiple equilibria, where the relevance of fiscal discipline and more generally of macroeconomic policies is greatly reduced by the unpredictable behavior of market expectations in the determination of the final equilibrium. It should be also noted that identifying the relevant needs for liquidity, that is, figuring out the size of B, is crucial in practice. Fiscal discipline may not be enough to prevent financial instability if the amount of contingent liabilities explicitly or implicitly associated to the safety net, and recorded as an “off balance” sheet item, is large or it is perceived to be so by the market.

3.1.1. The Selection of an Exchange Rate Regime

While our model did not include monetary and exchange rate elements, our approach does have implications for monetary policy and exchange rate regimes. The most convenient way of seeing these implications is to look at exchange rate regimes as degrees of public commitment to a predefined external value of the currency. Each regime then generates for the public sector “off balance” sheet liabilities which could be due at the end of any period and may be cumulated to already maturing debt.

In a fixed exchange rate regime the liabilities of the consolidated public sector would include also the central bank commitment to convert to foreign currency the short term (monetary) liabilities of the banking sector (Chang and Velasco 1998, 1999). This obligation would enormously increase the amount of potential short term foreign borrowing required in a crisis. Any shocks to foreign currency reserves or to money supply could shake market confidence in the stability of the exchange rate and would generate selling pressures on the market, transforming contingent liabilities into effective liabilities.

The type of contingent liabilities generated by a currency board would not be very different. Although in principle currency boards should sever the link between runs on banks and runs on currency, the Argentina experience of 1994 showed that both runs may be correlated in a currency board regime.

Only in the case of a flexible exchange rate such “off balance sheet” liabilities can be wiped out, substantially reducing the short-term liquidity needs of the government. More specifically the net foreign position of the public sector would coincide with the difference between the value of foreign currency reserves and foreign holdings of domestic debt.

An alternative choice is to rely on the possibility of introducing capital controls. If they are aimed at reducing foreign short-term capital inflows, they can be seen as equivalent to an increase in the opportunity cost of investing short term. Capital controls would generate both an upward shift of the OG curve in Chart 1 and a reduction of the amount of short-term debt held by nonresidents.

Contagion is often generated by sovereign defaults but gets transmitted mostly through currency crises. This fact suggests that, although the triggering element of contagion may be related to a government default on its obligations (Mexico in 1994 and Russia in 1998), the main factor of instability is related to foreign exchange commitments which unduly extends the value of net public liabilities. Not always there has been a coincidence of debt crisis and currency crisis. For instance, in the 1992 ERM crisis, the run on weaker currencies was not paralleled by a run on the public debt of high indebted countries, such as Italy, or by a run on individual banking systems. Contagion was limited to the currency market and once the exchange rate commitment was lifted in England and in Italy the crisis subsided. In our framework this can be explained as the result of the sudden drop of short-term public liabilities generated by the exchange regime switch. Graphically this can be seen as a sudden reversion of short-term liabilities from a crisis level to a stability zone.

In contrast to the ERM crisis, the East Asian crisis was not limited to currency but involved bank runs as well. Floating the exchange rates did not prove to be a sufficient measure to revert these economies to the stability area. This may have been the

consequence of large implicit liabilities associated to bank protection, which still left the East Asian countries in the region of vulnerability.

Although no default on public debt took place, due to the low level of inherited debt, spreads on sovereign issues remained high, a clear sign of market perception of increased probability of default. The introduction of capital controls in Malaysia can be seen as an extreme measure to avoid any further increase of short-term commitments towards foreign investors.

3.2. The Level of Bankruptcy Costs

Finally, the model posits a relationship between the cost of default and the exposure to contagion. Also in this case it is useful to consider that cost not as a given parameter but as a variable that can be influenced by policy actions. In what follows we shall argue the bankruptcy costs at a systemic level can be seen as a function of financial depth and we shall therefore try to point at the structural reforms that may be required to foster the financial depth of an economy and at their proper sequencing.

