Getting the Exchange Rate Right: Insular vs. Open Economies

Ronald I. McKinnon and Kenichi Ohno
Stanford University

I. Introduction

Do exchange rate fluctuations increase "justifiable" protectionist pressure?

Despite the existence of highly sophisticated markets for forward exchange, swaps, and currency options, most foreign exchange risk is unhedgeable. A firm making investment decisions today cannot forward sell all its future output, nor contract for most of its future supplies of inputs. Because these forward commodity markets are incomplete, an importer or exporter cannot then utilize the elaborate existing markets in forward exchange to offset most of the risk from future exchange rate fluctuations (Kindleberger (1972) and (1985), McKinnon (1986)).

Among economies highly integrated in trade and finance, therefore, unexpected exchange rate changes provoke protectionism by increasing the riskiness of investment — and deviations from purchasing power parity impede the efficient allocation of capital both nationally and internationally. For example, when the dollar suddenly swung from being undervalued in the late 1970s to being highly overvalued from 1981 to early 1985, many expensive investments in manufacturing, mining and agriculture had to be written off because of America's sharp decline in international competitiveness. In 1985-86 as the Japanese yen has risen sharply against all other major currencies, Japanese industrialists now find their profit margins sharply squeezed — with the threat of a severe investment slump in the offing.

Consider the problem of agricultural protectionism — particularly in

[Seoul Journal of Economics, 1988, Vol. 1, No. 1]

Europe and Japan. The U.S. dollar is the dominant currency of invoice for primary products in international trade throughout the world. Thus the European and Japanese governments feel they cannot allow fluctuations in their mark/dollar or yen/dollar exchange rates to be reflected on a one-for-one basis in the mark or yen prices of domestic agricultural commodities. Hence, they seal off their internal markets for a wide variety of agricultural produce by strict quotas, sliding-scale tariffs, or export subsidies so that their domestic prices are unaffected by exchange fluctuations.

II. Two Views of the "Right" Exchange Rate

If exchange rate changes are so disruptive, what prevents the three major economic blocs — the United States, Japan and Western Europe — from coordinating their monetary policies in order to achieve exchange stability? Because they cannot agree on "target" rates in the first place. Diversity of opinion over what constitutes "correct" or euqilibrium exchange rates at any point in time is a major reason — if not the only reason — why the cooperative spirit of G-5 (September 1985) for bringing the dollar down was so short-lived. In early November 1986 in the face of a very weak dollar, there was an ambiguous Japanese/American accord to keep the dollar from falling below some unspecified but grossly undervalued level against the yen; whereas no agreement at all was reached regarding an appropriate floor for the dollar, against the EMS (Europen Monetary System) group of currencies.

As of 1986, newspaper surveys of Japanese entrepreneurs frequently find 200-220 yen to the dollar as the rate consistent with their long-run normal profits. McKinnon (1986) regards 200 yen as approximately the right yen-dollar rate. The Japanese government seems willing to tolerate only up to 160-180 yen, while the U.S. government was for a while inclined to push the yen higher than that. Williamson (1986) estimates the proper rate to be 162, and an even higher yen is regarded as desirable by Bernstein (1986) and Krause (1986), whose estimates are 120 and 100, respectively. The present disagreement does not stem from difference in merely technical assumptions. It is rooted in two separate theories of what the exchange rate is expected to accomplish —*purchasing power parity* (PPP) or *balanced multilateral trade.*

According to the PPP criterion, official exchange rate targets should be set to align national price levels so that the real purchasing power of money, say one dollar, is roughly the same in terms of internationally tradable goods in each country. Monetary policies should be coordinated so that this common price level is stable — without significant inflation or deflation being imposed on any one of the trading partners. Presently, according to PPP, the yen-dollar rate should be higher — say ¥200/$ as shown in Table 3 below.

The PPP criterion looks at the exchange rate simply as an extension of domestic monetary policy to achieve a more uniform standard of value for international investment and resource allocation. The primary obligation of the central bank is to stabilize the domestic and international purchasing power of the domestic money — as under a fixed exchange rate regime.

On the other hand, the balanced trade (BT) criterion argues that the exchange rate should be set to roughly balance the flows of imports and exports of any one country — allowing for the need to make interest payments and their debt-service requirements, and for "small" new net capital flows. Net trade flows are assumed to be dominated by relative prices at home and abroad as determined by the exchange rate. Because demand and supply conditions in international commodity markets change frequently, the BT criterion has it that continual exchange rate flexibility is necessary for external equilibrium.

Presently, people taking a BT approach come up with very low estimates of the yen/dollar exchange rate in order to correct the huge U.S. trade deficit. A sharply devalued dollar, they reason, will expand U.S. exports and contract imports — according to the old elasticities model (Robinson (1937), Meade (1951)) of the balance of trade.

