

Discussion Paper No. 9510

November 1995

**Determining the Foreign Exchange Rate
in Aid of Export Industries**

by

*Casimiro V. Miranda, Jr.**

*Professor, School of Economics,
University of the Philippines

Note: UPSE Discussion Papers are preliminary versions circulated privately to elicit critical comment. They are protected by the Copyright Law (PD No. 49) and not for quotation or reprinting without prior approval.

UPSEDP '96
7.22.96

A B S T R A C T

The general definition of profit is used to derive an equation that uniquely determines the foreign exchange rate required to maintain the long-run normal rate of profit of exporters, under the detrimental effect of the local currency's appreciation. Compensatory foreign exchange rate adjustment affecting only the revenue side is then considered.

DETERMINING THE FOREIGN EXCHANGE RATE
IN AID OF EXPORT INDUSTRIES

By

Casimiro V. Miranda, Jr.*

Once upon a time a king gathered some blind men about an elephant and asked them to tell him what an elephant was like. The first man felt a tusk and said an elephant was like a giant carrot; another happened to touch an ear and said it was like a big fan; another touched its trunk and said it was like a pestle; still another, who happened to feel its leg, said it was like a mortar; and another, who grasped its tail said it was like a rope. Not one of them was able to tell the king the elephant's real form.

The Teaching of Buddha

I adhered scrupulously to the precept of that brilliant theoretical physicist L. Boltzmann, according to whom matters of elegance ought to be left to the tailor and to the cobbler.

Albert Einstein

I. Introduction

The problem of what exactly is the right foreign exchange rate that will aid export industries in distress due to the appreciation of the country's currency has not as yet been settled to everyone's satisfaction. Determining the appropriate foreign exchange rate is extremely important especially for less developed countries whose development strategy is anchored on export promotion so that the pace of development itself maybe considerably influenced by the vagaries of the foreign exchange market.

*Professor, School of Economics, University of the Philippines.

One such country is the Philippines. With a population of mostly Boeotians, this feudal country's lords are trying to steer the economy upward through an export-oriented development scheme and arrest further downward plunge of its already declining real per capita income, to a nominal ₱2,000.00 by the year 2000.

As an indication of the significance of the foreign exchange rate apropos of the woes of the export sector inflicted by the appreciation of the peso and to dramatize the intense drama behind the central problem of determining it, we give an account of the accounts of the media and well-informed sectors of a meeting attended by the country's top, well-known, renowned, famous, and popular economists, and exporters for the purpose of threshing out the search for the right foreign exchange rate issue. The meeting held not too long ago highlighted this search puzzle and was a direct consequence of the travails of exporters which started early this year (1995) when the peso began to appreciate.

The story had it that these top, well-known, renowned, famous, and popular economists at the meeting could not agree on a common foreign exchange rate that will help export industries from the negative impact of the currency's appreciation. Much to the chagrin of exporters, almost everyone was suggesting, some even insisting with vague justification, different figures. For example, someone suggested ₱32.00 to US\$1.00 while another countered, why not ₱80.00! Still another (also an economist) claimed that it should be ₱38.00, and so on until they looked like a---s. A calumnist in a local daily was pissed off by these discordant and confusing figures all of which he considered ridiculous, and so he decided to put an end to all this by suggesting ₱100.00(!!!) - the mother of all foreign exchange rates.

It is against this backdrop that the author of this study came up for the first time with a simple solution to this foreign exchange rate problem. With the author's characteristic Wagnerian humility, this humble pioneer work that is very hard to improve on is presented in the following sections of the study.

II. The Depreciation Rate

The objective of this study is to provide a simple equation which will uniquely determine the optimal depreciation rate of the RP Peso relative to a foreign currency, say, the US Dollar, for the purpose of

stabilizing the profit position of export producers and their continuous operation in the face of the detrimental effect of the currency's appreciation. The depreciation rate determined from the equation which will be derived from the simple long-run profit equation and equilibrium of the firm is optimal in that it is consistent with the equality of price and marginal cost in a competitive industry.

To begin with, let the long-run total cost C^* (a function of output Q) of a typical firm in a competitive export industry be

$$C^*(Q) = C(Q)(1+r) \quad (II.1)$$

where $C(Q) = \sum_{j=1}^m w_j k_j$

k_i = the optimal quantity of the i th input employed by the firm

w_i = price per unit of the i th input k_i

r = the normal or average mark-up or rate

of profit in the industry. More appropriately, r is the remuneration of entrepreneurial input whose role in the production function includes the organization and management of production, decision-making, and risk-taking, among others. As such, it is the opportunity cost of the firm.