Although bankruptcy costs are generally taken as given, they are not exogenous and generally depend from institutional features of different financial systems. The cost of default of a sovereign borrower, or of the failure to honor the commitment of the consolidated public sector, has a clear relationship with financial structure. The recent wave of crises has provided abundant evidence that the depth and diversification of financial systems (Greenspan, 1999), the degree of leverage of corporate sectors (Claessens et al, 1998), and financial liberalization (Demirguc Kunt and Detragiache, 1998) have an impact on the intensity of crises and on the resilience of the economic system in the aftermath of a crisis. The cost of the crises has been measured both in terms of the extent of deviations of GDP growth from trend (Demirguc Kunt and Detragiache, 1998) and of the cost of bank restructuring for public finances (Caprio and Klingebiel, 1998).

It is plausible that government insolvency will negatively reverberate on the financial system as a whole and therefore have a larger impact on deeper financial systems. This is not an overstatement if we consider that government in most developing countries is the

implicit or explicit provider of insurance to the banking system, which in turn depends for its stability on the stability of the corporate sector. More generally, when crises have a systemic nature, government liabilities become, to a certain extent, an approximation of the consolidated liabilities of major sectors of the economy.

In most developing economies the cost of financial disruption following a government default on its debt can therefore be related to the level of financial depth. Supporting evidence is provided by the lower intensity of the economic slump in Mexico when compared with the recession in East Asian countries. The smaller amount of bank credit to the private sector may indeed have been a relevant factor in helping a faster recovery in Mexico than in East Asian. We do not have yet an assessment of the fiscal cost of bank restructuring in East Asian countries but the comparison of the ratio of NPL to GDP provide a first eloquent indicator of the relative severity of these crises.

Economies where financial claims account for a limited portion of the GDP will not be able to fully exploit their growth potential but at the same time will not suffer too much from a financial meltdown. In this case, which is broadly consistent with the Russian experience, the incentives to default are high. In the graphical representation of Figure 1 the Russian economy would be positioned in the lower part of the graph where default can be triggered also at a low level of debt.

Why, then, did East Asian economies, where the claims of the banking sector are multiple of GDP and face much higher bankruptcy costs, prove to be easy prey of financial distress and did not resist contagion more effectively? The reason is largely related to the lack of diversification of financial systems where the banking system is the main supplier of funds to the economy. As a matter of fact, larger financial depth in developing countries is often approximated by a large M2/GDP ratio (Levine et al., 1998). As we have seen, a weak but large banking system may significantly add to the contingent liabilities of the public sector and move the economy into the crisis area.

Again in our graphical representation we would posit an “only banking” deep and weak financial system in the Northwest section of Chart 1. In that area, which is a crisis zone or a default area, we have in fact both a high bankruptcy cost, generated by the financial depth, and a high level of contingent liabilities, associated to the bank safety net. A large but not diversified financial system is highly exposed to systemic crises, or as the

Chairman of the Federal Reserve Board, Allan Greenspan, has put it “The lack of a spare tire is of no concern if you do not get a flat. East Asia had no spare tires.” (Greenspan, 1999). An equally deep but more diversified financial economy, where equity and bond markets may represent the necessary “spare tire”, would instead be positioned in the Northeast section, that is in a safer area. In this case, differently from the previous one, we have a lower level of contingent liabilities for any given level of financial depth. It is worth reiterating that, independently from the level of diversification of the financial system, the shift toward a flexible exchange rate arrangement would pull the economy out of more agitated waters if not inside the harbor.

Two implications can be drawn for policy purposes. First, a lower exposure to contagion requires not only deeper but also more diversified systems. Second, the centrality of banks in the financial system implies the need of a strong system of regulation and supervision in order to relieve the burden of the safety net for the public sector.

This discussion suggests a number of structural policy actions that may usefully complement liquidity management and exchange rate policies in driving the economy outside the contagion area. A partial list would include the development of capital markets, the effective protection of minority shareholders and of creditors' rights and a cautious policy of financial liberalization.

Developing capital markets is essential for the emergence of long term debt instruments. Capital markets do not, in fact, provide liquidity by maturity transformation - as banks do - but by ensuring the liquidity of longer term claims and their prompt negotiability on the markets. The development of markets for both longer term debt instruments and stocks are therefore an essential step for better risk sharing.

Stock markets development, in turn, depends essentially on legal frameworks, on minority shareholders protection from controlling shareholders. As for banks, improvements depend to a relevant extent from the protection of creditors rights and from the quality of regulation and supervision.

