THE DEVELOPING-COUNTRY DEBT PROBLEM

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1) Introduction

In 1974, commercial banks were highly praised for solving the financial puzzle of the seventies, namely, how to recycle the OPEC surpluses to the oil importing countries. This prompt response, as opposed to the sluggish increase in international official lending, then prevented a major world crisis, where the main victims would have been middle income countries with restricted access to OPEC capitals. It also started, however, a period where unprecedented current account deficits were financed by competitive credit markets at floating interest rates. Project loans, conveying external savings to investment programs in developing countries, were used as the basic vehicle for recycling. Yet, since money is fungible, and since lenders were not prepared to be repaid in borrowers' local currencies, the central part of the story was competitive balance of payments finance. Loan maturities were never matched to external account projections of debtor countries, since commercial banks believed that short-term loans were safer than long-term ones, an obvious fallacy of composition, as far as balance payment finance is concerned. Hence, the system was based on continuous debt roll-over.

Banks surely knew that sovereign risks were superimposed to the commercial ones, and never overlooked the possibility of a few countries facing balance of payment troubles because of improper economic management. Yet, since debtor countries followed independent economic policies, the chances of a global debt crisis were minimized on the grounds of the law of large numbers. The implicit assumption was that no covariance trap would distort the large numbers behavior and suddenly transform a large set of good debts into bad ones. That adverse covariance problems could occur, was known by the experience of the thirties, when a debt crisis emerged as a result of a dramatic decline in world trade. That they would show up again in the early eighties, was dispelled by the notion that economic theory had
progressed enough to exorcize the Kondratiev cycles.

In fact, competitive recycling would hardly breakdown as long as the rate of growth of exports of debtor countries exceed the international interest rates. In this case, indeed, reduced debt/export ratios and improved credit standing indicators could be reconciled with a more than complete debt service roll-over. Historical evidence after the Second World War suggested that rates of growth of international trade tended to exceed interest rates. Non-oil developing countries, in particular, expanded the dollar value of their exports at average annual rates of 10.3% between 1963 and 1973 and of 21.1% between 1973 and 1980, overfulfilling the roll-over test. Hence, until 1980, few doubts were cast on the health of competitive recycling.

The unanticipated event was the unorthodox blend of tight monetary and loose fiscal policy in the United States since 1981. In a world of floating exchange and interest rates, this policy turned pushed the international debt problem into the covariance trap. A crisis was to emerge, as a result of the abrupt escalation of the debt/export ratios and was precipitated by the defaults of Poland, by the Falkland war and, as a "coup de grace", by the Mexican moratorium in late 1982. The latter spilled over a general confidence breakdown in developing-country debts and led to a hurried retreat of commercial banks from new lending to such nations. Since competitive recycling was based on roll-over, debtor countries soon became illiquid and had to apply for widespread rescheduling arrangements.

A lesson of the crisis is that balance of payments finance involves too many externalities to be efficiently carried on by competitive credit markets. Their origin is the peculiar nature of collaterals to sovereign risk. Some tangible collaterals do exist, the external assets of debtor countries that may be seized in case of default, but, in the present world, they stand as nothing but a
symbolic proportion of the outstanding external debts. Creditors have a much stronger trump card, the price that each country is prepared to pay to keep its access to foreign credit markets, by transferring abroad a certain proportion of its exports revenues. Now, this is not only an intangible, but also a reflexive collateral, in the sense that its value depends on the behavior of lenders. If the latter decide to cut the access of a debtor nation to the international financial markets, such nation looses most incentives to honor its external obligations. Hence, what creditors can get repaid from an illiquid debtor is contingent on whether conflicts are to be decided by cooperation or by confrontation. This provides, incidentally, a strong argument against competitive pricing of developing-country debts at secondary markets. Pure competition is a non-cooperative game that could tranform the debt problem into an international financial collapse.

This threatening scenario was actually displayed after the Mexican moratorium. A disruption was prevented by the timely intervention of the IMF and of the major central banks, trying to persuade commercial banks to act as a Collective and to cooperate with illiquid developing countries. The present rescheduling mechanisms, under the leadership of the IMF, may be characterized as a transition towards cooperative recycling, combining the central lender concept of Bretton Woods with the muscle of commercial banks. The approach has been that developing debtor countries face a liquidity but not a solvency problem. Now, this approach has been challenged by a number of economists and politicians in both, debtor and creditor countries.

The present paper discusses whether developing debtor countries should be treated as illiquid or insolvent. While the appropriate diagnosis may vary from case to case, some important general principles can be developed. The most important of all concludes that, as far as sovereign risk is concerned, there is no clear cut between illiquidity and insolvency. This may look as a disquieting
conclusion, since it brings the problem into a grey area. Yet, it also conveys a hopeful message; solvency can be promoted by international cooperation, appropriate economic policies, and adequate restructuring of the international lending system.
2) Debt dynamics

The dynamics of foreign indebtedness is described by the differential equation:

\[ \dot{D} = \lambda D + G \]  \hspace{1cm} (1)

where \( D \) indicates the country's net foreign debt (i.e. total external indebtedness, public, private, short and long term, minus foreign reserves), \( \dot{D} \) its derivative respect to time (following the usual convention on dots), \( \lambda \) the average nominal interest rate. \( G \) stands for the resource gap (+) or surplus (-), here defined as the non interest current account external deficit, minus direct investment into the country, plus capital exports from the country. This is a debt related definition: direct investment from abroad reduces the gap (or adds to the surplus) because foreign risk capital is not included in the country's external liabilities. \( G \) and \( D \) are measured in current dollars and, for the sake of simplicity, all the country's foreign debt is taken as dollar denominated. Since our concern is the debt problem, negative values of \( D \) will be excluded from the time span of our analysis. Treating \( G \) and \( \lambda \) as piecewise continuous functions of time, equation (1) is solved by the cumbersome expression:

\[
D(t) = \int_{-\infty}^{t} G(\tau) e^{\lambda(\tau-t)} d\tau
\]

which says that the present net external debt equals the sum of the past resource gaps grossed up by compounded interest rates.

Equation (1) is nothing but a balance of payments tautology that splits the net foreign debt increase into two components, the interest payments \( \lambda D \) and the non hereditary part \( G \). Its importance results from the fact that, except for complicated interest rate renegotiations, economic policies in debtor countries can only affect the debt paths through action on the resource gap or surplus. Taking the interest rate as a constant, and treating \( G \) as a well behaved decreasing function of time, which crosses the zero landmark at instant \( T_o \), as in figure 1a, one is led to the famous three phases of the debt cycle. Phase I is that of resource gaps, when debt grows faster than interest rates. In Phase II the country scores resource surpluses, but these are not strong enough to offset interest payments:
debt continues to expand, although at rates of growth below the interest rate. Finally, in Phase III, the resource surpluses acquire the necessary momentum to overcome the interest payments: the nominal debt declines until it is paid off, as in figure 1b.

Table I shows how the Brazilian foreign debt has expanded between 1971 and 1982. It displays a typical movement from the early stages of Phase I, when debt increases are gap dominated, to the later ones, when debt grows mostly because of interest accumulation. In fact, in 1983 Brazil moved to Phase II of the cycle. Yet, data also indicate that, in a world of shocks, neither the interest rate is to be treated as a constant nor the resource gap as a well behaved declining function of time.
When $i$ and $G$ are stochastic, the phases of the debt cycle do not necessarily follow their natural order. Doubts may be cast as to whether Phase III will ever be reached and come to a happy end.
### Table I

**Brazil's Net Foreign Debt (US$ Million)**

<table>
<thead>
<tr>
<th>YEAR</th>
<th>NET INITIAL DEBT $D_0$</th>
<th>CURRENT ACCOUNT DEFICIT C</th>
<th>DIRECT INVESTMENT MINUS CAPITAL EXPORTS I</th>
<th>DEBT INCREASE $\Delta D = C - I$</th>
<th>INTEREST PAYMENTS J</th>
<th>RESOURCE GAP G = D - J</th>
<th>END OF YEAR NET FOREIGN DEBT $D_1 = D + \Delta D$</th>
<th>AVERAGE INTEREST RATE (i) $I = J / D_0$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1971</td>
<td>4.109</td>
<td>1.307</td>
<td>168</td>
<td>1.139</td>
<td>302</td>
<td>837</td>
<td>5.248</td>
<td>7.4</td>
</tr>
<tr>
<td>1972</td>
<td>5.248</td>
<td>1.489</td>
<td>318</td>
<td>1.171</td>
<td>359</td>
<td>812</td>
<td>6.419</td>
<td>6.8</td>
</tr>
<tr>
<td>1973</td>
<td>6.419</td>
<td>1.688</td>
<td>940</td>
<td>748</td>
<td>514</td>
<td>234</td>
<td>7.167</td>
<td>8.0</td>
</tr>
<tr>
<td>1977</td>
<td>24.268</td>
<td>4.037</td>
<td>810</td>
<td>3.227</td>
<td>2.103</td>
<td>1.124</td>
<td>27.495</td>
<td>8.7</td>
</tr>
<tr>
<td>1978</td>
<td>27.495</td>
<td>6.990</td>
<td>2.047</td>
<td>4.943</td>
<td>2.696</td>
<td>2.247</td>
<td>32.438</td>
<td>9.8</td>
</tr>
<tr>
<td>1979</td>
<td>32.438</td>
<td>10.742</td>
<td>2.212</td>
<td>8.530</td>
<td>4.185</td>
<td>4.345</td>
<td>40.968</td>
<td>12.9</td>
</tr>
<tr>
<td>1980</td>
<td>40.968</td>
<td>12.807</td>
<td>1.532</td>
<td>11.275</td>
<td>6.311</td>
<td>4.964</td>
<td>52.243</td>
<td>15.4</td>
</tr>
<tr>
<td>1982</td>
<td>61.651</td>
<td>16.279</td>
<td>2.542</td>
<td>13.737</td>
<td>11.358</td>
<td>2.379</td>
<td>75.388</td>
<td>16.4</td>
</tr>
</tbody>
</table>

*Source: Banco Central do Brasil*
An important question is how long should a developing country remain on Phase I of the debt cycle. The answer depends on a key variable of debt dynamics, the difference between the rate of growth of its exports and the interest rate on the outstanding debt. In fact, indicating by $X$ the dollar value of the country's annual exports of goods and services, by $\dot{X}/X$ its rate of growth, and by $z = D/X$ the debt/export ratio, equation (1) is equivalent to (*)

$$\dot{z} = (i-x)z + g$$

(2)

where $g = G/X$ stands for the resource gap as a proportion of exports. The above equation yields a well known stability condition: if the rate of growth of exports exceeds the interest rate, a permanent resource gap can be reconciled with a limited debt/export ratio. In the particular case where $i$, $x$ and $g$ are kept unchanged in time, the debt/export ratio converges to:

$$z_{\text{lim}} = \frac{g}{x-i}$$

(3)

As an example, if a country sustains a resource gap of 10% of its export revenues, is such revenues increase 13% per annum, and if the interest rate remains at 8% a year, the debt/export ratio converges to 2.