Today, the difference between these two criteria is fundamental, and they yield radically different estimates for "right" exchange rates. We seek to establish that (i) the balanced trade criterion and the case for flexible exchange rates presupposes a certain type of insular economy where interaction with the rest of the world is limited; and (ii) the PPP criterion and the case for fixed exchange rates is more appropriate for economies which are highly open in trade and finance.

III. The Insular Economy

Broadly speaking, major industrial countries in the 1930s into the 1950s were "open" in only a limited sense because the private international capital market was moribund and restrictions on commodity trade proliferated. Let us call this particular stage of international economic integration the "insular" economy (McKinnon (1981)).

In an insular economy, foreign trade is only a fringe activity and exchange rate changes do not have a significant direct impact on the overall domestic price level — although they affect imports and exports. Financial transactions with the rest of the world are tightly regulated, and domestic nationals are effectively barred from acquiring or issuing assets in foreign currencies for purely financial reasons (*i.e.*, not related to trade, tourism or direct investment). Consequently, the rate of interest is domestically determined independently of the cost of capital in other countries.

Many macroeconomic models, of both Keynesian and Monetarist traditions, and of various degrees of complexity, are — even today — built with the implicit assumption of insularity in the above sense. Modifying a model used by Marston (1985), let us present a simple analytical framework to illustrate how, in an insular economy, the exchange rate does indeed affect trade in a predictable fashion: a devaluation improves the net trade balance.

Consider the following set of equations

$$Y = A + B \qquad \text{domestic output} \qquad (2.1)$$

$$A = C(\underset{+}{Y}) + I(\underset{-}{i - \dot{p}}) + G \qquad \text{domestic absorption} \qquad (2.2)$$

$$B = B(\underset{-}{A}, \underset{+}{e-p}) \qquad \text{trade balance} \qquad (2.3)$$

$$m - p = L(\underset{+}{Y}, \underset{-}{i}, \underset{-}{\dot{p}}) \qquad \text{money market} \qquad (2.4)$$

$$\dot{p} = \alpha\,(\underset{+}{Y - \bar{Y}}) \qquad \alpha > 0 \qquad \text{price equation} \qquad (2.5)$$

$p = \bar{p}$ alternative price equation (2.5)′

Exogenous:

G government expenditures

e exchange rate: domestic currency/ foreign currency

$\bar{Y}$ "full employment" output

m the nominal stock of money.

Endogenous:

Y real GNP

i domestic nominal interest rate

A domestic absorption

p domestic price level

$\dot{p}$ actual and expected rates of price increase

B the net trade balance.

Note that, except for the interest rate i, all lower case letters denote the logarithms of these variables.

The "real" exchange rate e-p is defined on the presumption that the foreign price level is fixed (for simplicity, assume $p^*=0$). Thus e-p is also the reciprocal of the economy's international terms of trade between exports and imports. In the pegged exchange rate regime considered first, e is exogenously set by the monetary authority through sterilized intervention — which is feasible because our economy is financially insulated with no private capital flows from the outside world.

Alternative equations determining the domestic price level, suitable for an insular economy, are offered. (2.5) suggests that the rate of price increase depends on deviations from "full-employment" output $\bar{Y}$. In the older Keynesian tradtion (2.5)′ takes domestic prices to be fixed. Neither specification allows for any direct impact of the exchange rate on the overall level of domestic prices.

Our economy is also insular in the following additional important respects:

(i) the domestic interest rate is determined independently of those prevailing abroad; and

(ii) absorption (especially investment) is not influenced directly by e-p.

However, the trade balance is influenced by the real exchange rate; and let us suppose the basic elasticities (Marshall-Lerner) conditions are satisfied such that:

$$\frac{\triangle B}{\triangle(e - p)} > 0 \text{ when absorption is constant.} \tag{2.6}$$

Given a devaluation — where the pegged exchange rate e increases relative to p — (2.6) says that exports tend to expand and imports contract so that the trade balance tends to improve before any repercussions on domestic income and absorption are taken into account.

However, any such devaluation will tend to increase domestic output and then price which increase imports — but not to the extent of reversing the initial favorable effect on the trade balance. In final "long-run" equilibrium when $\dot{p}$ is again zero, from equation (2.1) through (2.5) we have that

$$\frac{dY}{de} = 0 \quad \frac{di}{de} > 0 \text{ and } \frac{dB}{de} > 0. \tag{2.7}$$

This improvement in the trade balance implies that A has fallen relative to Y. The increased price level reduces the real stock of money, raises i, and thus crowds out domestic investment even though Y remains unchanged in long-run equilibrium under equation (2.5). Hence, in an insular economy, a devaluation improves the trade balance after all macroeconomic repercussions work themselves out in the longer or intermediate run.