It is hard to argue against the need for diversification of the financial structure and strengthening of the regulatory framework. More uncertain is the role of financial liberalization. Financial liberalization provides the conditions for financial contagion; at

the same time need not cause it and may be beneficial if contagion does not occur. But the frequently claimed benefits of financial integration on the possibility of consumption smoothing, on development of the investment opportunities and on the external equilibrium have been recently cast in doubt by the destructive impact of capital movements in the recent years. The problem is that financial liberalization has often failed to provide a stable supply of capital for the amount of time required for consumption to be smoothed along the economic cycle and for investment to become productive.

Too often, financial liberalization - both internally and externally - has been a synonym of accelerated development of short-term instruments. Domestic financial liberalization, with its removal of limits to bank interest rates, credit expansion and required reserves, has often resulted in a fast acceleration of bank credit and conversely of money aggregates. External liberalization, in turn, has prompted a large upswing of short-term inter-bank funding from more developed to developing economies.

Like financial deepening, financial liberalization is a double-sided phenomenon. It may increase the strength and resilience of a financial system but also its exposure to undesired runs. The costs of financial crisis intervening after the liberalization process have been shown to offset the benefits deriving from improved financial integration (Demirguc-Kunt and Detragiache, 1998). The experience of the recent wave of financial liberalization processes seems to suggest that financial integration should be first sought for longer maturity assets, which are less associated to the roll-over risk discussed in this paper. In addition, the liberalization of financial decisions should be integrated by an adequate monitoring of the short-term exposure of the main sectors of the economy with respect to the foreign sector.

3.3. The Need for Coordinated Policies

Clearly, what we need is a coordinated set of policies for reducing the exposure to financial contagion. Without a proper coordination between the structural reforms intended to increase the depth of financial markets and policies addressed to increase the diversification of funding sources, the fragility of the system may increase instead of

being reduced. Analogously, a financial liberalization that is not followed by a parallel strengthening of the banking sector regulation and supervision may increase the exposure to financial contagion of the economy. Finally, exchange rate policies need to be made conditional on the strength of the banking system and public debt management needs to take into account the exchange rate regime.

Three lessons have emerged so far. In the first place, the cost of ignoring policy coordination is not a predefined bad outcome: it is an uncertain outcome. In other words if, as a result of the lack of coordination, the economy is dragged into a crisis zone, it becomes vulnerable to factors which are independent from the policy actions making the outcome of those policy, to a certain extent, unpredictable.

The second lesson is that there is no single policy is likely to achieve a better insulation from contagion. More likely there are different combinations of liability management, exchange rate policy and structural reform which are coherent with a shift of the economy toward the stability zone. This appears to be an important conclusion because it leaves flexibility in the process of policy implementation.

A third lesson is that in order to assess the exposure to contagion we may rely on the analysis of three classes of policy actions. What makes this consideration relevant is that it is independent from the source of financial contagion. To the extent that contagion is generated by foreign interest rate shocks and default expectation it is not relevant to know the source of the shock or of the revision of expectation. In other words the proper policy response is not dependent on the specific factor that might have generated a jump in the level of foreign interest rates: be it due to the information processing technology, portfolio allocation technology or by any other factor which affects international investors' behavior. This seems to be particularly relevant if we consider that one of the major implications of financial integration is exactly a larger exposure to international interest rates shocks.

These lessons point to the relevance of a combined implementation of the three classes of policy actions as preventive measures. A cursory review of recent episodes of contagion may provide a useful guide to cases of failed or successful policy coordination. The "tequila crisis" hit Latin American countries as a consequence of the higher return required by foreign investors to invest in the region in the aftermath of the crisis of

Mexican Tesobonos. The interest rate shock was felt with particular strength in those countries that were most strongly committed to a fixed parity with the dollar.

Argentina was severely hit by the crisis although it was not particularly vulnerable from the point of view of its banking system or its outstanding public debt. Probably thanks to these factors Argentina was able to withstand the crisis without abandoning the currency board. Still the costs have been high in terms of growth. This has led to a further reduction of the net foreign currency exposure of the country by introducing liquidity requirement for banks and contingent liquidity arrangements with foreign private financial institutions (Powell, 1999). At the same time, bank supervision has been considerably strengthened also to reduce the level of public sector contingent liabilities.

It is interesting to observe that countries that adopted a more flexible approach to the exchange rate and used capital controls, like Chile, were able to withstand the consequences of the contagion with lower consequences in terms of output growth.