If the interest rate exceeds the rate of growth of exports, resource gaps can not be sustained for long, since they would push the debt/export ratio beyond any safety limit. Hence, depending on the expected sign of $x-i$, mildly declining resource gaps can either be looked as a natural absorption of foreign savings or as an evidence that debtor countries are postponing the indispensable adjustment policies. In fact, the breakdown of competitive recycling can be explained by a sudden and unanticipated change in the sign of the $x-i$ differential. During the

(* To prove the equivalence between equation (1) and (2) it is enough to remark that $\dot{D}/D = \frac{z}{z} + \frac{\dot{X}}{X}$. One should note that $i$ and $x$ are instantaneous rates. For instance, a 10% a year annually capitalized interest rate corresponds to $i = \log 1.1 = 9.53\%$.}
seventies, when debtor countries were expanding their exports far beyond the interest rates, resource gaps were considered a natural element in the balance of payments of the non-oil developing countries. In a few cases there was some questioning as to the size of the gaps, but not as to their sign. With the unanticipated events of the early eighties, the explosion of the international interest rates, world recession, dollar appreciation and shrinking trade, conventional wisdom moved to the opposite pole. In the interim period, debt/export ratios rose substantially, entering in some cases a dangerous zone. A typical example is that of Brazil, where such ratio leaped from 2.6 in 1980 to 3.8 in 1982.

Because of the steep increase in the debt/export ratios and of the change of expectations as to the \( x-i \) differential, what was previously accepted as the normal debt dynamics of the developing countries, was suddenly transformed into evidence of overindebtedness. Since no debtor country can uphold a resource gap without its creditors consent, developing countries were forced to move to Phase II of the debt cycle and are now being urged to reach Phase III as quickly as possible. This is to say that debtors must sustain a resource surplus \( G = -hX \), where \( h \) is a positive ratio that transforms equation (2) into:

\[
\ddot{z} = (i-x)z-h
\]

Since \( h \) is the proportion of exports that the country will set aside to service its external debt, the above equation bears some similarity with the Norman Bailey rescheduling proposal: developing country debt should be replaced by exchange participation notes entitling the holder to a specific participation in the country's export earnings. Although highly impractical from the banking point of view, the proposal describes how foreign debts can be expected to be repaid: with part of the export proceeds and not by the sale of assets or natural resources. As such, it provides some useful solvency tests.

A weak solvency test just requires the debt to be paid-off over a finite time horizon. It is automatically fulfilled for any positive \( h \) if \( x-i > 0 \), i.e. if the interest rate does not exceed the rate of growth of exports. This explains the attractiveness of a world where interest rates remain consistently below the rates of growth of international trade. In such scenario, most sovereign risk problems can be automatically solved by themselves. Debtor countries have only to acknowledge two points: 1) exchange rate management should keep the country's
exports in line with the expansion of international trade; ii) the costs of sustaining for long a certain surplus/export ratio are substantially lower than those of extended moratoria. Creditors are only required to understand the dynamics of the debt cycle. If the inequality \(x-i \geq 0\) holds, external debts can be paid-off in no more than \(T = z_0/h\) years, where \(z\) stands for the initial debt/export ratio. Countries like Brazil and Argentina, where \(z_0\) is close to 4, could repay all their external debts in no longer than 16 years, if they were willing to set aside 25% of their export revenues to service foreign liabilities. But, even if the warranted surplus/export ratio was reduced to a modest 10%, the debt would still be fully repaid within a 40 year time horizon.

If exports expand below the interest rate, a minimum critical effort \(h > (i-x)z\) is needed to prevent the debt/export ratio from exploding beyond any safety limit. This is to say that, if the interest rate exceeds by 6 percentage points the rate of growth of exports, countries like Brazil and Argentina would not even meet the weak solvency test if they were not willing to sustain a surplus/export ratio above 24%.

Taking \(h\) and \(x-i\) as constants, equation (4) is solved by:

\[
z = \frac{h}{i-x} \left(1-e^{(i-x)t}\right) + z_0 e^{(i-x)t}
\]

Assuming \(h > (i-x)z_0\), as required by the weak solvency test, the number of years to pay-off the debt (i.e., to reduce \(z\) to zero) is given by:

\[
T = \frac{\log_e \left(1 + (x-i)z_0/h\right)}{x-i}
\]

which is a decreasing function of both, \(h/z_0\) and \(x-i\) as indicated on Table II.

\[(*)\) Formulae (5) and (6) assume \(x-i\). For \(x=i\), \(z=z_0 -ht\) and \(T = z_0/h\).
The trouble with the weak solvency test is that it says nothing about the extension of Phase II of the debt cycle. It only requires a consistently declining debt/export ratio but, when exports are growing, this does not necessarily imply a declining debt. When solvency is questioned, because of uncertainties as to the future paths of $h$ and $x-i$, this is a particularly strained stage of the debt cycle: in spite of their efforts to adjust the balance of payments, debtor countries are not even able to meet the interest payments without additional borrowing. A stronger solvency test requires, therefore, that the country will be able to reach Phase III of the debt cycle in a given period of time, say, five years.

Since equation (1) is equivalent to:

$$\frac{D}{D} = i - \frac{h}{z} \tag{7}$$

a country can only reach the last phase of the debt cycle when $h > zi$. If exports are growing, this is a much more stringent condition than the inequality $h > z(i-x)$ of the weak solvency test. Taking $z = h/i$ and $t = 5$ in equation (5), the strong solvency test requires:

$$\frac{h}{z_0} = \frac{i(x-i)}{xe^{5(x-i)-i}} \tag{8}$$

<table>
<thead>
<tr>
<th>$x-i$ (% a year)</th>
<th>$h$ (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$2z_0$</td>
</tr>
<tr>
<td>-6</td>
<td>$\infty$</td>
</tr>
<tr>
<td>-4</td>
<td>$\infty$</td>
</tr>
<tr>
<td>-2</td>
<td>$\infty$</td>
</tr>
<tr>
<td>0</td>
<td>50.0</td>
</tr>
<tr>
<td>2</td>
<td>34.7</td>
</tr>
<tr>
<td>4</td>
<td>27.5</td>
</tr>
<tr>
<td>6</td>
<td>23.1</td>
</tr>
</tbody>
</table>
Numerical results are indicated on Table III. The required adjustment effort, besides being proportional to the initial debt/export ratio, decreases with the x-i differential and, for a given x-i, is an increasing function of the interest rate.

**TABLE III**

**STRONG SOLVENCY TEST: REQUIRED h/z\(_o\) (%)**

<table>
<thead>
<tr>
<th>x-i (% a year)</th>
<th>7</th>
<th>9</th>
<th>11</th>
<th>13</th>
<th>15</th>
</tr>
</thead>
<tbody>
<tr>
<td>-6</td>
<td>6.7</td>
<td>8.0</td>
<td>9.0</td>
<td>10.0</td>
<td>10.8</td>
</tr>
<tr>
<td>-4</td>
<td>6.2</td>
<td>7.3</td>
<td>8.4</td>
<td>9.2</td>
<td>10.0</td>
</tr>
<tr>
<td>-2</td>
<td>5.7</td>
<td>6.8</td>
<td>7.7</td>
<td>8.5</td>
<td>9.3</td>
</tr>
<tr>
<td>0</td>
<td>5.2</td>
<td>6.2</td>
<td>7.1</td>
<td>7.9</td>
<td>8.6</td>
</tr>
<tr>
<td>2</td>
<td>4.7</td>
<td>5.7</td>
<td>6.5</td>
<td>7.3</td>
<td>7.9</td>
</tr>
<tr>
<td>4</td>
<td>4.4</td>
<td>5.2</td>
<td>6.0</td>
<td>6.7</td>
<td>7.3</td>
</tr>
<tr>
<td>6</td>
<td>4.0</td>
<td>4.8</td>
<td>5.5</td>
<td>6.2</td>
<td>6.7</td>
</tr>
</tbody>
</table>

Whether developing countries with high debt/export ratios will be prepared to accept such adjustment efforts is a questionable point. Surely, what is being required is only a temporary sacrifice: once Phase III is reached, the surplus/export ratio may be reduced. Also, since adjustment programs are subject to IMF approval, debtor countries may have to face an all or nothing choice. Yet, assuming z\(_o\) = 4, the required h ranges from a relatively mild 16% in the southwest corner of Table III to a virtually intolerable 43.2% in the northeast extreme. The conclusion is that the lower the initial debt/export ratio, the lower the interest rate, and the higher the x-i differential, the greater are the chances that a debtor country will meet the strong solvency requirements.

Assuming that a country is able to sustain for five years the surplus/export ratio required by the strong solvency test, an important question still remains: how much will the external debt increase until Phase II comes to an end? The
answer is provided by the expression:

\[
\frac{D_{\text{max}}}{D_0} = \frac{(x-i)e^{5x}}{xe^{5(x-i)}-1}
\]  

(9)

Numerical results are shown on Table IV.

