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1. Objectives.

The standard theory of the crawling-peg is, in general, not very explicit as to the objectives for which a country might adopt such a policy.[1/]

Basically, those objectives as commonly perceived boil down to: a) balancing the external sector; or b) maintaining a stable pattern of production of traded/non-traded goods and services.

However, as soon as capital flows enter the picture, one is forced to recognize that, past certain limits, it is mainly the interest rate that has comparative advantage when it comes to balancing the external accounts. What happens is a mixture of the classical textbook analyses of external balance with and without capital flows. All that matters is the current account equilibrium and the interest rate only plays a role vis-a-vis the domestic IS-LM apparatus. When capital flows are introduced at the textbook level, one finds a situation where a minute change in the interest rate causes (almost) infinitely large capital flows which swamp everything else.

The latter construction omits consideration of the fact that there may be market imperfections that belie the point that a small differential

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1/ More generally, this could also be said of any action aimed at choosing the "right" exchange rate. Let us say, at this stage, that when we use the expression exchange rate we really mean the commodity exchange rate, i.e. including all tariffs, surcharges, etc., and the effect of quantitative restrictions and subsidies. As regards the real side of the economy, one just as soon devalue as impose a tariff-cum-export subsidy system.

between domestic and foreign interest rates will bring about large capital flows. Those imperfections have to do with risk differentials, with transaction costs and with imperfect information.[1/] There will therefore be a band around the international interest rate--see Figure 1--within which the domestic interest rate can move without triggering hardly any capital flows. In Figure 1, the domestic equilibrium can float from $I_o\ S_o/L_o\ M_o$ implying i_{MAX} to I_1S_1/L_1M_1

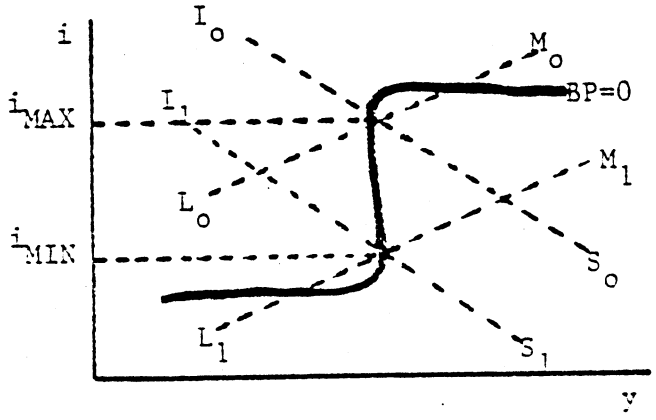

Figure 1

implying i_{MIN} without there being any significant capital flows as long as $i_{MIN} \leq i \leq i_{MAX}$. However, once a country moves beyond the limits of $(i_{MAX}-i_{MIN})$ it is obvious that balancing the external accounts is a job where the interest rate has the comparative advantage. It used to be that this band was fairly wide in Latin American countries. During the '70s, however, international liquidity, better knowledge and communications and, perhaps, other reasons too, have considerably reduced it.

If we therefore rule out balancing the external accounts as a major objective of a crawling peg, we are mainly left with the objective of maintaining a stable profitability for the different sectors of the economy.

1/ Notice that risk differentials, as stated, are perfectly known.

Why is this stability desirable? Basically because resource reallocation is a costly process. Not only is that clear in terms of investment in physical capital but it is also costly to reallocate labour once we take into account the costs of hiring and training the requisite labour forece.[1/] What is more, from the point of view of LDCs with a long history of import-substitution which are presently struggling to establish an export-oriented industrial sector, a stable level of profitability is quite crucial. For instance, Morawetz shows that in the textile industry in Colombia it took several years of a potentially profitable exporting outlook before manufactured exports really took off.[2/] Therefore, henceforth we shall assume that the objective of a crawling-peg is to maintain a constant balance of profitability in the traded and non-traded goods sectors; and we make it explicit that the initial structure of the economy is considered optimal.

2. The Rule.

If one assumes that in the world market there is no inflation, then the simplest rule for the crawling-peg arises:

$$\overset{\circ}{d} = \overset{\circ}{\pi}^{d} \qquad (1)$$

where d is depreciation of domestic currency;

π^{d} is domestic price level; and

$\overset{\circ}{x} = \frac{dx}{dt}\frac{1}{x}$ is the percentage rate of change of the relevant variable

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1/ The pioneer work in this area is W. Oi, "Labor as a Quasi-Fixed Factor", JPE December, 1962. Oi counts in the firing costs, but these are only financial not real, as hiring and training are.