East Asian countries, differently from Latin American economies had much deeper financial systems. In addition, the level of diversification of the financial system was low, the banking system was structurally weak and a fixed exchange rate regime was in place. These countries had a high level of public contingent liabilities related not only to the exchange rate regime but also to the safety net. Floating their exchange rates proved helpful to remove part of the pressure, but not sufficient to remove the causes of instability.

Additional steps were needed in order to reduce the traditional weaknesses of the banking system and to develop alternative channels of financial intermediation. Structural reforms, though, require a long time to be put in place and cannot provide an immediate protection from continuing exposure to financial contagion.

Very prudent policies with respect to net foreign financial liabilities need to be taken in the transition toward a more strong financial system. From this perspective the reintroduction of capital controls in Malaysia can be interpreted as a device to buy time. It is interesting to observe that countries like Taiwan and Singapore, where bank liabilities were more similar to more developed economies, suffered considerably lower pressure also at the height of the crisis.

4. Implications for International Policy

We have noted that the exposure of an economy to financial contagion is, in fact, to a large extent dependent on past choices of economic policy. This means that the victims of contagion are seldom absolutely powerless to prevent being infected. Still, once in a crisis zone, the outcome of domestic policy actions becomes uncertain and hostage to arbitrary changes in market expectations; as a consequence, even appropriate policy may not be able to avoid bad outcomes. In addition, the distribution of external shocks has changed with the globalization of world capital market and extreme shocks have become more frequent and of larger dimension. The consequence for developing countries is that the risks of financial liberalization may have changed exactly at a time when they were opening their capital accounts, lending support to the notion that the consequences of financial integration might have been largely underestimated. From this perspective emerging economies would seem to be the innocent victims of a process which is out of their control (Calvo, 1998).

Such different views of limits and responsibilities of national policy makers are reflected in the role which the International Financial Institutions (IFIs) are expected to play in preventing and managing episodes of financial contagion. If exposure to contagion is due to inefficient macroeconomic management, the IFIs should ration their liquidity in the occurrence of a crisis, in order to limit moral hazard. If, on the contrary, country responsibility is limited, then generous liquidity support should be considered in order to prevent negative externalities.

In this section we consider actions that should be taken at the international level to cope with the spread of contagion. We shall focus on two comprehensive classes of policies and discuss their relevance in light of our model:

- The development of international financial standards or codes of conduct, intended to improve the quality of financial supervision and to increase transparency and accountability of domestic policy makers;
- The provision of liquidity to crisis countries, through different policy instruments and different strategies involving IFIs and the private sector.

A key issue is the proper balance between the opposing goals of controlling moral hazard and providing liquidity at an international level is very similar to that on the lender of last resort at the national level. Should liquidity be provided freely and at no penalty rates to crisis country in order to avoid bad equilibria, or should instead such a policy be avoided in order to limit moral hazard and prevent countries to enter the crisis zone? And what solutions are feasible if the amounts of liquid resources are inadequate to make a credible commitment of liquidity support in the occurrence of a crisis?

We shall not try to provide an exhaustive survey of the remedies to the risk of contagion that have been suggested in the debate on the reform of the international financial architecture. In particular, we leave out of our discussion the effects of the surveillance, undertaken by the IMF in its Article IV consultations, on the pursuit of sound macroeconomic management. Such surveillance efforts are likely to result in a more cautious macroeconomic management and are not different from those discussed in the previous section.

4.1. Improving Financial Standards

Recent crises have underscored that national financial infrastructures need to be urgently upgraded in order to reduce the costs of financial integration. Different rules, different codes of conduct may lead, in the event of financial liberalization, to major shortcomings. It has been said recently that "if the planned route for a superhighway draws near to a primitive village, it is not a good idea to design an off-ramp that dumps high-speed traffic into the center of the town before its streets are paved, intersections are regulated and pedestrian have learnt the dangers of walking in the street" (Frenkel, 1999).

The adoption of common standards is likely to reduce the costs faced in the process of financial liberalization, as well as to increase transparency and to reduce moral hazard. The development and dissemination of internationally recognizable standards would help countries to identify their institutional weakness and, if compliance with the standards can be monitored and made transparent, would strengthen their incentives to take corrective action early. At the same time, better investment decisions can be made by

allowing market participants to assess information on potential borrowers in light of international benchmarks.