TABLE IV

<table>
<thead>
<tr>
<th>x-i (% a year)</th>
<th>7</th>
<th>9</th>
<th>11</th>
<th>13</th>
<th>15</th>
</tr>
</thead>
<tbody>
<tr>
<td>-6</td>
<td>1.008</td>
<td>1.029</td>
<td>1.056</td>
<td>1.090</td>
<td>1.129</td>
</tr>
<tr>
<td>-4</td>
<td>1.023</td>
<td>1.047</td>
<td>1.077</td>
<td>1.114</td>
<td>1.157</td>
</tr>
<tr>
<td>-2</td>
<td>1.037</td>
<td>1.065</td>
<td>1.098</td>
<td>1.138</td>
<td>1.183</td>
</tr>
<tr>
<td>0</td>
<td>1.051</td>
<td>1.082</td>
<td>1.118</td>
<td>1.161</td>
<td>1.210</td>
</tr>
<tr>
<td>2</td>
<td>1.065</td>
<td>1.098</td>
<td>1.138</td>
<td>1.183</td>
<td>1.235</td>
</tr>
<tr>
<td>4</td>
<td>1.077</td>
<td>1.114</td>
<td>1.157</td>
<td>1.205</td>
<td>1.260</td>
</tr>
<tr>
<td>6</td>
<td>1.090</td>
<td>1.129</td>
<td>1.175</td>
<td>1.227</td>
<td>1.285</td>
</tr>
</tbody>
</table>

An alternative exercise assumes that the debtor country is prepared to sustain a surplus/export ratio \( h = 6.25 \% \) (which, for \( z = 4 \), leads to \( h = 25 \%) \), as in the Bailey proposal, until the end of Phase II of the debt cycle. The number of years required to reach Phase II and the interim debt expansion are both increasing functions of the interest rate and decreasing functions of the \( x-i \) differential, as indicated in Tables V and VI. Results in the northeastern region of the Tables are clearly unmanageable because of both, the extension of Phase II and the disproportionate debt growth.
### TABLE V

$h/z_o = 6.25\%$: NUMBER OF YEARS OF PHASE II

<table>
<thead>
<tr>
<th>$x-i$ (% a year)</th>
<th>$i$ (% a year)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>7</td>
</tr>
<tr>
<td>-6</td>
<td>21.2</td>
</tr>
<tr>
<td>-4</td>
<td>4.3</td>
</tr>
<tr>
<td>-2</td>
<td>2.5</td>
</tr>
<tr>
<td>0</td>
<td>1.7</td>
</tr>
<tr>
<td>2</td>
<td>1.3</td>
</tr>
<tr>
<td>4</td>
<td>1.1</td>
</tr>
<tr>
<td>6</td>
<td>0.9</td>
</tr>
</tbody>
</table>

### TABLE VI

$h/z_o = 6.25\%$: $D_{max}/D_o$

<table>
<thead>
<tr>
<th>$x-i$ (% a year)</th>
<th>$i$ (% a year)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>7</td>
</tr>
<tr>
<td>-6</td>
<td>1.104</td>
</tr>
<tr>
<td>-4</td>
<td>1.018</td>
</tr>
<tr>
<td>-2</td>
<td>1.010</td>
</tr>
<tr>
<td>0</td>
<td>1.007</td>
</tr>
<tr>
<td>2</td>
<td>1.005</td>
</tr>
<tr>
<td>4</td>
<td>1.004</td>
</tr>
<tr>
<td>6</td>
<td>1.003</td>
</tr>
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</table>
Although based on simple balance of payments tautologies, the foregoing analysis leads to some important conclusions.

First, as far as sovereign risk is concerned, there is no clear borderline between illiquidity and insolvency. A number of solvency tests can be developed on the basis that a country is solvent if and only if its external debt can be paid-off. All these tests conclude that solvency depends on the warranted $h/z_o$ surplus/debt ratio and on the $x-i$ rate differential. Moreover, for a given $x-i$, the lower the interest rate, the shorter will be the strained Phase II of the debt cycle. Yet, since neither $h$, nor $x$ nor $i$ can be predicted on safe grounds, the best one can do is to attribute subjective probabilities to the alternative scenarios.

Second, actions to improve the solvency probabilities should be urgently undertaken, in the economic policy area and on the institutional front.

Faster OECD recovery, tighter fiscal and temporarily looser monetary policies in the United States would be more welcome, from the debtor countries' point of view. Assuming, however, that OECD nations will not change their basic policies just because of the developing-country debt problem, specific measures can still exert a highly favorable impact on the Third World balance of payments. Examples are the creation of worldwide income tax free bonds to finance developing country debt under IMF conditionality; an allocation of SDRs to compensate the recent decline in world reserves; the strengthening of both, the IMF and the World Bank; and the elimination of protectionist actions against the exports of the highly indebted countries. IMF conditionality; on the other hand, should put more emphasis on the need for real exchange devaluations and wage-price flexibility, minimizing the recessive cost of the adjustment policies.

In the institutional front one must recognize that the present recycling mechanisms, trying to reconcile IMF centralization with commercial bank competitive freedom, are obviously inadequate to face long term international debt problems. As a transitional system they are to be credited for preventing a world financial collapse after the Mexican moratorium in 1982. Yet, because of externalities, adverse expectations, improper regulations, or even because of misunderstandings of debt dynamics, risks of disruptions in the debtor-creditor relations should not be minimized. To reduce such risks, both, the IMF
and the World Bank should be enabled to increase their share in developing-country balance of payments finance. And banking regulations, traditionally modelled for commercial risks, should be properly adapted to the peculiarities of the external debt problem.
3) The transfer paradox

The most dramatic consequence of the debt crisis was the paradoxical change of sign in the international flow of funds. Developing countries, in spite of their natural standing as capital importers, are now being forced to transfer abroad a sizeable proportion of their export revenues. (Latin America, in 1983, raised its surplus/export ratio to 27.4%). Net resource transfers mainly benefit the United States, whose huge external gaps find no parallel in contemporary economic history.

The optimistic diagnosis explains the paradox as a simple temporary deviation from normal trends. The fact that developing countries are natural capital importers does not mean that they should live with uninterrupted resource gaps. Debts expanded too swiftly in the last few years, and a temporary run of resource surpluses is now required to restore the appropriate creditstanding indicators. Once this result is achieved, developing countries will find the necessary financial support to return to Phase I of the debt cycle. As to the United States capital imports, they simply reflect an overvaluation of the dollar, that sooner or later will be corrected by the exchange markets.

This happy-end approach to the transfer paradox, which perhaps enjoys more popularity in international financial circles than in debtor developing nations, relies on three assumptions. First, that real interest rates are bound to decline to their 0-4% a year historical average. Second, that world economic growth will be robust enough to allow debtor countries to expand their exports above the interest rates. (Without this condition, future resource gaps will become unsustainable). Third, that the international financial system will transfer net resources to developing countries, once their creditworthiness coefficients, such as interest/export ratios, are brought down to appropriate figures.

All these hypotheses, of course, can be questioned. The idea that real interest rates should be confined within a relatively narrow range, such as 0-4% a year, finds no support in economic theory. Surely, interest rates would decline if the United States decided to change its present policy-mix, based on monetarism and supply-side economics. Yet, there are no indications that this change is to occur. The combination of tight monetary versus loose fiscal policies in the leading world economy may have ruined a number of countries but...
least up to now, looks a success in the United States. Real interest rates are abnormally high before tax, but not once the effect of income taxes is taken into consideration. Market forces determine the after-tax interest rates, the relevant ones for dollar savers and investors, and which are moderate enough to support the present economic recovery. Now, interest rates before tax are the ones that burden the balance of payments of the debtor countries, being high enough to challenge their solvency. In a word, the way income tax laws operate, treating interest as taxable income of lenders and as deductible expenditure of domestic borrowers, creates a perverse fiscal transfer from debtor to creditor countries. Of course there is nothing new in this fact, except that fiscal transfers are now extremely painful for developing debtor countries.

The assumption that sooner or later exchange markets will force a dollar depreciation can also be challenged. Of course, the prospective current account deficits of the United States may seem absurd, but currencies do not devalue because of anticipated balance of payments disequilibria. Along the seventies, international capital markets provided abundant finance to the developing country resource gaps. There is no reason why, during the eighties, they should not do the same for the United States. Moreover, if market psychology turns against the dollar, things may become still worse for debtor countries. In fact, in this case the Federal Reserve is likely to tighten the monetary policy to prevent the reignition of inflationary pressures from both, the demand and the import cost sides. The outcome could be a catastrophic explosion of interest rates, precipitating a new world recession, and transforming the debt issue into a hopeless problem.

A disquieting thought is that, at least up to now, there is no evidence that the optimistic scenario is likely to prevail. As previously noticed, Latin American countries, in 1983, raised their average surplus/export ratio to 27.5%, transferring to abroad 29.5 billion dollars. Adjustment policies involved substantial social costs, such as the dramatic acceleration of inflation rates, the increase in unemployment and a 5.9% decline in the real per capita income of the region. Yet, since adjustment was achieved through import cuts and not through export growth, the debt/export ratio of the region continued to rise, from 3.3 to 3.5, according to ECLA's estimates. This is to say that, in 1983, Latin American countries were not even able to meet the weak solvency test. Part of this adverse result can be attributed
to linkage effects: import cuts in one country implied export losses for the others. Yet, even if statistics described Latin America as a consolidated block, cancelling intraregional trade and debts, the 1983 achievements would still look rather unimpressive from the long-term solvency point of view.

This leads to a challenging political question: how stable is a world that, although repudiating colonialism, requests developing debtor countries to transfer abroad 25-30% of their export revenues? The obvious stability condition is that debtor nations are convinced that keeping such transfers is preferable to a confrontation with the world financial community, in terms of present value of domestic welfare losses. This could be easily achieved if developing countries endorsed the optimistic explanation for the transfer paradox. Yet, political leaders in the main debtor countries suspect that this temporary deviation from normal trends may last twenty or thirty years. Many of them even question whether sustained resource surpluses in the 25-30% range, as a proportion of exports, will lead to the eventual pay-off of the external debts. This, of course, creates a serious potential for confrontation.

What may prevent a disruption is the fact that the best choice for debtor countries may be neither immediate confrontation nor indefinite cooperation, but temporary cooperation followed by ever postponed confrontation. At least in the short run, debtor nations are likely to sustain substantial resource surpluses, even if they look at the optimistic diagnosis for the transfer paradox as mere wishful thinking. The reason is that the world financial community cannot only force the debtor nations to eliminate their resource gaps. It can also impose a once-for-all resource surplus by drying-up commercial credits. A debtor country can play tough with its creditors by suspending the payments of both, principal and interest. In modern economic diplomacy this does not mean debt repudiation nor even extended moratorium: the debtor nation simply announces its willingness to honor its commitments but that, unfortunately, its Central Bank cannot print dollars. Yet, in this case, creditors tend to react by cutting the commercial credit facilities, and forcing the country to pay most of its imports on a cash basis. Since there is a lag in export receipts behind shipments, the country would be imposed a resource surplus worth, perhaps, four or six months imports. This is a much more stringent effort than what is required by an IMF adjustment program. When the country is illiquid, it leads to a highly painful and inefficient balance of payments adjustment through
import rationing. This explains, incidentally, why the proposal of creating a debtors' cartel found little appeal up to now: it could jeopardize the access of the participating countries to commercial credits. It also explains why illiquid debtor nations had no success in their temporary attempts to depart from IMF conditionality.