2/ D. Morawetz, "Why the Emperor's New Clothes Are Not Made in Colombia" (mimeo) IBRD Staff WP #368, January 1980.

However (1) is the simplest formulation of the purchasing-power-parity (PPP) approach to the crawling-peg. To take into account the issue of profitability, (1) should be changed to:

$$\overset{\circ}{d} = \overset{\circ}{c}^{d} \qquad (1')$$

where c is the domestic cost of production of traded goods.

In this way, we reflect the objective of maintaining a constant profitability in the production of traded goods.

However, since inflation exists in the world market, the most popular formulation of the crawling-peg rule is:

$$\overset{\circ}{d} = \overset{\circ}{\pi}^{d} - \pi^{w} \qquad (2)$$

where π^{w} is the international price level.

Naturally, (2) turns into:

$$\overset{\circ}{d} = \overset{\circ}{c}^{d} - \overset{\circ}{\pi}^{w} \qquad (2')$$

when PPP is abandoned in favor of our present objective.

The next step is to introduce the notion that other countries which play some role in the formation of π^{w} not only experience inflation, but they also devalue their currency vis-a-vis some yardstick.[1/] Therefore:

$$\overset{\circ}{d} = \overset{\circ}{c}^{d} - (\overset{\circ}{\pi}^{w} - \overset{\circ}{d}^{w}) \qquad (3')$$

3. The Basket.

The last step really introduces us into the area we were aiming at. Basically starting from (2) or (2') we have a somewhat mythical concept

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1/ That yardstick has to be the same to which our currency is pegged, say, the U.S. dollar or the SDR.

which is "the" world price. Naturally, this is an excellent abstraction at the theoretical level and, as with all abstractions, it greatly helps the thought process leading to progress in economic theory. However, when it comes to applied use, several aggregation problems appear which we choose to subsume in the expression "the basket".

The aggregation problem involved in coming to π^w or to $\overset{\circ}{\pi}^w$, can be thought of as being composed of two largely inseparable components:

a. aggregation across goods whose relative prices change; and
b. aggregation across countries whose rates of inflation and devaluation differ.

In general what most countries' policy makers do is to build a basket of foreign currencies of their trading partners. The question, naturally, is whether to use the weights implicit in the country's imports, or in its exports, or in some combination of both. This question would be largely irrelevant in practice if at least one of two conditions were met:

a. all trading partners have very small weights in both exports and imports, so none of them can significantly alter the result; or
b. all trading partners behave in a fairly similar fashion, by which we mean that, for each trading partner i, equation (4) takes values close to zero,

$$(\overset{\circ}{\pi}^i - \overset{\circ}{d}^i) \tag{4}$$

leaving only the case of equation (5) for the country j to whose currency we have pegged ours.

$$\overset{\circ}{\pi}^j - 0 \tag{5}$$

If all equations (4) are identically zero, then our rule becomes simply

$$\overset{\circ}{d} = \overset{\circ}{C}_d - \overset{\circ}{\pi}_j \qquad (2'')$$

However, it may happen that, simultaneously, conditions a. and b. do not hold.

Let us illustrate the consequence by referring to a small country U whose very large neighbors A and B behave in the following manner in a given period, say one year:

	$\overset{\circ}{\pi}$	$\overset{\circ}{d}$
A	100%	0
B	40%	80%

(6)

If U has adopted the crawling-peg rule of maintaining the competitivity of the traded-goods sector, the country is in serious trouble. The real price of goods exported by B is rapidly falling and naturally the spectrum of goods exportable by B will be expanding, successfully incorporating what previously were B's domestic goods. On the other hand, U's exports are easily penetrating A's market and, while the spectrum of goods that U can export to the rest of the world may remain constant, the range of goods that it can export to A will expand very rapidly.[1/]

1/ Naturally, all other countries in the world are also taking advantage of A's behavior. However, since U is small relative to A, it still faces a perfectly elastic demand in A's market.

Assuming that both A and B maintain their behavior over a sufficiently long period, it will prove true that, in U:

$$W_B = \frac{M_B}{N_1} \rightarrow 1$$

$$\sum_{i=1} M_i \qquad (7)$$

$$W_A = \frac{X_A}{N_2} \rightarrow 1$$

$$\sum_{j=1} X_j \qquad (8)$$

where M_i denotes imports from countries i=1,.., B,.., N.

X_j denotes exports to countries j=1,.., A,..., N_z

For simplicity, assume both (7) and (8) end up holding as strictly equal to unity, i.e., all U's imports come from B, all U's exports go to A.