It is arguable that in several occasions the severity of the crisis has not been foreseen due the lack of adequate statistical information on the financial structure of relevant sectors of the economy. This, in our theoretical framework, amounts to the lack of a precise understanding of the dimension of short-term public commitments and, therefore, of the country's exposure to financial contagion. Without appropriate measurement, the authorities of an emerging economy may believe that they are in the no crisis region, while the truth is that they are in the crisis zone or even in the default zone. Interestingly, such a conjecture has been confirmed by a recent recommendation of the Financial Stability Forum. That Forum suggests that an urgent step towards a better management of the international financial system is the extensive collection of statistical information on the net foreign financial positions of the major sectors of several economies.

The growing perception of the relevance of common international standards has led to the development of new codes of conducts. New guidelines recently issued by international bodies include the Core Principles for Effective Banking Supervision set out by the Basel Committee in 1997; the IMF's Special Data Dissemination Standard; the IASC's International Accounting Standards; and IOSCO's Objectives and Principles of Securities Regulation, which provides a pragmatic base for national regulators to establish codes for security markets that can be tailored to their own countries. Meanwhile, new standards are being developed by international institutions in their core areas of expertise, like the IMF's guidelines for monetary, fiscal and financial policy transparency. Less satisfactory is the progress in bankruptcy standards and corporate governance standards, where greater opposition needs to be faced to change considerably different traditions and legal systems.

The approval of new regulatory standards, and even their introduction in the domestic regulations, is only the first step of a more complex process. While the establishment of international standards is an important step towards crisis prevention, it is even more important to encourage the actual implementation and monitor the adherence to standards. Enforcement will typically be difficult unless some stringent and observable parameters are devised and subject to international surveillance. A relevant example is

provided by minimum bank capital requirements, along the lines set out by the Basel Committee in 1988. Such requirements were introduced by most developing countries but only nominally enforced, as can be gathered from the generalized compliance with the eight per cent ratio by all the East Asian banking systems before the crisis. The awareness of these problems has generated an intense debate on how to provide an effective surveillance. A concerted effort in this direction is the joint IMF - World Bank's Financial System Stability Assessments program, aimed at evaluating the health and vulnerabilities of members' countries financial systems. The program also includes the assessment of compliance with the BCBS Core Principles.

The transparency resulting from compliance with best practice rules would not, by itself, solve the problems generated by an inadequate incentive structure. The common perception that, with increased transparency, the private sector should be able to play a greater role may be incorrect. As Stiglitz and Bhattacharya (1999) discuss extensively, in the presence of externalities market mechanisms alone, even with improved transparency, would not be sufficient to ensure prompt and systematic adherence of standards. Transparency needs to be integrated to the different nature of incentives required by developing countries, which are mostly recipient of international financial flows, by developed countries which are often home of the major financial intermediaries, and by individual creditors. Among the incentives that need to be modified in developed countries is the more favorable treatment of G-10 countries' banks for short term lending to developing countries. The maturity of capital outflows needs to be monitored by looking at the maturity composition of their creditors liabilities.

New rules on debt rescheduling in the event of a crisis have been proposed to be included in bond contracts by the G-10 after the Mexican crises (Fisher, 1999). The G-22 report on International Financial Crises has also suggested that a qualified majority rule be included to facilitate the restructuring of bonds contract in the event of a crisis. More generally, provisions to enhance creditor protection in the international arena, along lines similar to those followed at the national level, have been suggested by Miller and Stiglitz (1999).

Overall, improvements of standards in developing countries and the revision of the structure of incentives in more developed economies are part of a common effort to

enable market discipline to play a more effective role in preventing larger financial imbalances and to help the construction of a more stable system.

4.2. The Supply of International Liquidity

To the extent that the previous standard setting policies accomplish their goal, we can expect the weaknesses of any single economy and the responsibility of international and domestic policy makers to become clear faster and in a much more uncontroversial way than it has been the case. Increased transparency should also help reduce moral hazard, with a beneficial effect on the amount of contingent public liabilities. All these policies, though, cannot prevent the realizations of a bad equilibrium to obtain should a crisis occur.