The upper panel of Table 1 gives a complete set of repercussions for a change in the exchange-rate peg for both the "short" and "long" runs.[1] The short-run solutions are instantaneous changes at time t_0 with predetermined p but with expected inflation possibly different from zero, while

[1] We assumed (i) $0 < C' < 1$, (ii) $-1 < B_1 < 0$, (iii) $1 - C' + \alpha I' > 0$ and (iv) $L_1 + \alpha L_3 > 0$. (i) and (ii) confine the marginal propensities to consume and to import between 0 and 1. (iii) guarantees a positive net marginal propensity to save as income increases. (iv) is the condition that, in a boom where Y and $\dot{p}$ rise according to (2.5), the real demand for money increases rather than decreases. This is a reasonable assumption for countries with relatively low inflations (*i.e.* not hyperinflationary).

TABLE 1
INSULAR ECONOMY
With a Pegged Exchange Rate: $e = \bar{e}$
(Solutions to equations 2.1-2.5)

exogenous	m	G	e	m	G	e
endogenous	short-run			long-run		
$\dot{p}$	+	+	+	0	0	0
p	0	0	0	+	+	+
Y	+	+	+	0	0	0
A	+	+	?	+	+	−
B	−	−	+	−	−	+
i	−	+	+	−	+	+

With a Passively Floating Exchange Rate: $B = 0$
(Solutions to equations 2.1, 2.2, 2.3′, 2.4 and 2.5)

exogenous	m	G	m	G
endogenous	short-run		long-run	
$\dot{p}$	+	+	0	0
p	0	0	+	+
$Y=A$	+	+	0	0
e	+	+	+	+
i	−	+	0	+

the long-run solutions are new steady-state solutions reached after $\dot{p} = 0$. (In this paper, we ignore the consequences of physical and financial asset accumulation via I and B.)

Alternatively, if the domestic price level in our insular economy remains constant as per equation (2.5)′, income would increase with the devaluation, *i.e.* $dY/de > 0$. Because the domestic propensity to spend out of income is less than unity (otherwise the model becomes unstable) and investment is again crowded out as i increases, absorption will still fall relative to income so that $dB/de > 0$ in response to a "controlled" rise in e.

What about the case where the exchange rate floats rather than being pegged by the government? Because there are no capital flows, e must vary so as to balance imports and exports.[2] Exporters and importers are

[2] Although some authors (McKinnon (1979)) have questioned whether a determinant exchange rate exists when private capital flows are absent.

the only participants in the foreign exchange market. (The central bank stays out and there are no private speculators.) Floating can be represented by allowing e to be endogenous such that exports equal imports:

$$B(\underset{-}{A}, \underset{+}{e - p}) = 0 \qquad (2.3)'$$

This presumption that the net trade balance could be kept close to zero by a variable exchange rate underlies the earlier advocacy of floating (Friedman (1953), Meade (1955)). A floating exchange rate satisfying (2.3)′ has the additional advantage that, given the absence of international capital mobility, domestic income and the price level are determined independently of any disturbances in the market for internationally tradable goods — as represented by the B function satisfying the Marshall-Lerner condition. In an insular economy with a floating exchange rate, macroeconomic equilibrium is determined as if the economy were closed.

Algebraically, one can see this immediately: when $B = 0$, $Y = A$ and equations (2.1) and (2.2) are identical — the standard Hicksian *IS* curve from which e is absent. Similarly, e is absent from the *LM* function and the price equation — (2.4) and (2.5) respectively. Thus, the *IS* and *LM* functions and the domestic price equation determine Y, p and i independently of any foreign disturbance — see the lower panel of Table 1.

However the balanced trade criterion is not innocuous. In the context of an insular economy, BT implies that the "right" exchange rate must change continually in response to international and domestic disturbances. For example, the fall in the price of oil over the past year has benefited the Japanese trade balance much more than the American. This prompted some analysts, Williamson (1985 and 1986) for example, to lower their estimates of the desirable yen/dollar exchange rate. (Whereas under the PPP criterion to be considered later, the exchange rate should be invariant to uniform worldwide changes in the price of oil or any other commodity.)

By now everybody is familiar with argument that the U.S. economy is financially open (rather than insular). In the 1980s, the huge U.S. budget deficit raised interest rates and attracted capital from abroad causing exchange appreciation and a correspondingly large American trade deficit. For many (Feldstein (1986), Branson (1985)), this exchange appreciation was seen as necessary to generate the trade deficit. Only then, they believed, could foreign saving be transferred in real terms to help finance the U.S. fiscal deficit — another illustration of the supposed advantages of exchange flexibility.