In the medium term, however, debtor countries may take the necessary steps to face a sudden cut in commercial credits. A substantial accumulation of reserves may be out of question, since lenders are likely to try to keep borrowers on a short leash. Yet, the same result can be obtained through import substitution policies, increased bilateral trade between debtor countries, and through the accumulation of inventories of basic imports. Some of these steps, of course, require additional sacrifices to the ones of sustaining the internationally agreed resource surpluses. Yet, they may be preferable to the perspective of transferring to abroad 25-30% of the export revenues on a long-term basis.

Summing up, the risks of a debtor-creditor international confrontation can be minimized in 1984, but not necessarily in the next-coming years. The proper dimensions of the confrontation should be made explicit. They hardly would be shaped as debt repudiation, an ideological move that naturally triggers a number of international reprisals. Instead, developing debtor countries are likely to choose the much more polite "limited ability to pay" approach. In practice, this would mean that they would be willing to sustain a surplus/export ratio, high enough to prevent international retaliation, but too low to ensure solvency at market interest rates. The debtors' cartel might eventually blossom, trying to achieve what politicians in the debtor countries claim for: a broad debt rescheduling, with adequate grace periods, appropriate amortization terms and fair interest rates.

How can the confrontation be avoided? A happy-end can only be achieved if the surplus/export ratios that debtor nations are willing to sustain are reconciled with those that they need to keep up to meet solvency tests. As explained in the preceding section, the demand for the surplus/export ratio h is a decreasing function of the rate of growth of exports and an increasing function of the interest rate i. Now, as in Marshallian analysis, x and i affect the supply of h in the opposite directions.

In fact, for a developing country, the willingness to transfer resources abroad depends on both, limited social
cost, and lack of political resentments. High real interest rates undermine adjustment policies because of the latter effect. They are interpreted by a number of debtor countries as nothing but colonialism with modern economic weapons. Political leaders often argue that developing nations were caught by the floating interest rate trap: they were encouraged to borrow at prospective low real interest rates and are forced now to repay the debt at rates beyond any usury ceiling.

As to the social costs of sustained resource surpluses, they depend on how they are achieved. In the most favorable case, they may be the effortless result of an improvement in terms of trade, as occurred with the OPEC countries after the first oil shock. There is little hope that the developing-country debt problem can be solved through this easy method, even if a robust OECD recovery could bring some help. Yet, resource surpluses promoted by export led economic growth can be politically accepted. Surely, for a country with no weakness in aggregate demand, transferring abroad H billion dollars means giving up the same amount of domestic expenditures. In particular, it implies a sizeable contraction of real incomes and consumption outlays, if domestic savings must be raised to sustain investments levels. Yet, in a growing economy with low unemployment rates, social tensions are easy to dissipate. The unfavorable scenario is that of scoring resource surpluses at the cost of a long recession that reduces imports, and of import controls that aggravate recession. Unfortunately, this has been the 1983 experience for most debtor countries.

Since recessions are hard to prevent at early stages of adjustment programs, there is no reason to predict an inevitable debtor-creditor clash in the next few years. Yet, there is also no reason for optimism, since a successful case, combining external adjustment with domestic growth, is still to be displayed.

In the preceding section, a number of specific measures were suggested to reduce the demand for resource surpluses in developing countries. The same measures are likely to encourage debtor countries to accept the transfer paradox.
The dogmatic assumption that competitive markets can solve all the world problems has led to a curious proposal: developing-country debt should be dealt with by adequate pricing. The proposal, defended by some conservative economists, dismisses the IMF and the coordinated rescue packages, leaving the solution to the wisdom of market forces: outstanding credit contracts should be priced in secondary markets, where the risks of insolvency would be signalled by appropriate discounts. This would force the banks to disclose the "true" value of their assets and write-off the losses they have incurred because of imprudent lending. Developing countries could get the additional finance they needed provided they were prepared to pay the market interest rates. In the case of overindebted nations, these rates would be high enough to deter excessive new borrowing and to encourage the adoption of required external adjustment policies, independently of IMF conditionality. Surely, the free market approach could cost some bankruptcies, but these should be accepted as the deserved punishment for irresponsible lenders and borrowers.

In spite of its naive attractiveness, the proposal contains a major flaw: it overlooks the fact that the central reason why a developing country may be willing to keep up a resource surplus is the expectation of continued access to foreign credit markets. If this access is cut because the country is unable to fully service its debt, the country is likely to react reducing the resource surplus to zero. Hence, what a country can raise in risk neutral financial markets, i.e., the expected present value of its future resource surpluses, depends on whether occasional conflicts are to be solved by cooperation or lead to retaliation. Chances of retaliation are much greater in a competitive environment than under cooperative arrangements, since competition excludes the formation of coalitions. The conclusion is that the free market approach would underprice the developing-country debts instead of expressing anything like their "true value". As a result, the interest rates would be pushed beyond those which would be set by a single monopolistic lender. In many cases this might transform illiquidity into insolvency.

A simple example illustrates the point under discussion. Let us assume that all the external debt $D$ of a certain country falls due on the same day $t$. The country is
financial markets would provide the country the necessary funds \( E(H) \), not only to repay the debt \( D \), but also to build up a reserve level \( E(H) - D \).

Now, let us turn to competitive markets, which follow the rules of non-cooperative games. In this case, any creditor would have the choice between two strategies: a) playing tough, i.e., advising the debtor country that it would be called in default whenever its contractual obligations were not met; b) playing soft, which means, taking no action against a country unable (or perhaps unwilling) to fully service its debt. Competition encourages the first choice, since soft players may simply carry the cost of bailing out the tough ones.

To be specific, let us assume that the country can raise at the financial markets a total sum \( G < D \), which is to say that it can only service part of its external liabilities. Let \( \alpha_k \) be the share of the \( k \)-th creditor in the country's total debt. Creditors are assumed to be atomized enough, so that \( \alpha_k D < d \), which is to say that collaterals to sovereign risk, although too small to match the country's total debt, cover the exposure of any individual creditor. (This atomization hypothesis avoids mixed strategy solutions for the non-cooperative game described below).

The rules of the game are assumed to be the following: if the total share \( B \) of the tough creditors is such that \( BD \leq G \), the debtor country will pay \( BD \) to those creditors and divide the remaining \( G - BD \) among the soft players, proportionally to their exposures. If \( G < BD \), the country will reprise by reducing its resource surplus to zero, and leaving the collateral \( d \) to be shared among the tough lenders.

Which is the best strategy for the \( k \)-th lender? Indicating by \( \alpha \) the aggregate debt-share of its tough competitors, the \( k \)-th player faces the following pay-off table:

**Pay-off to the \( k \)-th creditor**

**Tough strategy:** \( \alpha_k D \), if \( (\alpha + \alpha_k) D \leq G \); \( \frac{\alpha_k}{\alpha + \alpha_k} \cdot d \), if \( (\alpha + \alpha_k) D > G \)

**Soft strategy:** \( \min \alpha_k (G - \alpha D; 0) \)

Elementary calculations show that, since \( \alpha_k D < d \), playing tough is preferable to playing soft, for any feasible \( \alpha \): \( 0 \leq \alpha \leq 1 - \alpha_k \). The situation is similar to the two prisoners
totally illiquid: to honor its outstanding commitments, it must previously raise at the foreign financial markets a lump sum not inferior to \( D \). The value \( d \) of the country's foreign assets that can be attached in case of default is no more than a small percentage of \( D \).

Prospective resource surpluses, besides involving a number of uncertainty elements, depend on whether conflicts lead to cooperation or to confrontation. If the hypothesis of calling the country in default is ruled out, the possible resource transfer paths are described by the stochastic process \( H(t) \). The corresponding present values are indicated by the random variable \( H \), with mathematical expectation \( E(H) \). Since the country attributes a positive value to its access to foreign credit markets, all the possible realizations of \( H \) are greater than \( d \).

Now, let us take the case where default is declared whenever the expected present value of the country's future resource surpluses falls below its foreign debt. In such event, the country is assumed to react by reducing to zero its resource surplus. Possible resource transfer curves are now described by the stochastic process \( H'(t) \), whose realizations are such that \( H'(t,\omega) \leq H(t,\omega) \). Hence, \( E(H') \leq E(H) \). To complete the model we assume that financial markets are risk-neutral with rational expectations.

If \( D < E(H') \) the country is obviously solvent at day \( t_0 \), and can raise the necessary funds to service its debt. If \( E(H) < D \), the country can only meet part of its contractual obligations. Now, let us take the challenging intermediary case where \( E(H') < D < E(H) \). Here, the country is solvent at day \( t_0 \), if its problems are to be solved by cooperation; but insolvent, if conflicts lead to retaliation. In the latter hypothesis, \( E(H')=0 \), since the country, once being called in default, will react by reducing its resource surplus to zero.

How does the game solve? The answer depends on whether cooperative or competitive action is taken.

The cooperative solution is the one that would emerge if balance of payments finance was provided by a single monopolistic lender. In this case, since all possible realizations of \( H \) are greater than \( d \), the central lender would rule out the hypothesis of calling the debtor in default. In other words, since there is little collateral to sovereign risk, the creditor would be better-off only receiving part of the contractual payments than pushing the debtor to a disruptive confrontation. This course of action being made clear,
dilema. Individual rationality, here opposed to collective rationality, leads every actor to tough playing and to eventual retaliation. Financial markets, anticipating this result, would make $E(H') = 0$. As a consequence, the country would be unable to raise one single dollar to service its debt.

The exercise obviously describes an extreme case. All the country's foreign debt matures in the same day to, when irreversible decisions have to be made, leaving no room for the signalling strategies of iterated games. Yet, in spite of its blunt simplicity, it conveys an important message: no serious argument supports the view that competitive financial markets are an efficient structure to provide balance of payments finance. After all, balance of payments are managed by Governments that should not be confounded with competing actors. Moreover, the efficiency of competitive markets cannot be accepted as an universal axiom, but only as a theorem that can be proved under specific circumstances, where there is no conflict between individual and collective rationality. General equilibrium theory shows that this theorem does not hold when individual optimization leads to externalities, or when the problem is to supply an adequate amount of public goods. There is no "a priori" reason why it should hold for balance of payments finance.
5) **The rise and fall of competitive recycling**

As indicated in the preceding section, efficient balance of payments finance should follow the rules of bilateral monopoly, and not those of free competition. In fact, except under purely floating exchange rates, balances of payments are subject to non-competitive interventions. Moreover, since there is virtually no collateral to sovereign risk, subtle instruments are required to approach moral hazard issues: as far as external debts are concerned, there is no clear cut line between ability to pay and willingness to pay.