A policy of liquidity provision to crisis countries can eliminate the uncertainty and lack of coordination that result in the occurrence of bad outcomes. But there are several questions associated with such a policy. For example, its financing is a key issue, and may require a commitment from the international community. The lack of an international central bank able to issue high-powered money requires that enough funds be set aside for their use in the occasion of a crisis. While a national central bank can print money when required, for an international lender of last resort the provision of liquidity requires, as in the case of a currency board, the establishment of an adequate amount of liquid reserves. Only based on these reserves can a promise to provide liquidity gain credibility.

Major steps have been done in the recent years to increase the amount of resources available to sustain countries that have experienced or may be experiencing negative outcomes. Notwithstanding these efforts, which have led to a series of quota increases, the IMF has today a size with respect to the GDP of its member countries of only one third of that at its inception in 1945 (Fisher 1999). These reserves can be increased, in case of systemic problems, by borrowing from the New or the General Arrangement to Borrow.

In spite of their limited resources, the IFIs have introduced new facilities intended to increase the amount of resources to be deployed with short notice; notably, these facilities

have features devised to limit moral hazard. This is the case of the Emergency Financing Mechanism introduced after the Mexican crisis, of the IMF's Supplemental Reserve Facility (SRF) established in 1997, of the Contingent Credit Lines (CCL) introduced in April 1999, and of the supply of guarantee on the part of the World Bank.

In addition to a large and more liquid supply of funds from the IFIs, it has been recognized that the resources to be deployed in a crisis should in the future rely on the contribution of the private sector to a larger extent. A source of private funds may be untapped by often debated changes in bond contracts, allowing qualified majorities to modify the bond covenants in order to facilitate bond roll-over in the event of a crisis. This is much in the same spirit that led in the past to rolling over syndicated bank loans. An additional source of funds has been pioneered by Argentina, South Africa, and Mexico, who have entered a financial contract with consortiums of foreign commercial banks for the provision of liquidity in times of crisis.

Once the amount of resources available for liquidity provision has been settled, there is the need to establish guidelines for the execution of assistance policies. What are the features of an International Lender of Last Resort and how effectively can it address the issue of preventing and managing the occurrence of episodes of financial contagion? We shall consider this question, first, from the perspective of liquidity creation, and then looking at the potential implications for moral hazard.

Our theoretical discussion implies that, to the extent that liquid resources are sufficient to fully meet a debtor position, a crisis can be effectively eliminated. This implication can be illustrated with reference to the model of Section 2. Assume that an international institution is committed to step in if the new debt auction is unsuccessful, purchasing all the unsold bonds at the prevailing world return. Referring to the graphical representation of equilibria in Chart 1, we observe that in this case the bad outcome possibility effectively disappears - and with it the OG curve in Chart 1. Default will obtain with probability zero on the left hand side of the schedule OH and with probability 1 on the right hand side. Both the crisis zone and the eventuality of contagion are effectively dispelled by the promise of a full financing in the event of a crisis.

Notably, it turns out to be crucial from the IFI's perspective to be able to properly assess the weakness of the economy before lending takes place. In the simplified setting

of our model this requires to verify if the economy's level of debt is on the right or on the left hand side of B2 in Chart 1. In the first case, the failure of the initial period auction cannot be addressed by a lending policy because the borrower would default in any case and the IFI would ultimately lose its fund. To the left of B2 the funding would instead ensure a good equilibrium, and the IFI would be repaid at the expiration of the loan.