Conversely, when the U.S. trade deficit becomes so large in the mid 1980s, many economists (for example, Bergsten (1986)) wanted the dollar devalued in 1985-86 in order to improve the net trade balance even though, realistically, the fiscal deficit remains as large — or larger — than ever. Is it plausible that an engineered dollar devaluation — such as that which has occurred in 1985-86 — would itself substantially diminish or eliminate the U.S. trade deficit? *Only if the American economy is insular.*

To see this important point, let us perform a simple thought experiment. Take equations (2.1), (2.2), (2.3)′, (2.4) and (2.5)′ (prices are fixed) describing an insular economy with a floating exchange rate such that $B = 0$. Then shock the system by raising G — debt financed government expenditures. Solving the system we get in long (and short) run equilibrium:

$$\frac{dY}{dG} > 0,\ \frac{di}{dG} > 0 \text{ and } \frac{de}{dG} > 0 \tag{2.8}$$

A depreciated currency and balanced trade is indeed consistent with debt-financed government expenditures in an insular economy. Instead of attracting capital from abroad, the rise in G stimulates domestic absorption and income leading to an incipient trade deficit which depreciates the domestic currency: e rises and trade remains balanced.

True, the domestic interest rate would rise — possibly very sharply — to crowd out domestic investment and thus "make financial room" for the increased G. Nevertheless, if one accepts this crowding-out of investment as an inevitable consequence of reducing the trade deficit, currency depreciation does have a predictable effect of preventing any substantial trade deficit from developing.

And for people who are very worried about the current U.S. trade deficit and the protectionist pressure it generates, exchange depreciation seems like a plausible way of reducing the trade imbalance even if the American fiscal problem is not resolved. But people who argue this way clearly have something like our insular economy in mind — if only implicitly. If instead the American economy is truly open, the U.S. trade deficit need not improve because of devaluation *per se* — as we shall see.

IV. The Open Economy

In an "open" economy, international trade has substantial impacts on the domestic economic activity, and capital movement is virtually free across countries. This description suits the reality of major industrial countries in the 1980s better than that of insularity.

Financial openness in particular introduces two important changes in macroeconomic modeling. First, (expected) rates of return on comparable assets in different currency denominations tend to converge, and thus the rate of interest is now determined internationally. Second, because of free lending and borrowing abroad, a nation need not equate its income with its expenditure period by period. That is, $Y \neq A$ and $B \neq 0$ *even under free float.*[3] As long as a saving gap — say due to a fiscal deficit — exists, the exchange rate itself need not adjust to eliminate any trade imbalance.

To illustrate this important analytical point in sharp relief, the following set of five equations present a fairly extreme — but not empirically unreasonable — model of an open economy.

$$Y = A + B \qquad \text{domestic output} \qquad (3.1)$$

$$A = C(\underset{+}{Y}) + I(\underset{-}{i-\dot{p}}, \underset{+}{e-p}) + G \qquad \text{domestic absorption} \qquad (3.2)$$

$$B = B(\underset{-}{A}, \underset{+}{e-p}) \qquad \text{trade balance} \qquad (3.3)$$

$$m - p = L(\underset{+}{Y}, \underset{-}{i}, \underset{-}{\dot{p}}) \qquad \text{money market} \qquad (3.4)$$

$$\dot{p} = \beta(e-p) \qquad \beta > 0 \qquad \text{price expectations} \qquad (3.5)$$

[3] In any economy the balance of trade is identically equal to the savings-investment (and income-expenditure) gap in the accounting sense. However, it is only when private capital is mobile internationally that firms and individuals can actively determine (collectively) the size of net

Endogenous: Y, A, B, $\dot{p}$ (or p), m.
Exogenous: e, i, G.

Consider first the financial side of the model if e floats. In keeping with the modern asset approach to exchange-rate determination (Frenkel and Mussa (1980) and (1985)) we presume that the exchange rate is a forward-looking variable. That is, international investors choose between domestic and foreign exchange assets today on the basis of how they think the exchange rate is going to move in the future.

Furthermore, consider only fairly stable countries which exhibit neither secular inflation nor deflation with respect to each other — such as Germany, Japan and the United States. Then available empirical evidence (Meese and Rogoff (1983)) indicates that exchange rates behave like random walks: they are unpredictable (out-of-sample) on the basis of any past information about relative money growth rates, interest rates, trade deficits and so on. Today's spot exchange rate is the best guess of tomorrow's so that

$$e_{t+1} = e_t + u_{t+1}, \text{ where } E_t(e_{t+1}) = e_t \tag{3.6}$$

In fact, in an "efficient" market, the floating exchange rate moves only in response to new information — as represented by u_{t+1}. In (3.6), news occurs between time t and $t+1$ Thus, we treat the exchange rate e as an "exogenous" or leading variable in our model of the open economy.