(II.1) is the general form of the cost function which owes its usual textbook shape from the presence of increasing and decreasing returns to scale in a neoclassical production function. If $C(Q)$ has local and import contents, (II.1) is written as

$$C^*(Q) = [C_d(Q) + C_m(Q)](1+r) \quad (II.2)$$

where $C_d(Q) = \sum_{i=1}^d w_i k_i$ is the local component,

and $C_m(Q) = \sum_{i=d+1}^m w_i k_i$, the import component,

($i=1,2,3,\dots,d,d+1,\dots,m$).

Under the above-definition of r , excess profit or quasi-rent in a competitive industry is zero in the long-run. Thus the long-run profit equation of a typical firm in the industry is

$$[C_d(Q) + C_m(Q)](1 + r) = R$$

or $[C_d(Q) + C_m(Q)](1 + r) = PQ \quad (II.3)^2$

where $R = PQ$ is total revenue; P is price per unit of output Q . Both sides of (II.3) are in pesos.

Dividing (II.3) through by Q , we have

$$(c_d + c_m)(1 + r) = P \quad (II.4)$$

where $c_d = C_d(Q)/Q$ and $c_m = C_m(Q)/Q$. (II.4) is just the equality of long-run average cost and average revenue. From (II.3) we also have long-run marginal cost $dC(Q)/dQ = \text{price } P$. These are all shown in the following diagram where at point M of the long-run marginal cost curve ab , long-run average cost curve cd , long-run marginal cost, long-run average cost, and price or average revenue Q_0M are equal at the output level Q_0 hence excess profit is zero.

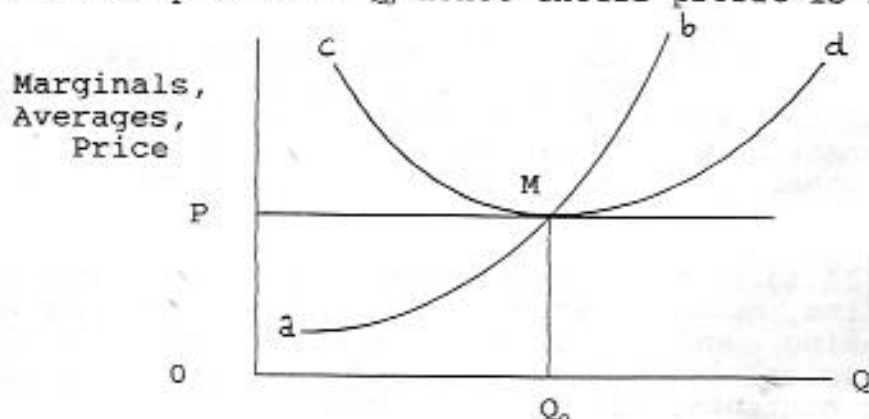


Figure A

²The long-run profit equation in (II.3) can be derived from the general definition of profit: total profit $\Pi = \text{total revenue } R \text{ or } PQ - \text{total cost } C$. From this, $C + \Pi = PQ$ or $C(1 + \bar{r}) = PQ$, where the rate of profit $\bar{r} = \Pi/C$. Under short-run condition, $\bar{r}$ contains excess profit or quasi-rent due to the fixity of some inputs, while in the long-run where all inputs are variable, r as defined, has none.

Now, let e be the foreign exchange rate (RPP:US\$1.00), and $\bar{e}$ be any of the past and prevailing foreign exchange rates chosen as the base period or reference foreign exchange rate. Preferably, $\bar{e}$ should be the e at the time when average cost and average revenue in (II.4) are equal. Thus initially, at $e = \bar{e}$, (II.4) can be written as

$$(c_d + c_m^* e)(1 + r) = P^* e \quad (\text{II.5})$$

where $c_m^* = c_m / \bar{e}$ and $P^* = P / \bar{e}$. Hence c_m^* and P^* are, respectively, the base period or reference import content average cost and the price of the good both of which are in US Dollar, but since e is RPP:US\$1.00, $c_m^* e$ and $P^* e$ are in pesos.

First, consider only an appreciation of the peso, i.e., a decreasing e . Given the average cost and the price P^* (in US Dollar) of the export good, suppose e falls to $e^* < \bar{e}$ such that in (II.5) average cost