The Bretton Woods agreement endorsed the bilateral monopoly approach to balance of payments finance, less because of game theoretical considerations than because of the fact that private international lending had collapsed during the thirties. Official lending and direct investment covered most current account deficits until the middle sixties. Then, with the emergence of the euro-dollar markets, commercial banks took an increasing share in the supply of international liquidity.

Competitive recycling did not flourish because of its intrinsic merits, but because commercial banks, as opposed to official credit agencies, provided a timely response to the challenge of the first oil shock, namely, how to channel the OPEC surpluses to the oil importing countries. This prompt action avoided an international economic collapse, where the greatest victims would be the developing countries unable to attract funds from the major oil exporters. Yet, it also set in motion a system of balance of payments finance that departed considerably from the central lender concept of Bretton Woods.

Under the bilateral monopoly approach, the central lender would realize that, since there is virtually no collateral to sovereign risk, a country's external debt should not exceed the pecuniary value of its access to international credit. In other words, foreign debts would be limited to a point where the social costs of extended moratoria would exceed those of normal servicing the external obligations.

Second, the central lender would only finance extended resource gaps if borrowers used the external savings to invest in export promotion and import substitution programs that would lead to the eventual repayment of the debt, according to the balance of payments projections for each country. Loan maturities would be consistent with such projections, grace periods
being extended until the expected end of Phase II of the debt cycle.

Third, the central lender would monitor the economic policies of each debtor country with a set of conditionality tests. These would be intended to prevent exchange rate overvaluations, to keep inflation under control, to promote wage-price flexibility and to create the basic conditions for sustained economic growth. Of course, financial assistance would be cut if the conditionality tests were not met.

Fourth, if unanticipated factors pushed some borrower to a point of overindebtedness, the central lender would call for appropriate adjustment policies, leading to a run of resource surpluses. Yet, whenever necessary, the central lender would not oppose to refinance part of the interest payments falling due. In fact, since there is no difference between losing one dollar today or losing this dollar plus interest in some future date, any creditor is better-off receiving part of the interest payments than forcing the game to a stale-mate. (Of course, this would not be the case if collaterals did exist).

How do these rules compare to those of competitive recycling? In a word, competitive credit markets overreact to changes in expectations.

First, during the seventies, risks of foreign exchange crises were minimized, and banks almost took for granted that their loans would be repaid with each country's reserves, which, in turn, would be borrowed from other banks. Moreover, scarce information was available on total foreign debts, since official statistics usually omitted both, the private sector indebtedness and the short term external liabilities. The full disclosure of the total figures in late 1982 was received as a nightmare by the world financial community. Even Brazil, who had acquired the reputation of displaying comprehensive foreign debt statistics, had accumulated an unrecorded short-term indebtedness close to ten billion dollars.

Second, in a competitive environment, loan maturities could hardly be reconciled with balance of payments projections. They were usually adequate from the commercial risk point of view but, as an aggregate, too short from the external accounts perspective. The roll-over assumption, therefore, was inherent to the system. Incidentally, a number of countries choose to finance their foreign current account deficits with the cheaper
but also poisoning) short term credits. In some cases (e.g. Brazil and Mexico), foreign branches of developing-country commercial banks used their access to money market facilities to provide balance of payments finance.

Third, although external credits were usually directed to sound investment programs, competition obscured an obvious fact: money is fungible. A set of good projects does not exclude the possibility of overall economic mismanagement. In fact, some countries used their access to foreign credit markets to promote exchange rate overvaluations that ruined both, their balances of payments and their local industries. Commercial banks are perhaps to blame for not retreating when such unorthodox economic policies were implemented. A possible excuse is that some of these policies were defended by respected economists. (The Chilean model, for instance, was hailed for a time as the golden offspring of the Chicago School). Moreover, there was no way to reconcile competitive recycling with economic policy conditionality.

Fourth, once confidence was disrupted, banks moved to the opposite extreme. As previously noted, a single central lender would not object, whenever necessary, to refinance part of the interest liabilities of a troubled debtor. Yet, the rescue packages orchestrated in 1982 and 1983 to provide additional loans to countries already in Phase II of the debt cycle, met a number of resistances, especially from regional banks. This can be explained for two reasons.

On the one hand, although rescheduling of the principal is a common banking practice, interest capitalization, at least in the United States, triggers the classification of the loan as non-performing. The rationale is that commercial risks should be matched by adequate collaterals. If a borrower can not even meet his interest obligations, either he is illiquid or insolvent. In the first case, additional loans can be supplied with the protection of increased collaterals. In the second hypothesis, the best course of action is to declare the borrower's default and attach the collaterals. Of course, all this logic disappears when sovereign risk is involved. In the absence of significant collaterals, there is no substantial difference between additional lending to countries in Phase II of the debt cycle and partial interest rescheduling.

On the other hand, cross default clauses in syndicated loans, whereby all the participants agree to call the borrower in default if one participant does so, create a conflict
between individual and collective rationality. Because of such clauses, debtor nations cannot discriminate a group of non-cooperative financial institutions, excluding them from normal debt servicing. Hence, what a creditor can get back from an illiquid country depends on what the whole financial community decides to lend to that country, a total that is only slightly affected by its own individual contribution. As in the case of voluntary financing of public goods, self-interest leads to retreat.

A simple theoretical model explains the point. An illiquid country must pay, in year $t$, $J$ million dollars of interest on its outstanding external debt, and is able to generate a resource surplus equal to $H$ million dollars. The country is on Phase II of its debt cycle, which is to say that $0 < H < J$. If $L$ stands for the additional lending to the country, in million dollars, creditors will get paid back an amount equal to $\min\{J;H+L\}$ and the country will accumulate arrears totaling $J-H-L$. (Negative arrears are to be understood as reserves). Arrears cost the lenders a $(J-H-L)$ million dollars, where $0 < a < 1$, because of the loss of their credit standing. Reserves in the debtor country are assumed to increase their profits by a symmetrical amount. Creditors want to maximize their net pay-back minus the cost of arrears.

Let us first take the case where balance of payments finance is provided by a single central lender. The objective function to be maximized:

\[ (*) \min \{ J;H+L \} - L \text{ is the net pay-off to the lender.} \]
\[ f(L) = \min \{J; H+L\} - a(J-H-L) - L \]

is described in figure 2. Here, \(\frac{df}{dL} = a > 0\), for \(L < J-H\), and \(\frac{df}{dL} = a-1 < 0\) for \(L > J-H\). The optimizing behavior of the creditor leaves the debtor on a short leash (i.e., with no positive reserves), but refinances all the part of the interest liabilities that cannot be covered by the country's resource surplus, making \(L = J-H\).

Now, let us assume that balance of payments finance is supplied by a competitive credit market, where \(q_i\) stands for the share of the \(k\)th bank in the total country's external debt. We shall assume that no such individual share exceeds 50%, i.e., \(0 < q_k < 1/2\). \(L_k\) and \(L = \sum L_k\) indicate, respectively, the additional lending to the country by the \(k\)th creditor and by the whole financial community.
Because of cross-default clauses in syndicated loans, the country is assumed to distribute its payments and arrears proportionally to each creditor's exposure. Hence, the net pay-off to the k\textsuperscript{th} bank is given by $a_k \min \{J;H+L\} - L_k$, and the corresponding amount of arrears by $a_k (J-H-L)$. Accordingly, the objective function to be maximized by the k\textsuperscript{th} creditor is:

$$g_k(L_k) = a_k \left( \min \{J;H+L\} - a(J-H-L) \right) - L_k$$

The optimizing behavior depends on how each creditor estimates his actions to influence those of his competitors. The classic non-cooperative case is the Cournot equilibrium, where each actor assumes that his individual choices do not affect the decisions of the other participants. Here $\frac{\partial L}{\partial L_k} = 1$, which is to say that:

$$\frac{\partial g_k}{\partial L_k} = \begin{cases} (1+a)a_k - 1, & \text{for } L < J-H \\ a_k - 1, & \text{for } L > J-H \end{cases}$$

In any case, $g_k(L_k)$ is a decreasing function of the additional lending $L_k$ by the k\textsuperscript{th} creditor, as in figure 3. Taking for granted that the principal has already been rescheduled, i.e., that $L_k \geq 0$, individual rationality leads to $L_k = 0$, and $g_k(L_k) = g_k(0) = a_k (H-a(J-H))$. All banks refuse to participate in the new loan to the country and, as a consequence, each of them incurs a loss that cooperative action could prevent making $L_k = a_k (J-H)$, namely:

$$g_k(a_k (J-H)) - g_k(0) = a_k (J-H)$$

The above analysis provides the rationale for the equitable burden sharing principle: under a fair cooperative arrangement each bank should participate in additional loans to the country proportionally to its individual exposure.
Cournot equilibria assume a non-cooperative mood that is only likely to prevail in highly atomized markets. They can neither explain the emergence of successful cartels like OPEC, nor the effectiveness of the rescue packages orchestrated under the leadership of the IMF since late 1982. Yet, the foregoing analysis leads to some important reflexions.

First, the competitive recycling experiment was fortunate enough to deeply involve a selected number of large banks. Because they were highly exposed to illiquid developing countries, they promptly cooperated with the IMF and the major Central Banks after the Mexican moratorium in 1982, thus preventing a desintegration of the international financial system. Had the balances of payments of developing countries been financed by bond markets, as in the early part of the century, a collapse would be almost inevitable.