To simplify, we focus exclusively on the arrival of news (at time t_0) about what future price inflation and commensurate money growth will be in the domestic economy (monetary conditions in the rest of the world are taken as given). If an (unexpected) depreciation — a rise in e — is to be analyzed, *the model should also incorporate explicit assumptions about a change in future expectations that the increase in e represents.*

For an increase in e to be sustained, people might, for example, expect that the authority will (gradually) increase the money supply and that price inflation will continue until purchasing power parity is restored — as

foreign lending — whereas in an insular economy the nation's net foreign asset position is mainly under the control of the central bank.

described by equation (3.5) — at the newly depreciated exchange rate.[4] For example, this increase in e could arise from a conscious, but unexpected, international agreement — say, the Plaza Hotel accord of September 1985 by the G-5 to nudge the dollar down in the foreign exchange markets. (Equivalently, people could expect a rise in monetary velocity due, say, to international currency substitution (McKinnon (1982)). There are other plausible expectational shifts explaining a jump in e which are not explored in this paper.)

In interpreting equation (3.5), the important point is that the exchange rate leads (or causes) domestic prices — unlike our model of the insular economy. And here the inflationary impact of a rise in e (anticipating monetary expansion) immediately begins to raise the overall domestic price level — and not just that of tradables.[5]

The second characteristic of our open economy is that

$$i = i^* \tag{3.7}$$

Financial arbitrage is such that the domestic nominal rate of interest equals the foreign rate even when the exchange rate is floating. This again is carrying openness to an extreme but it is consistent with the random walk hypothesis embodied in (3.6). Today's exchange rate is the best guess of the future so that expected exchange rate movements need not appear in (3.7). (One could include a variable "risk premium" in (3.7), but at this level of abstraction, we are going to ignore it.)

Thirdly, it should be noted that, in equation (3.2), domestic absorption is also impacted directly by the real exchange rate in an open economy (McKinnon (1981)) in contrast to an insular one. That is

[4] Agents in our economy are rational in the sense that they do not make systematic errors in predicting future m and p relative to available information. They understand that, in the long run, monetary expansion is inflationary and PPP must hold. However, they do not know the structure of the economy in detail and cannot, therefore, reduce in-coming information to probabilistic means (and variances) of future endogenous variables.

[5] There is a case for disaggregating into tradable and nontradable goods — with only the former being severely and directly impacted by the exchange rate. But insofar as the exchange rate is taken as a signal of future monetary expansion, all commodity and services prices will be affected as well — as specified in (3.5).

$$\frac{\partial I}{\partial (e-p)} > 0 \tag{3.8}$$

a real depreciation — albeit temporary — in a financially integrated world makes the domestic economy look like a cheap place in which to invest, and so I increases. The resulting expected inflation and the lowered real interest rate will also increase I because of $\partial I/\partial (i-\dot{p}) < 0$.

We can now solve our model of the open economy represented by equations (3.1)-(3.5) presuming that e changes exogenously. Following an arrival of news about the future stance of monetary policy, the exchange rate depreciated at time t_0 because people suddenly expect gradual future monetary expansion and inflation. Table 2 and Figure 1 show e's impact in the endogenous variables p, $\dot{p}$, Y, A, B and m both in the short and long runs.

In the short run when p is predetermined but p is variable, this unexpected depreciation at t_0 cause a one-for-one deviation from PPP (*i.e.* e-$p > 0$) and sets off a domestic inflation via (3.5). An undervalued currency and an inflation reinforce each other to stimulate domestic investment and increase both A and Y. However, *the net trade balance may improve or worsen because increases in absorption and real depreciation have offsetting effects.* (See equation (3.3)) In Table 2, these short or "intermediate" run change are summarized as follows:

$$\frac{\partial \dot{p}}{\partial e} > 0,\ \frac{\partial Y}{\partial e} > 0,\ \frac{\partial A}{\partial e} > 0 \text{ and } \frac{\partial B}{\partial e} \gtrless 0?$$

With solutions for these variables, equation (3.4) endogenously generates a path for the money supply that supports the inflationary expectations. When the exchange rate floats, it is unusual to treat future money growth to be endogenous. But this is consistent with the idea that the exchange rate signals future changes in public policy. Our model suggests that the initial change in m needed to support a depreciation is small and even its sign is ambiguous. However, as the economy advances towards a new steady-state, m must definitely increase in strict proportion to e (and to p). Otherwise, the entire model becomes inconsistent, peo-

TABLE 2
OPEN ECONOMY
With a Forward Looking (Floating) Exchange Rate
(Solutions to equations 3.1-3.6)

exogenous	e		G
endogenous	short-run	long-run	
$\dot{p}$	+	0	0
p	0	+	0
Y	+	0	+
A	+	0	+
B	?	0	−
m	? (*)	+(*)	+(**)

(*) changes in m necessary to support the inflationary expectations which depreciate (raise) e.
(**) a change in m necessary to accommodate an increase in G with e unchanged.

ple's expectations collapse and e must fall back to the original level.