$(c_d + c_m^* e^*)(1 + r)$ is greater than average revenue $P^* e^*$. To restore the equality in (II.5), the prevailing foreign exchange rate e^* must increase or be made to rise to equal $\bar{e}$ otherwise the rate of profit r must fall. Since $\bar{e} > e^*$, $e/e^* = 1 + z$, where $z > 0$ is the depreciation rate necessary to raise e^* such that

$$e = e^*(1 + z) \quad (\text{II.6})$$

Substituting (II.6) into (II.5) where $e = \bar{e}$, we have

$$[c_d + c_m^* e^*(1 + z)](1 + r) = P^* e^*(1 + z) \quad (\text{II.7})$$

which is the equation that determines the desired foreign exchange rate or the depreciation rate of the peso that will help export producers maintain their prevailing profit position for continuous operation. The depreciation rate z determined by (II.7) is unique for any given

c_d , c_m^* , r , $e = \bar{e}$, P^* , and the prevailing foreign exchange rate e^* - all of which are directly observable or are known - that satisfy (II.7). In determining z , the important condition is that the long-run profit equation in (II.3) or in terms of averages in (II.4), must initially be satisfied. Thus z is nothing more than the depreciation rate that will restore the equality in (II.3) or (II.4), once average cost becomes greater than average revenue due solely to an appreciation of the currency.

Next, consider the more general case of a falling P^* along with a possibly decreasing e also. (We disregard the case of rising P^* since, given the prevailing foreign exchange rate e^* , this is a happy situation which may not call for foreign exchange rate adjustment). In this case, e is now broadly interpreted as the foreign exchange rate required to maintain the equality in (II.5) since it now has to compensate not only for the difference between the base or reference foreign exchange rate $\bar{e}$ and the prevailing foreign exchange rate e^* but also for the decrease in P^* . So defined, e may now exceed $\bar{e}$. In

general, $e \geq e^*$. Solving for e from (II.5), we have

$$c_d(1+r)/[P^* - c_m^*(1+r)] = e \quad (\text{II.8})$$

It is clear from (II.8) that for e to exist and be strictly positive and compensatory depreciation to work within manageable proportion when P^*e falls below $(c_d + c_m^*e)(1+r)$ in (II.5), $c_d(1+r) > 0$ so that $P^* > c_m^*(1+r) \geq 0$ from (II.4). This means that cost must have at least one or some purely local input content. In reality, cost has, of course, at least one purely domestic component namely, labor. Furthermore, $c_d(1+r) > 0$ makes for the upper positive limit

to e which is undefined if $P^* - c_m^*(1+r) = 0$, i.e., if cost consists only of imported inputs, and compensatory foreign exchange rate adjustment will not work because there is no e that will close the gap when, in (II.5), average revenue falls below average cost. This condition is obviously nonexistent if cost has zero import component in which case compensatory depreciation measure is focused only on the revenue side. It is also evident from (II.8) that, given the cost components and r , the extent of compensatory foreign exchange rate adjustment, i.e., the magnitude of the depreciation rate z in (II.6), will be determined by the extent of the change in e which varies inversely as P^* and, the difference between e and the prevailing foreign exchange rate e^* . These are all summarized by (II.7) where e now broadly interpreted as the foreign exchange rate required to maintain the equality of average cost and average revenue, is equal to $e^*(1+z)$.

Although in the derivation of (II.7) the discussion centered only on compensatory depreciation as a policy measure to help export producers maintain their profit position in the face of the detrimental impact on them of an appreciation of the peso, the equation however is general in form and scope and hence applicable to any movement and desired adjustment of the foreign exchange rate for whatever motivation, including stabilization of the prevailing profit position of export industries regardless of the reason for its fluctuation. For this we

simply allow $e \gtrless e^*$ in (II.5) so that correspondingly, z can also take on any value, i.e., $z \gtrless 0$, as has been made in the case of a price decline.

With regards to stabilization measure intended to shield export industries from undue fluctuations of the foreign exchange rate, the variance of e maybe restricted to an arbitrarily determined "small" value - perhaps close to zero - which means that the corresponding depreciation or appreciation rate z may also be arbitrarily fixed to achieve this objective.

III. Conclusion

By expressing the price P of the export commodity as P^*e we now have two distinct sources of changes in P : (a) changes in the price P^* (in US Dollar) of the commodity itself as determined by its own market, and (b) changes in the foreign exchange rate e (RPP:US\$1.00) as determined by the foreign exchange market. Thus altogether from (II.5), there are now three distinct reasons for the divergence between average cost and average revenue - in particular, for average cost to exceed average revenue. Correspondingly, there are now also three "reasons" for the management of the foreign exchange rate especially through depreciation. These are (1) appreciation of the peso, or a fall in e ; (2) decrease in the price P^* (in US Dollar) of the commodity itself; and, (3) increase in cost. Or any combination of these, just to complete the list.

Of these three reasons, this study gives qualified support only to such managed depreciation intended solely to aid exporters by stabilizing their long-run profit position, i.e., maintaining the equation such as that shown in (II.3) or (II.4) and consequently, the continuous operation of the export industries in the face of the detrimental effect of (1) appreciation of the peso. "Detrimental" appreciation here means an unexpected large

fall in the foreign exchange rate, and the variance of which over some period of observation, is persistently large and even increasing.