Second, although a certain group of large banks is likely to accept cooperative arrangements for a number of years ahead, there is no reason why the smaller units should be willing to sacrifice individual advantage for collective rationality. The Cournot motivation, where each bank tries to be bailed-out by its competitors, is too strong to be ignored, at least in the case of the regional banks. Up to now, the damages caused by
free riders have been substantially limited through moral suasion by the IMF, by the major Central Banks and by the leading commercial banks. The fact that, in January 1984, more than six hundred banks accepted to join the 6.5 billion dollars additional lending facility to Brazil, shows how effective these cooperative efforts can be in the short run. Yet, this was only achieved through strenuous handicraft, involving the Managing Director of the IMF, some leading Central Bankers, the Advisory Bank Committee, and the President of the Central Bank of Brazil. The latter, incidentally, had to fly 150 thousand miles around the world and travel for fifty five days, until the operation was concluded. A discouraging thought is that the 6.5 billion dollars are just intended to clear the Brazilian arrears and enable the country to meet its interest payments in 1984. According to the IMF projections, a new jumbo loan will be needed for 1985, probably of a smaller size, but still involving a few billion dollars.

Debt dynamics tells us that, at least in the next few years, additional loans to countries in Phase II of the debt cycle should become routine operations, and not be looked upon as extraordinary rescue packages. Whether the present recycling system can only rely on moral suasion to substitute collective rationality for self-interest, is a highly questionable issue, since coalitions among hundreds of participants are hard to hold for long. As previously noted, there are strong similarities between additional lending to illiquid countries and the provision of public goods. Nobody can take seriously the idea that public goods should be systematically financed by voluntary contributions. In the same vein, a solution must be found to offset the sovereign risk externality, where what a bank gets paid basically depends on what its competitors decide to lend to the country.

The easiest way to cope with the problem would be to accept partial interest capitalization as a normal practice at early stages of debt restructuring arrangements. Capitalized interest in loans to debtor-country Central Banks, in the percentage determined by IMF-supported adjustment programs, and endorsed by each creditor's country Central Bank, should be treated by national regulatory authorities as an acceptable rescheduling practice, not causing the classification of such loans as non-performing. The quality of bank assets would be the same than under the current rescue packages to illiquid countries, while debt renegotiations would become much easier.
6) Witch hunting

Who is to be held responsible for the debt crisis, commercial banks that behaved as imprudent lenders, or developing debtor countries that misused the borrowed external funds? This is the fashionable debate in witch hunting circles, where every crisis provides an unique opportunity for the practice of their favorite sport.

The debate reflects nothing but poor logic, since it does not even meet elementary probability tests. Until late 1982, commercial banks never behaved as a Collective, but rather as independent decision units. In the same line, developing debtor countries never coordinated their individual economic policies. Now, the chances of a crisis being precipitated by the errors of a large number of independent actors are too small to support any acceptable theory. A plausible explanation for the debt crisis must rely either on some external factor, on the inadequacy of the recycling system or on both. Hence, the witch hunting investigation, might well be left aside, were it not for the insistent charges by conservative-populist politicians and by poorly informed observers.

As shown in preceding sections competitive credit markets do not provide an efficient framework for balance of payments finance. Yet, creating the appropriate institutions to face economic demands is a task for Governments and not for free enterprises. Private banks are not to be held responsible for the flaws of competitive recycling, they were simply playing the rules of the game. The responsibility is to be called on the policy-makers of the major world financial centers, who reduced to a low profile the IMF and the official lending agencies, failing to realize that the efficiency of competitive markets is not to be taken as an universal axiom. On contrary, as expressed by William Cline, "it was widely recognized in the mid-1970s and again in 1979-1980, that bank lending played a socially valuable role in facilitating the financial recycling of OPEC surpluses to nonoil developing countries in the process of adjustment. Official lending responded only sluggishly, especially to middle-income countries, so that it was primarily bank lending that met the sharply increased need for financing. Moreover, as was repeatedly pointed out at the time, if this lending had not been
forthcoming, developing countries would have been forced to cut back their imports from industrial countries, causing an even sharper world recession after the first oil shock. (*)

As to debtor countries, a widespread criticism is that they wasted the borrowed funds in projects with low, or even negative rates of return. The charge reflects, once again, the confusion between commercial and sovereign risks. Were it the case, Brazilian and Mexican borrowers would be facing problems with debt-servicing in cruzeiros or pesos. Now, if developing countries shared the United States seignorage, namely, if they could clear their foreign liabilities with their domestic currencies, the international debt problem would never have emerged. Of course, after a three-year recession period, a lot of unused industrial capacity is to be found in developing countries. Yet, this has been the effect and not the cause of the debt crisis. As previously remarked, project finance was nothing but a veil. The central story was that of balance of payments finance.

Surely, a number of developing countries are to blame for the lack of monetary and fiscal discipline. Yet, the adverse effects of expansionary policies on the balance of payments can be prevented if the real exchange rates are kept at appropriate levels. This was the case of Argentina, in the 1976-78 period, when substantial current account surpluses were scored, in spite of loose demand controls that kept the annual inflation rate in the 150% zone. In the same line, except for an unfortunate intermission in 1980, the Brazilian crawling peg has been consistently managed since 1968 so as to avoid a real appreciation of the cruzeiro. Now, the emergence of the Chilean external debt problems coincided with a period of tight orthodox controls on aggregate demand.

Summing up, what leads to disordered external debt growth is not the lack of monetary and fiscal discipline, but the inappropriate management of exchange rates. What can be argued is that expansionary policies yield the political temptation to overvalue the real exchange rate, transferring part of the resulting inflationary policies to the rest of the world. This appears to be the central reason why IMF-supported adjustment programs involve stringent demand controls. (An intriguing question is how an IMF program would deal with the United States fiscal deficit). In fact, especially in the late seventies, a number of developing countries damaged their external current account positions with exchange rate overvaluations. In some cases, (e.g., Argentina and Mexico), external debts expanded far beyond current account deficits, an evidence of heavy capital flights.

A curious fact is that two of the most disastrous overvaluation experiments, those of Argentina and Chile, were inspired on a prestigious textbook model, that of a small economy with fixed or predetermined exchange rates. Brazil run a similar exercise in 1980. It was less disastrous because its life was shorter and because it had been preceded by a 30% currency maxi-devaluation in December 1979. The model, which enjoyed a good reputation in IMF circles, assumes that wage-price flexibility leads to full employment equilibrium, and that the supply of foreign capital to the country is infinitely elastic at a given dollar interest rate, LIBOR plus a risk premium. The latter plus the prefixed exchange rate devaluation determines the domestic nominal interest rate. Money supply becomes endogenous, open-market operations being offset by countervailing changes in the country's external reserves. Fiscal expansion is crowded out by additional resource gaps in the balance of payments. Hence, fiscal restraint is the appropriate instrument to adjust the external current account.

The attractiveness of the model is that it yields an easy anti-inflationary prescription: prefix the exchange rate devaluation and limit the expansion of the net domestic credit so as to keep an adequate level of external reserves. This can be achieved, whenever necessary, through open market operations. As shown in Appendix, even if nominal wages respond to price increases with some lag, the differential between domestic and external inflation rates may converge to the predetermined exchange rate devaluation.
The trouble with the model is that it relies on widespread confidence in the exchange rate predetermination rule. Now, if the current account deteriorates because of external shocks, adjustment lags, worsened terms of trade or improper fiscal policies, confidence is likely to be disrupted. In this case, insistence on the predetermination rule leads to continuous appreciation of the real exchange rate and to an eventual policy change.

A practical credibility test is provided by the domestic interest rate behavior. If economic agents actually believe in the exchange rate rule, the difference between domestic and international nominal interest rates should approach the predetermined exchange rate devaluation.

None of the above mentioned experiments met this credibility test. From the external debt point of view, the most unfortunate case was that of Argentina in 1979-1980, when free capital exports were coupled with the so called "tablita", which officially set forward the dollar/peso daily rates for a twelve month period. The confidence gap was pushed to its extreme point in 1980, when the exchange devaluation was limited to 23%, while the peso interest rates remained in the 120% a year zone. In the absence of capital controls, international hot money was attracted to the country by a prospective 5% a month dollar yield. Oddly enough, local authorities accepted this huge differential as the "risk premium of Argentina". As one could expect, the exchange rate rule brought a temporary decline in inflation rates. Yet, as a result of the peso overvaluation, imports leaped from 3.5 billion dollars in 1978 to 9.4 billion dollars in 1980 and, in spite of improved terms of trade, the external current account moved from a 1.9 billion dollar surplus in 1978 to a 4.8 billion dollar deficit in 1980. Since the risk premium attracted a substantial inflow of short term capital, the country's reserves were kept at high figures, in spite of the increased current account deficits and of the massive long term capital flights. Yet, sooner or later the exchange rate rule was bound to collapse. It did in March 1981, when the new administration of General Viola buried the tablita with a strong peso devaluation.

Chile advanced one step ahead the tablita; in the second quarter of 1979 the exchange rate was pegged at 39 pesos per dollar, this currency parity being kept unchanged for three years. Contrary to Argentina, Chile controlled capital exports and succeeded in eliminating the public sector deficit.
was strongly reduced and, in 1981, the domestic inflation rate was comparable to that of the United States. Yet, because of adjustment lags and wage-price rigidities, traded goods were made extremely cheap compared to the domestic ones. As a consequence, imports increased from 2.9 billion dollars in 1978 to 6.6 billion dollars in 1981, expanding the current account deficit from 1.1 to 4.8 billion dollars. Domestic interest rates clearly indicated the lack of confidence in the exchange rate rule. Adverse expectations combined with monetary and fiscal restraints eventually led to a dismal recession, unemployment rates escalating to the 20%-25% range. Contrary to other Latin-American countries, exchange rate overvaluation in Chile was not caused by the lack of political will to fight inflation, but by blind dogmatism.

Whether inspired or not on fashionable economic models, exchange rate overvaluation was a wasteful source of growing indebtedness in some developing countries, especially when capital controls were absent. Had the IMF played a major role in the recycling process since 1974, most of these destabilizing experiments could have been avoided. Yet, the fact that they did occur cannot be attributed exclusively to irresponsible economic management in some debtor nations. A more serious structural problem is that both, the collapse of the Bretton Woods systems and the huge OPEC surpluses following the two oil shocks blurred the concept of equilibrium exchange rate as a function of current account performance. Once this concept was replaced by that of free market determination of exchange rates, overvaluation could only be signalled by an immediate loss of reserves. Now, the expansion of international liquidity in the late seventies postponed any such signalling. Total reserves continued to increase in the group of non-oil developing countries, an evidence that, for the average member of the group, Central Bank intervention prevented further currency appreciation. This is enough to dispel the idea that developing debtor nations systematically mismanaged their exchange rates. Measured by the fashionable floating exchange rate standards, overvaluation was the exception and not the rule. Had developing countries followed the monetarist gospel on the evils of dirty floating, current debt problems might be still harder to handle.