Suppose that the monetary authority does provide m as required over time, so that inflationary expectations are fulfilled. In the long run, nothing "real" changes — Y, A and B return to their initial levels — and m and p increase with e to re-establish the quantity theory relationship and PPP:

$$\frac{\partial Y}{\partial e} = \frac{\partial A}{\partial e} = \frac{\partial B}{\partial e} = 0 \text{ and } \frac{\partial p}{\partial e} = \frac{\partial m}{\partial e} = 1$$

Thus, our open economy model has shown that the effect of a depreciation on the balance of trade is ambiguous in the short run and nil in the long run. These results are obtained by considering the various effects of e on the open economy while explicitly defining B to be the difference between Y and A. We have assumed an exchange rate change to be exogenous, but it must be supported by particular paths of m and p subsequently.

Consider again the debate between the PPP criterion and the BT criterion for the correct exchange rate. In an open economy, represented by equations (3.1)-(3.5), the only criterion that can avoid inflations and deflations (relative to p^*) is the PPP criterion, where e is set equal to $p - p^* = p$ (because we normalized $p^* = 0$). This conclusion is further

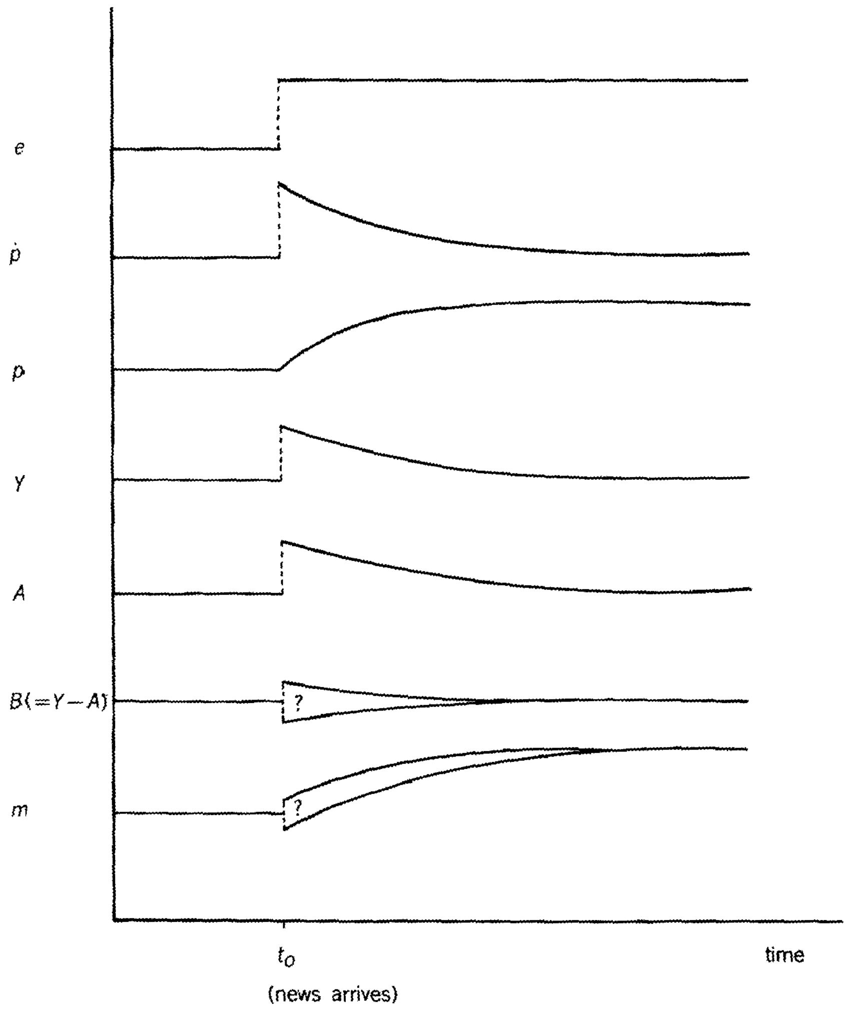

FIGURE 1
RESPONSES TO AN "EXOGENOUS" RISE IN *e* IN ANTICIPATION OF FUTURE MONETARY EXPANSION IN AN OPEN ECONOMY

reinforced if p^* (the world price level) is stable. Then, the PPP criterion for setting the domestic exchange rate approximates having a single international standard of value. (of course, this leaves open the whole question of how to anchor the international price level p^* — a question taken up by McKinnon (1984) and (1986).