This study is also inclined to favor compensatory depreciation to counter the effect of adverse price movement (thus e can exceed $\bar{e}$), though with less weight compared to that accorded to adverse movement of the foreign exchange rate only, provided the price's downward plunge is also unexpected, large, and persistent. In both of these cases, export producers are virtually helpless because besides being unable to respond to the changes with equal swiftness, these maybe due largely to external factors. These two cases which affect only the right-hand side of (II.5) seem to be the only acceptable rationale for managed compensatory depreciation of the foreign exchange rate especially in a less-developed economy whose economic development strategy is anchored on export-orientation. Any other intentional or managed depreciation the purpose of which is to give export industries excess profit or quasi-rent, or to keep pace with changes in cost not attributable to changes in the foreign exchange rate, is outside the scope of this study. On the other hand, any depreciation of the peso brought about by purely market forces which results in excess profit should be rightfully enjoyed by the industry. Such a phenomenon may only be shortlived because of structural adjustment with its accompanying increasing costs that will ensue, reversal of the trend by the foreign exchange market itself, and the inflationary pressure of the depreciation itself.

Now, why has the third case - increase in cost (the left-hand side of (II.5)) - been left out as a rationale for compensatory depreciation measure? The reasons for deliberately excluding increases in cost, even if these maybe due to depreciation brought about by the foreign exchange market, as a rationale for compensatory depreciation involving only the right-hand side of (II.5) are:

- 1) If cost has import content, it will already be automatically adjusted as the foreign exchange rate is adjusted through compensatory depreciation even if its object is only the revenue side.

- 2) much unlike the price of the good and the price of the foreign currency which are competitively determined by market forces over which exporters have no influence, cost however, can somehow be "controlled" or managed by producers themselves whether or not some inputs are imported and the input markets are competitive. The operation and management of production (for example, how

inputs are to be more efficiently combined, closer supervision of the workforce to raise productivity, reorganization of the production process, etc.) are completely in the hands of producers.

3) more importantly and quite apart from (2), to spur cost-saving technological innovation, a move that is also completely under the initiative of producers. In other words, the supply side of the market behind which is cost, has more than enough room for adjustment on the initiative of export producers to offset upward cost movement. The second and third reasons are extremely important especially in economic development since they spell the difference between a dependent, inefficient, and uncompetitive industry and, an independent, highly efficient and competitive industry.

4) In contradistinction with these reasons which are largely normative, there is a theoretical rationale for excluding the cost side of (II.5) from any policy measure intended to aid export producers. Although the effect of tinkering with cost (through any form of direct or indirect cost-based subsidy such as tax credit on local or imported input cost component, preferential tariff rate on imported inputs, provision of a fund to offset adverse cost movement, etc.) is the same as that of compensatory foreign exchange rate adjustment affecting only revenue in that both restore the profit position of export producers, they are however very much different in their respective impact on the economy and in this respect the two are not equivalent. Outside of outright foreign exchange control, tinkering with the foreign exchange rate through the foreign exchange market is a purely monetary measure which, like open market operation, simply involves buying or selling foreign currency. This will simply change the relative composition of the Central Bank's foreign and local currency holdings, and has virtually no distortionary impact on resource allocation, but will restore an optimal situation and may even redress any deficit in the balance of trade. Also, the money supply is unchanged since it includes foreign currency holdings of the public and the banking system. On the other hand, tinkering with the cost side is distortionary. A subsidy on input cost, for example, will distort the competitive input market whatever form the subsidy takes since it must come from taxes which are generally distortionary. Moreover, this may also worsen income distribution which is also distortionary because the recipient of such form of government expenditure is certainly not the low-income group. Such measure that affects only the cost side is therefore hardly defensible. This asymmetry between compensatory foreign exchange rate adjustment that affects

only the revenue, and measures that affect only the cost side, provides a sufficient argument against interfering with the cost side of (II.5).

Thus, ignoring cost movement as a rationale for compensatory depreciation measure simply means that export producers must be eventually left to fend for themselves. As regards these arguments pro and contra compensatory foreign exchange rate adjustment, after the initial determination of the equality in (II.5), the only two parameters whose behavior over time needs to be identified and closely monitored by policy-makers for the purpose of determining the extent of the compensatory depreciation measure are, the price (or prices) of the export good (or goods) and, the foreign exchange rate.

References

1. Kindleberger, Charles P. and Lindert, Peter H., International Economics. Fifth Edition. Homewood, Illinois: Richard D. Irwin, Inc., 1982.
2. Leftwich, Richard H. and Eckert, Ross D., The Price System and Resource Allocation. Tenth Edition. New York: The Dryden Press, 1988.