Summing up, neither the errors of the lenders nor those of the borrowers can explain the global debt crisis which emerged in late 1982. The central cause has been already indicated in our discussion on debt dynamics: the sudden and unanticipated
change of sign in the difference between the rate of growth of developing-country exports and the international interest rates. From 1974 through 1980, a typical interest rate on developing-country loans, LIBOR plus 1.5% a year spread, averaged 10.7%, while exports of non-oil LDCs were expanding at 21.1%, overfulfilling the weak solvency test. In 1981-1982 the interest rate soared to 16.3% a year, while the annual rate of growth of exports declined to 1%, challenging any solvency analysis. Even if balance of payments finance was provided by a single central lender, such a change would require drastic adjustment policies. Under competitive recycling, the yield could be nothing but a crisis. Witch hunters may argue that rational markets should anticipate a world recession in the early eighties, since inflation in OECD countries was escalating to intolerable levels, and that the inevitable outcome was a combination of higher international interest rates and lower rates of growth in non-oil LDC's exports. In fact, lenders and borrowers were probably prepared to face a normal adjustment shock, like the one of 1975. Yet, what rational economic agents could never foresee was the policy-mix of the United States, where tight money was associated to loose fiscal administration, leading to abnormal interest rates and to a managed strong dollar. Expectations are based on historical experience, but not on unorthodox experiments.
7) Policy suggestions

In late 1982, the timely intervention of the IMF and of the major Central Banks prevented an international financial collapse. The approach was that the developing-country debt problem should be treated as an illiquidity crisis and not as a structural solvency problem. Even if the correct diagnosis still dwells in a grey zone, and may vary from country to country, the optimistic view should be endorsed for two reasons. First because, since there is no clear cut line between balance of payments insolvency and illiquidity, adequate handling of the problem combined with appropriate policy steps can actually promote solvency at market terms. Second because, as long as a debtor country values its access to external credit markets above the tangible collaterals to sovereign risk, creditors have no collective interest in declaring its bankruptcy.

Since collaterals to balance of payment loans are mostly intangible, a functional concept of solvency is required. In the following discussion it will be understood as "sustained cooperation between creditors and debtor countries leading to declining debt/export ratios, as long as necessary". This concept discards rescheduling proposals of the Rohatyn style, at off-market interest rates. While stretched maturities and even lower spreads are a natural outcome of rescheduling arrangements, there is no reason why creditors should accept any systematic interest rate relief. First because lenders would be better-off by capitalizing into principal any part of the interest obligations that borrowers were temporarily unable to meet. Second because, as far as sovereign risk is concerned, there is a cloudy zone between ability to pay and willingness to pay, which could trigger a serious moral hazard problem: once interest relief was granted to a debtor country, other indebted nations would claim for the same benefit on the basis of equitable treatment, and good debts would be transformed into bad ones.
Proposals of the Bailey style, linking the transfer of resources abroad to a certain percentage of exports, although attractive from the debt dynamics point of view, are also inconvenient, for two basic reasons. First, they do not provide an adequate capital market instrument. Second, they might push debtor countries into autarchy, preferring import substitution to export growth.

How long the presence of a central coordinator will be necessary to sustain the cooperation between creditors and debtor countries is a controversial question, but the IMF should be prepared to play this role for an extended period of time. Developing nations may face a long phase of credit rationing and, in the interim period, IMF-supported adjustment programs should set balance of payment targets for debtor countries, indicating, as a consequence, the amount of principal and interest to be refinanced. To play this role, the IMF will need the cooperation of the major Central Banks, and should adjust its conditionality to the new exchange rate regimes and to the structure of the debt problem.

An initial objection must be dispelled. A frequent criticism is that the moral suasion involvement of the IMF and of the major Central Banks in the recent rescue packages to Brazil, Mexico and other developing countries was an imprudent step, since the prestige of such institutions may be severely hurt if, in the future, any such country faces a true solvency problem. The charge reflects, once again, the confusion between commercial and sovereign risks. It would only make sense if IMF traffic signals were used to finance resource gaps in debtor countries. The rationale for the moral suasion efforts has already been explained in the preceding discussion: since there is virtually no tangible collateral to sovereign risk, creditors are better-off by receiving part of the interest obligations and refinancing the rest than by pushing the borrower into a confrontation.

As appropriate international lending system should promptly respond to the IMF-supported adjustment programs. The response has
been reasonably automatic as far as the rescheduling of principal is concerned, but highly bureaucratic in terms of the so-called "new money facilities". As previously explained, the asymmetric response is due to two factors; i) bank regulations, especially in the United States, fail to recognize that additional balance of payments finance to countries in Phase II of the debt cycle is equivalent to partial interest capitalization; ii) financial externalities, inherent to competitive credit markets, oppose individual rationality to collective maximizing behavior, encouraging free riders.

Deregulated interest capitalization, of course, could make life too easy for both, debtors and creditors, and lead to snowballing debts. What regulating authorities should realize is that, in one specific case, partial interest capitalization should not trigger the classification of loans as non-performing, that of loans to debtor-country Central Banks, based on IMF-supported adjustment programs, duly endorsed by the monetary authorities of the creditor nations. Obviously, regulators must defend the health of the banking system, and minimum capital requirements as a proportion of both, total assets and sovereign exposures are probably the easiest and most effective solution to the problem. Yet, it should be recognized that the now fashionable rescue packages, that provide additional loans to illiquid debtor countries, do not make banks' assets any better than if interest capitalization was accepted as a normal rescheduling practice under the above mentioned principles.

This new approach to interest capitalization would improve the rescheduling arrangements in two directions. First, it would place maturity stretching and temporary increase in bank exposures at the same operational level. Second, it would ease the implementation of the equitable burden sharing principle, since what a bank got paid would no longer depend on what its competitors decided to
lend to the debtor country. Of course, moral suasion would still be required to solve the free rider problem, since any individual creditor could oppose not only to interest capitalization but also to rescheduling of the principal. Contingency planning, in fact, should recognize that a coalition of several hundred participants may be impossible to hold for long, and that the Collective should only retain its core members, the large international commercial banks.

A realistic approach to the problem should blend moral suasion with a substantial increase in official lending to developing countries. Additional official lending is not only necessary to compensate for the retreat of some small private participants that, incidentally, should never have been involved with balance of payments finance. But also to improve the equilibrium of the international financial system. As previously remarked, official lending responded too sluggishly to recycling demands over the last ten years, while commercial banks overextended their loans to developing countries. Time has come to invert the trends. This does not necessarily imply an additional burden to the creditor-country taxpayer, since official credit agencies can use their access to private capital markets. Of course, an idea to be discarded in the next-coming years is that of country graduation by official agencies. It would imply a still tighter credit rationing to middle income countries, exactly those who were more severely struck by the debt crisis.

To keep developing debtor countries cooperating with the international financial community, a basic question should be addressed: under what conditions rational policy-makers in debtor nations would prefer cooperation to retaliation? While precise rupture points are difficult to locate, a general principle remains valid: a growing economy with expanding exports hardly would seek confrontation with its creditors. In the same line, solvency at the expense of prolonged
recession may be politically unsustainable.

This basic principle requires a revision of the nature and scope of IMF conditionality. Present criteria have been designed for short term deviations from equilibrium, where the role of the IMF is only to prime the pump, market forces accomplishing the rest. Yet, the developing country debt problem may last a decade or even more.

Up to now, IMF conditionality concentrates on two points, adequate exchange rate management and demand discipline. The latter is to be achieved through fiscal restraint and limited expansion of the net domestic credit. The underlying macroeconomic model assumes that wage-price flexibility leads to full employment equilibrium and that private savings and investment are not affected by budgetary cuts. Hence, any reduction in the public sector deficit leads to an equal improvement in the external current account. Inflation is to be fought through monetary policies, since it yields the political temptation of exchange rate overvaluation.

Although monetary and fiscal restraint combined with adequate exchange rate management is necessary to reconcile external adjustment with price stability (or moderate price instability), it may be not enough. IMF conditionality, at its present terms, is recession-biased and therefore highly unpopular in developing countries, because it overlooks wage-price rigidities. A complicating factor is that some required adjustment policies, including exchange rate devaluations, indirect tax increase and subsidy cuts, imply a temporary acceleration of the inflation rates. Wage-price stickiness combined with aggregate demand controls can lead, under such conditions, to dismal stagflation. A typical example is provided by Brazil, where widespread lagged indexation schemes create highly adverse inflation-output trade-offs in the short run. In 1983, when the IMF program was implemented, the inflation rate leaped from 100% to over 200% a year, while real output declined 3.3%. Even if this could be regarded as a short-run impact of
stabilization policies, a disquieting thought is that inflation was still running at explosive rates in early 1984.

Even if a temporary recession may be the inevitable outcome of adjustment policies, a prolonged economic slowdown should be considered by the IMF as disturbing as galloping inflation. Especially in developing countries, it leads to social tensions and to political instability. It also yields a false balance of payments test, since the current account improvement may be undermined by a future recovery.

A further problem is that adjustment policies in developing countries should not only lead to relatively quick recovery, but also to sustained growth. This is not only necessary for political reasons, but also to keep exports growing in the long run, a solvency condition given the present debt dynamics and the international interest rates. This is to say that adjustment should focus on consumption and not on investment cuts. Moreover, debtor countries should create favorable conditions for new direct investment from abroad.

The conclusion is that, to play its role as the coordinator of the developing country debt rescheduling programs, the IMF should considerably enlarge its horizons. Strict conditionality, in terms of precise short-term targets, should be limited to three points: a) balance of payments behavior; b) real exchange rate levels; c) reduction of protectionist measures that could harm other debtor countries' adjustment policies. Moreover, the IMF would require from each country a comprehensive economic plan, intended to fight inflation, to promote wage-price flexibility, to strengthen domestic savings, to promote export-led growth and to encourage the substitution of risk capital for external indebtedness.

Keeping up the cooperation between creditors and debtors is a necessary but not a sufficient condition for international solvency. The effectiveness of the cooperation must be proved by declining
debt/export ratios, as far as necessary.

A change in the United States policy-mix, with a substantial cut in the public sector deficit and a once-for-all increase in real liquidity, accompanied by a robust OECD recovery could automatically yield such a prof. The favorable debt dynamics of the seventies could be resumed, exports of the developing debtor countries growing far beyond the international interest rates. Debt/exports ratios and other creditstanding indicators would quickly improve, now with the help of the resource surpluses of the developing debtor countries, dissipating the clouds of insolvency risks.