However, our PPP criterion says nothing about the state of the net trade balance. It could be positive or negative when purchasing power parity is satisfied. And we have shown that, in an open economy, the BT criterion for targetting the exchange rate is invalid because (i) balanced trade is not necessarily desirable, (ii) continual changes in e in pursuit of some trade balance objective no longer have predictable effects on B, while (iii) such changes in e now have adverse effects on domestic price stability and on the efficient allocation of investment.

How then is the net trade balance determined in an open economy? By the gap between domestic saving and investment. The parameter G measures government dissaving — debt financed public expenditures. If G increases, the net trade balance should deteriorate as the economy absorbs net capital from abroad — for any reasonable exchange rate strategy and monetary policy that the government subsequently employs.

The right-hand column of Table 2 shows the effect of increasing G on the presumption that the government follows a fixed exchange rate (and constant price-level) rule by simply increasing the money supply in response to downward pressure on e (a tendency to appreciate). The new issue of government debt would put incipient upward pressure on domestic interest rates, attract capital from abroad, and thus require the monetary authority to expand. The result is

$$\frac{dA}{dG} > \frac{dY}{dG} > 0 \text{ such that } \frac{dB}{dG} < 0.$$ [6]

What is, perhaps, an inadequacy in our open-economy model is the absence of explicit supply constraints on Y. If, instead, Y were constrained to be close to some "natural" level of full employment output, say, $\bar{Y}$, then domestic private saving would not rise with G. Then, the trade deficit would fully reflect the increase in government expenditures, *i.e.* $dB/dG = -1$, with a fixed exchange rate. But the same long-run result would hold

[6] Somewhat surprisingly, one would get exactly the same signs for these partial derivatives if the nominal money was fixed and the exchange rate appreciated so as to deflate the domestic price level.

if the exchange rate was floating, and appreciated in response to the increase in G.

Notice the important difference from the insular case: there is no crowding-out of domestic investment following an increase in G, and an increased absorption relative to income is automatically financed by borrowing abroad (*i.e.* a trade deficit). This conclusion depends on our assumption of the exogeneity of i, and the result must be modified to the extent that i can deviate from i^* due to a risk premium. However, our model does capture one important observed fact of the 1980s, namely, that the U.S. Treasury appears to be able to finance its huge deficit without much increasing domestic interest rates — simply by borrowing from foreigners.

V. Estimating PPP Exchange Rates

In order for the PPP criterion to be an effective policy guide for stabilizing exchange rates, we should be able to calculate PPP rates at any point in time with reasonable confidence. However, the method of estimating the PPP rate has improved very little since the early 20th century, when Cassel and Keynes proposed what is now called the "relative version" of PPP. According to relative PPP, one first selects a base year in which PPP seems to have held between two countries. Then the information about subsequent movement of relative prices is used to update the PPP estimate to present.

This old — but still common — method of estimating the PPP rate implicitly assumes that the economy is insular in the following sense:

(i) price in individual countries are assumed to move domestically and independently of the exchange rate; and

(ii) such divergent price movements cause temporary deviations from PPP, and a floating exchange rate adjusts smoothly but slowly over time to re-establish PPP.

These assumptions also imply that PPP can be maintained indefinitely so long as domestic prices of major trading countries are stable — until the next disturbance in domestic prices occurs (an outbreak of a war or a financial crisis, for example). Since PPP is supposed to hold during normal peace time, choosing a base year poses little problem to the economist — both Cassel (1922) and Keynes (1925) chose 1913 as the base year for an obvious reason.

In the financially open economies of the 1970s and 80s, however, the causality between prices and the exchange rate is likely to be reversed: exogenous exchange movements induce changes in relative prices between two countries. For example, if the yen is overvalued against the dollar, Japanese tradables prices tend to be pushed down and U.S. tradables prices tend to be boosted, from the levels consistent with domestic costs of production (typically unit labor costs). And our equation (3.5) above is set up so as to reflect causality going from the "exogenously" given exchange rate to prices.

With volatile exchange rates, PPP holds only by chance and choosing a base year now involves much guesswork — and a wrong choice will produce a completely irrelevant PPP estimate. The traditional method of relative PPP is therefore not suitable for financially open economies. We propose a new method of approximating absolute PPPs which takes advantage of the causality from the exchange rate to prices — which we shall call the "price pressure" method.

The basic idea of the price pressure method is to define the bilateral PPP exchange rate to be that rate which exerts no price pressure upward or downward on the tradables sector of either economy. From the data of the exchange rate, relative prices and relative costs, one can statistically estimate such a path of the exchange rate that satisfies this condition.