The role of the crawling peg policy is, in fact, to determine the size of those trade flows via the profitability of the traded-goods sector. The large problem is now the weighting system: on the import side the weight of B, W_B=1 and on the export side the weight of A, W_A=1.

For simplicity, assume that at the point in time when a decision on the rate of exchange must be made, $\overset{\circ}{\pi}^U = 70\%$. Assume also that domestic policy makers find that, in U, $\overset{\circ}{C} = \overset{\circ}{\pi}$. Then, application of (3') will require a determination of what is meant by $\overset{\circ}{\pi}^w$ and $\overset{\circ}{d}^w$.

There are broadly three ways of determining $\overset{\circ}{\pi}^w$ and $\overset{\circ}{d}^w$ under the circumstances described:

$$\overset{\circ}{\pi}^w = \lambda\overset{\circ}{\pi}^A + (1-\lambda)\overset{\circ}{\pi}^B, \quad 0 \leq \lambda \leq 1 \qquad (9)$$

$$\overset{\circ}{d}^w = \lambda\overset{\circ}{d}^A + (1-\lambda)\overset{\circ}{d}^B$$

where the three main possibilities are:

$\lambda = 1$ (9a)

$\lambda = 0$ (9b)

$0<\lambda<1$ (9c)

Using the fact that $\overset{\circ}{\pi}^{U} = 70\%$ along with the figures in table (6),

(9a) leads to $\overset{\circ}{d}^{U} = 70\% - (100-0) = -30\%$ (10a)

(9b) leads to $\overset{\circ}{d}^{U} = 70\% - (40-80) = 110\%$ (19b)

(9c) leads to, assuming $\lambda=\frac{1}{2}$ $\overset{\circ}{d}^{U} = 70\% - \frac{1}{2}(100-0)\% - \frac{1}{2}(40-80)\% = 40\%$ (10c)

So in the first case U ought to revalue by 30%, thus maintaining the profitability of its export sector; but in that case U's import-competing sector gets wiped out by imports from B. What this means, naturally, is that within U's economy there develops a strong resource-pull into exports and away from import-competing activities. But these changes away from the allocation we initially defined as optimal turn out to be the defeat of the policy. Therefore, the first solution is not acceptable since it does not fulfill the objectives of the policy.

The second solution is to devalue by 110%, thus maintaining the profitability of the import-competing sector. However, in this case there would be a very large increase in the profitability of the export sector, which would entail, as before, massive resource reallocation, toward exports, in U's economy.

The third solution, which calls for a 40% devaluation, fails to maintain the competitivity of either sector and would again involve massive resource reallocation toward U's exporting sector.

It thus seems that one exchange rate cannot do the job of ensuring constant profitability of both the exporting and the import-competing sector.

This happens simply because, in the extreme case built here, π°_{w} ceases to be a single number once each of U's trading partners: a) is large enough to have a significant impact on U's basket of currencies; b) behaves so differently from the other that an average between both becomes an economically meaningless figure.

The case built here is merely an exaggeration of the situation of Uruguay --a small country with two very large neighbors, Argentina and Brazil-- during most of 1980. However, the main interest of the case is that, albeit certainly not to this extent, the foreign currency baskets most LDCs use to guide them in their crawling-peg policies will very likely be different according to whether they use the composition of exports, of imports, or of both.

In a simple application of the theorem of the second-best, this situation calls for the small country to use two rates of exchange, each tied to the relevant basket of currencies. In this way, a domestic distortion is introduced which compensates for the effects of a foreign distortion to restore optimality.

Two Closing Comments.

In the first place, we recognize that there is some issue of enforcement of a two-tie exchange rate since the incentive to smuggling and over- and underinvoicing would be, no doubt, quite large. However, multiple exchange rate systems have explicitly existed in the past in many countries and it was not so much corruption but the issue of inefficiency which turned out to be the main reason to bring them down.

Since in this case it is quite obvious that it is efficiency that suggests the use of two rates, the corruption issue should adequately be kept in its proper place--in the woodwork.

In the second place one might ask, why reject the situations in which all U's industry is devoted to exporting to A while all U's industrial consumption is supplied by imports from B? We think such a rejection should hold on two grounds: first, by fiat, because we started out by assuming the initial allocation of resources was optimal. Second, more substantially, because such strong deviations from PPP as A and B are pictured as having, cannot be sustained for very long; therefore, U would be incurring in resource reallocation costs to respond to a short-lived foreign imbalance.