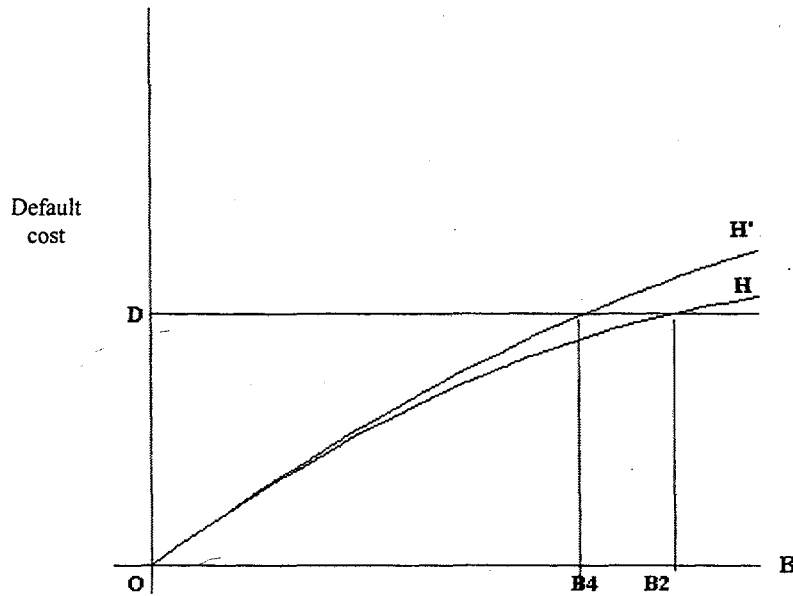
Let us now consider a more realistic case in which the amount of funds is lent at a penalty rate; this can be justified by Bagehot principles, in order to limit moral hazard. Suppose that, once the IFI is satisfied that the economy is illiquid but not willing to default, it will participate in the auction of public bonds and underwrite at a penalty rate the bonds left by the foreign investors. In this case, the crisis zone does not completely disappear, as in the no penalty case. Instead, it will shrink; this can be represented by a new schedule OH* (the same as OH, except that r is replaced by the penalty rate) which defines the conditions under which default of the debt rolled over debt would obtain. In Figure 3, the crisis zone is given by the interval between B4 and B2.¹⁰ The presence of a smaller crisis zone is generated by the higher fiscal costs associated with the penalty rate lending. But this does not prevent a good outcome to prevail if the debt level is not too close to the default area.

Let us finally consider one case in which the IFI's lending is conditional on some macroeconomic policy to be undertaken by the borrower in order to improve its future solvency. Conditionality has often been thought as a cost for the borrower intended to discourage moral hazard and provide a guarantee of repayment; it has therefore been used as a substitute to collateral, which has not been frequently posted. In the simplified setting of our model we cannot properly consider the effect of conditionality on moral hazard, but we can point to the effects which it may have on the stability of short run equilibria.

Differently from the posting of collateral, conditionality may reduce the country's available income - if a policy of fiscal restraint is called for. In this case the effects on income and consumption of a new lending from the IFIs is the same of rise of foreign interest rates, described in the previous section, and can be seen as upward shift of the lower bound of the crisis zone represented by the schedule OH. From this perspective the

¹⁰ B4 can be shown to be to the right of B1, although this is not shown in Figure 3.

Figure 3



CCL facility seems to have a number of desirable properties. In fact CCL are supposed to be granted to countries who have satisfactory macroeconomic performance, are reducing their structural weaknesses and whose exposure to crisis is well known. For these economies the imposition of a penalty rate should not have the undesired effect of shifting the economy from the stability area toward the crisis zone.

Our theory can also help evaluate the role that could be played by creditor protection schemes in a situation of distress. In this case, whether through the introduction of a payment stay, a restructuring of existing debt, or simply a rollover of expiring bonds, we would have the present level of debt being refinanced by the previous bondholders. As a consequence, the good equilibrium would be ensured, if there is one. Notably, this solution may have been enforced in Malaysia, where the introduction of control on capital outflows effectively amounted to a forced rollover of the existing debt of foreign investors for one year.

Can we conclude that devices intended to reduce moral hazard have the undesired effects of reducing the stabilizing effect associated with liquidity provision in a situation of distress? This appears to be an effect to be considered when addressing the

problems generated by the presence of multiple equilibria in a short time interval. In a longer time perspective, though, the net effects of risk sharing devices intended to reduce moral hazard need to be taken into account. Although our one period model is not well suited to describe the effects that the liquidity provision has on the actions undertaken by economic agents some qualitative considerations can be drawn. In the first place a policy of lending at penalty rate or conditional on fiscal adjustments which is stated in advance and followed in a crisis will generate a stabilizing effect on the selection of the level of debt exposure with foreign investors. In fact, rational agents will avoid generating a level of debt that may place the economy in a fragile position. From this perspective, the reintroduction of a crisis zone, which we have observed in the case of a penalty rate and of a conditional lending, may induce private agents and the government to avoid exposures larger than those compatible with the stabilizing effects of the lender of last resort. In our graphic representation the effect will be of reducing the level of debt “inherited” from the past with respect to the level which would have prevailed otherwise. The menace of a crisis window would then induce stabilizing behavior.

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