One attempt to implement the price pressure method is provided by Ohno (1986). Ohno estimates the absolute levels of the PPP yen/dollar and mark/dollar rate paths by maximizing the correlation (around zero) between exchange misalignments and movements in relative WPIs (which we call the "price pressure"). Table 3 shows his results for the yen/dollar rates from 1975 to 1985. (The original calculations are based on monthly data. Table 3 is an annual summary of the monthly results.)

PPP roughly held in 1975-76 and 1980-81. The dollar was undervalued against the yen in 1977-79 while it was overvalued in 1982-85. In 1986, however, the dollar is again undervalued sharply against the yen causing a remarkable fall in the internal Japanese price level (WPI) of over

TABLE 3
ACTUAL AND PPP YEN/DOLLAR EXCHANGE RATES
(Estimated by the Price Pressure Method)

year	(1) actual yen/dollar rate	(2) PPP rate	(3) exchange misalignment (% of PPP rate)	(4) price pressure* (% of PPP rate)
1975	297	305	−2.8	−5.8
1976	297	302	−1.7	−4.7
1977	269	295	−9.1	−6.0
1978	210	272	−22.8	−7.3
1979	219	248	−11.2	−4.4
1980	227	224	1.8	9.8
1981	221	218	1.5	5.5
1982	249	215	16.0	6.5
1983	237	218	8.8	1.5
1984	238	209	13.8	3.2
1985	239	206	15.7	3.8
1986 Jan. -Aug.	173	211	−17.8	−3.7
Aug. only	154	209	−26.2	−4.7

Note: This table is compiled from the monthly estimates of PPP exchange rates in Ohno (1986).

* "Price pressure" is defined as the movement of relative WPIs in excess of the movement of relative unit labor costs for manufacturing industries. The correlation of 0.73 (for 1975-85 only) between columns (3) and (4) measures how exchanges rate deviations from PPP bring pressure to bear on the inflation differential between Japan and the United States.

10 percent per year (not shown). The high correlation (0.73) between exchange misalignments and relative price movements suggests that prices are indeed affected substantially by exchange rate movements.

Table 4 gives a similar picture for the mark/dollar exchange rate. Large deviations from PPP over the past dozen years have induced sharp changes in relative inflation rates between Germany and the United States. Somewhat surprisingly however, in late 1986 at 2.1 marks/dollar, the American currency is not significantly overvalued against the European bloc. The implications of Table 3 and 4 is that, by the PPP criterion, the yen is overvalued against both the dollar and the mark.

VI. Concluding Remarks

Like stable prices, high employment and vigorous growth, balanced

TABLE 4
ACTUAL AND PPP MARK/DOLLAR EXCHANGE RATES
(Estimated by the Price Pressure Method)

year	(1) actual mark/dollar rate	(2) PPP rate	(3) exchange misalignment (% of PPP rate)	(4) price pressure* (% of PPP rate)
1975	2.46	2.69	−8.6	0.3
1976	2.52	2.62	−3.8	2.3
1977	2.32	2.56	−9.3	1.2
1978	2.01	2.50	−19.8	−2.8
1979	1.83	2.37	−22.6	−4.3
1980	1.82	2.28	−20.2	−6.1
1981	2.26	2.25	0.5	−6.1
1982	2.43	2.15	12.8	1.7
1983	2.55	2.15	18.7	2.0
1984	2.85	2.12	34.3	4.0
1985	2.94	2.08	41.7	9.0
1986 Jan. -Aug	2.25	2.12	6.2	5.0
Aug. only	2.06	2.11	−2.2	2.9

Note: This table is compiled from the monthly estimates of PPP exchange rates in Ohno (1986).

* "Price pressure" is defined as the movement of relative WPIs in excess of the movement of relative unit labor costs for manufacturing industries. The corrleation of 0.81 (for 1975-85 only) between columns (3) and (4) measures how exchange rate deviations from PPP bring pressure to bear on the inflation differential between Germany and the United States.

trade has been one of the traditional goals of macroeconomic policy. However, in the financially open world of the 1980s, the welfare value of balanced trade becomes suspect, and the assumed link between the exchange rate and the net trade balance hardly exists any more. The balance of trade is now determined by the nation's proclivity to lend or borrow abroad, which is not systematically related to the exchange rate.

Under these circumstances, loading the exchange rate with the burden of balancing trade is a policy misassignment. We would be much better off if we aligned major exchange rates according to the PPP criterion, which is more stable and predictable, and let the free working of the economic forces determine the balance of trade. We need to emancipate ourselves from the old, no longer valid, concept of "external balance," and assign the exchange rate for what it can accomplish: aligning and stabilizing the prices of internationally tradable goods in each country.

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