There is no perfect substitute for this ordered world scenario. Yet, since it cannot be taken for granted, some contingency planning policies can help the solution of the debt problem.

The first is the creation of worldwide income tax free bonds to provide funds for developing debtor country finance. The rationale for this proposal has been explained in our previous discussion on the transfer paradox. The way income tax laws deal with interest revenues and payments creates a perverse balance of payments transfer from debtor to creditor countries. Market forces determine the interest rate after tax, but debtor countries are burdened with interest rates before tax. Ideally, all international lending should be conveyed through such income tax free capital market instruments. Yet, in the short run this may be too much of a radical proposal. A softer suggestion is that such bonds only be issued by the IMF and by the World Bank, and perhaps by some other official lending agencies. The outstanding amounts could be controlled so as to keep the average interest rates paid by developing debtor countries at solvency levels. An alternative proposal, which would practically yield the same result, would be additional capital contributions, from creditor countries to official lending agencies, to compensate for the fiscal transfer caused by the income-tax impacts on international interest rates.
The second suggestion would be a standstill on protectionist actions against the exports of debtor countries supported by IMF adjustment programs. This would involve an agreement between the main creditor nations, and two international institutions, IMF and GATT. The logic of this proposal is crystal clear. Since the trade balances of debtor countries are under strict IMF targets, any export loss must be offset by an equal import cut-back from creditor nations. Hence, protectionism in creditor countries is self-defeating: it forces equal reprisals by debtor countries, not necessarily for political, but for immediate balance of payment reasons. It has been largely publicized that the Latin American recession in 1983 cost the United States the loss of almost half a million jobs. It should be stressed that part of the problem could have been avoided by a preferential treatment to Latin-American exports. In the absence of balance-of-payment constraints, protectionism may be a less than zero-sum game, allowing a country to increase employment at the expenses of the rest of the world. Now, when a group of countries must meet rigid trade surplus targets, protectionist actions against their exports is nothing but a boomerang.

A last policy suggestion is an allocation of SDRs to compensate for the decline of international reserves in the last three years. It would be no more than a marginal help to developing countries. Its impact on world aggregate demand would be minimal, given the rules that limit the use of the SDRs. Yet, it could provide the basis for a more efficient working of multilateral trade, an objective that cannot be achieved when debtor countries are kept on the short leash of a close to zero reserve level. It would also strengthen the prestige of the IMF and signal the political will towards international financial cooperation.

A debtor-creditor international clash would not necessarily trigger a new Great Depression. Yet, it would severely burden the
creditor country taxpayer because of both, the direct impact on commercial banks and the political consequences in debtor countries. Contingency measures following the above suggestions probably represent a cheaper approach to the problem.
APPENDIX

WAGE-PRICE FLEXIBILITY AND EXTERNAL ADJUSTMENT

The following macroeconomic model stresses the importance of wage-price flexibility for balance of payments adjustment and analyses the effects of exchange rate predetermination. The supply side of the model is specified by the equations:

\[ p_t = w_t \]  \hspace{1cm} (A.1)

\[ q_t = (1-a)p_t + a(e_t + p^*_t) \]  \hspace{1cm} (A.2)

\[ \pi_t = q_t - q_{t-1} \]  \hspace{1cm} (A.3)

\[ \theta_t = e_t + p^*_t - p_t \]  \hspace{1cm} (A.4)

\[ w_t - w_{t-1} = (1-\beta)E_{t-1}\pi_t + \beta\pi_{t-1} + \gamma\pi_{t-1} \]  \hspace{1cm} (A.5)

Equation (A.1) is a mark-up rule, where \( p \) and \( w \) stand for the logs of the GNP implicit deflator and of the nominal wage index. Equation (A.2) introduces \( q \), the log of the consumer price index, \( e \) and \( p^* \) indicating the nominal exchange rate and the price of the imported goods. Equation (A.3) and (A.4) define the inflation rate and the real exchange rate. Finally, equation (A.5) expresses the rate of increase of nominal wages as a function of expected and past inflation rates and of \( \gamma \), the log of the deviation of real output from full employment equilibrium. \( E_{t-1} \) is the conditional expectation operator; \( \beta \) and \( 1-\beta \) indicate the proportions of backward looking and forward looking responses of nominal wages to price increases; \( \gamma \) is the degree of wage flexibility.

Equations (A.1) to (A.5) lead to the Phillips relation:

\[ \gamma\pi_{t-1} = (1-\beta)E_{t-1}\pi_t + \beta\pi_{t-1} + \gamma\pi_{t-1} \]  \hspace{1cm} (A.6)

In the absence of shocks and of unanticipated policy changes, rational expectations yield perfect foresight. In this case:
\(\gamma_{t-1} = \beta (e_{t-1} - e_{t-1}) - \alpha (\theta_{t-1} - 0_{t-1}) \) \hspace{1cm} (A.7)

Adjustment programs usually require a real exchange rate devaluation, i.e., an increase in \(\theta\). They also aim at reducing the inflation rate \(\pi\). Now, as indicated by equation (A.7), the first impact of a real exchange rate devaluation is an acceleration of the inflation rate. The adverse side-effects of the subsequent anti-inflationary policies on output and employment are inversely proportional to the wage flexibility parameter \(\gamma\). In the extreme rigidity pole, where \(\gamma = 0\), a real exchange rate devaluation pushes the inflation rate to a permanently higher figure. If wages are absolutely flexible (\(\gamma = \infty\)), inflation can be cured without recession. Since prolonged recession undermines the political will to fight inflation and to adjust the real exchange rate, IMF conditionality should pay more attention to wage-price flexibility.

To analyse the effects of exchange rate pre-determination, we shall assume that the supply of foreign capital to the country is infinitely elastic at a given interest rate. Hence, the nominal domestic interest rate is expressed by:

\[ i_t = r^* + E_{t-1} ((e_{t+1} - e_t) + (p_{t+1}^* - p_t^*)) \]

where \(r^*\) stands for the external real interest rate. Indicating by

\[ \omega_t = (e_t + p_t^*) - (e_{t-1} + p_{t-1}^*) \]

(A.8)

the imported inflation rate, the real domestic interest rate is given by:

\[ r_t = i_t - E_{t-1} \pi_{t+1} = r^* + E_{t-1} (\omega_{t+1} - \pi_{t+1}) \]

(A.9)

Equations (A.2) to (A.4) and (A.8) yield:

\[ (1-\alpha)(\theta_{t-1} - 0_{t-1}) = \omega_t - \pi_t \]

(A.10)

indicating that the real exchange rate appreciates if and only if the actual inflation rate exceeds its imported component.

Since the nominal exchange rate is determined by the Central Bank, and since the supply of external capital is infinitely elastic at a given interest rate, the money supply is
endogenous. The demand side of the model is described, therefore, by the IS equation:
\[ y_t = a0_t - br_t + c \]

or, equivalently:
\[ y_t = a(\theta_t - \omega_L) + b E_{t-1}(\pi_{t+1} - \omega_t) \]  \hspace{1cm} (A.11)

where \( \omega_L \) stands for the full employment equilibrium real exchange rate.

Let us now discuss anti-inflationary policies based on exchange rate pre-determination. We shall assume that until period 0, the economy stands at full employment (\( y = 0 \)) with a constant inflation rate \( \pi_t = \pi_0 = \omega_t \). At the end of period 0 the Central Bank announces that the exchange rate policy will make \( \omega_t = \omega < \pi_0 \). To simplify the analysis, \( \omega \) will be taken as a constant.

Let us first assume that the exchange rate rule is not questioned by economic agents. This is to say that \( E_{t-1} \omega_{t+n} = \omega \) for \( t \geq 1 \) and \( n \geq 0 \). Since \( y_0 = 0 \), equations (A.6) and (A.10) determine the real exchange rate and the inflation rate in period 1:

\[ \theta_1 = \theta_L - \frac{B(\pi_0 - \omega)}{(1-\alpha)B + \alpha} \] \hspace{1cm} (A.12.a)

\[ (1-\alpha)\beta(\pi_0 - \omega) \]

\[ \pi_1 = \omega + \frac{(1-\alpha)\beta(\pi_0 - \omega)}{(1-\alpha)B + \alpha} \] \hspace{1cm} (A.12.b)

Immediate adjustment to the new exchange rate rule is prevented by the backward-looking response of nominal wages to price increases (\( B > 0 \)). The real exchange rate appreciates in period 1, and inflation falls between its initial rate \( \pi_0 \) and the target rate \( \omega \).

As can be derived from equations (A.6), (A.10) and (A.11), for \( t \geq 2 \), \( \theta \) and \( \pi \) follow the first order system of difference equations:
\[
\begin{bmatrix}
0_{t+1} - 0_{L} \\
\pi_{t+1} - \omega
\end{bmatrix} = M 
\begin{bmatrix}
0_{t} - 0_{L} \\
\pi_{t} - \omega
\end{bmatrix}
\]  \hspace{1cm} (A.13)

\[
M = d^{-1} 
\begin{bmatrix}
\hat{c} - \frac{\gamma a}{1-a} & \frac{\beta}{1-a} \\
\gamma a & \beta
\end{bmatrix}
\]  \hspace{1cm} (A.14)

where \( d = \frac{\alpha}{1-\alpha} - \gamma \beta \)

\( 0_{t} \) and \( \pi_{t} \) converge to the equilibrium values \( 0_{L} \) and \( \omega \) if and only if the absolute values of the characteristic roots of \( M \) are less than one, i.e:

\[
\gamma < \min \left\{ \frac{\alpha}{b(1-\alpha)} ; \frac{4\beta(1-\alpha)+2\alpha}{\alpha+2\beta(1-\alpha)} \right\}
\]

The fact that the system is unstable for values of \( \gamma \) exceeding the above limit challenges the effectiveness of anti-inflationary policies based on exchange rate predetermination. Even in the convergence case, the adjustment lags indicated on equations (A.12.a) and (A.12.b) may undermine the confidence in the exchange rate rule.

Lack of confidence, making \( E_{t-1} \omega_{t} = \omega + p > \omega \) still aggravates the adjustment process, introducing a non-anticipated real exchange rate overvaluation, expressed by:

\[
(1-E_{t-1})0_{t} = -p
\]

The result can be a further erosion of confidence, leading to the breakdown of the exchange rate predetermination rule.
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