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NAQVI

The Balance-of-Payments Problem and Resource Allocation in Pakistan — A Linear Programming Approach

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With an introduction by
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INTRODUCTION

In spite of the numerous measures taken from time to time by the Government of Pakistan to control imports and encourage exports, tlie country's balance of payments, except in 1950-51 and again in 1972-73, has always remained in the deficit. Even the massive devaluation of the rupee in 1972 has not been very helpful in easing the balance-of-payments situation. The persistence of disequilibrium in the balance of payments reflects the fundamental nature of the problem and underscores the fact that ***ad hoc*** policies, though inevitable, cannot lay the foundation of a lasting solution of Pakistan's balance-of-payments problem. What is the source of this problem? It can be argued that the balance of payments will remain in deficit as long as the growth rate of GNP exceeds the growth rate that domestic savings can sustain. Hence the problem cannot be solved as long as sufficient savings are not generated to sustain an acceptable growth rate of GNP. However, we can hope for a significant reduction in the deficit through expenditure-switching and production-restructuring which will reduce the trade gap to the resource gap.

The studies prior to publication of this article also analysed the problems relating to balance of payments, industrialization and growth, but the analysis did not take into consideration simultaneously balance-of-payments and investment policies. The point of departure of Professor Naqvi's article under review - "The Balance-of-Payments Problem and Resource Allocation in Pakistan — A Linear Programming Approach" — is that balance-of-payments policies cannot be isolated from investment policies. The main thrust of the argument is that isolated policies aimed at removing the balance-of-payments deficit cannot be very fruitful because they conflict with the optimum allocation of domestic resources. When various policy measures aimed at removing the balance-of-payments deficit are analysed in this perspective, it is not very difficult to understand why previous policy measures aggravated the balance-of-payments problem instead of alleviating it. The various policy measures taken from time to time, which have concentrated on restricting imports, have increased the profitability of the domestic production of the imports — even of those the domestic consumption of which was to be restricted. Such policies have resulted in a movement of resources from efficient 'activities' towards

inefficient 'activities', contributing to a non-optimal allocation of domestic resources – in particular, from the balance-of-payments point of view because the requisite transfer of resources to the export sector from the rest of the economy has not materialized. Professor Naqvi's contribution has been to clearly highlight the fact that variations in the price of foreign exchange, designed to approximate the opportunity cost, will be effective in improving the balance of payments only to the extent that they help in improving the allocation of domestic resources.

This study analyses Pakistan's balance-of-payments problems and industrialization policies up to the early Sixties within the framework of a simple and highly aggregative linear programming model. The choice of such a model proved to be strategically useful because it helped the author to tie together the loose ends of several earlier studies dealing with different aspects of Pakistan's commercial policy. For instance, the essence of John Power's analysis[1], which highlighted the inadequacies of Pakistan's foreign exchange rate policies, came out sharply in this study. By the simple device of changing the price of foreign exchange and then 'letting' it work through the economic system, the study traced the entire history of Pakistan's commercial policy, import licensing and all other related policies, with reference to distortions in resource allocation. The analysis brought out clearly the problems which are bound to arise if the price of foreign exchange differed from its opportunity cost.

The model distinguished two consumer-goods 'activities', one of which is completely inefficient compared to the other in the use of inputs per unit of one rupee's worth of output. In addition to the two consumer goods, the model considered one intermediate-goods-producing activity and one capital-goods-producing 'activity'. Then there was a separate foreign-exchange-producing sector which indicated the cost of producing (or earning) one unit of foreign exchange.

The model was employed to analyse the effects of changes in exchange rate on the pattern of investment, imports, exports and the balance of payments. Quite interesting results followed. It turned out that the best approach to remedy the persistent balance-of-payments difficulties was to 'correct' the domestic resource allocation, in particular that between import-substitution and export-expansion activities. This result was not surprising in itself, but was very important in view of the fact that the model did not contain any non-traded activity. In later Sixties, Professors Hansen[2] and Kuyvenhoven[3] formulated more comprehensive models for

[1]John H. Power. "Industrialization in Pakistan: A Case of Frustrated Take-Off?" *Pakistan Development Review*. Vol. III, No. 2. Summer 1963.

[2]B. Hansen. *Long- and Short-Term Planning in Underdeveloped Countries*. Amsterdam: North Holland Publishing Company. 1967.

[3]Arie Kuyvenhoven. *Planning with the Semi-input-output Method with Empirical Applications to Nigeria*. Leiden/Boston/London: Martinus Nijhoff Social Sciences Division. 1978.

resource allocation but arrived at the same conclusion: that investment and balance of payments are simultaneously determined.

Assuming reasonable values of parameters[4], Professor Naqvi derived a number of interesting results. One was about Pakistan's commercial policy, which provided incentives to both the import-substitution activities and the export-oriented industries. It was therefore important to determine which incentives were the 'dominant' ones. The study pointed out for the first time that, on the margin, incentives to import-substitution activities exceeded significantly those to export-oriented industries. This point was then used to analyse the efficiency of the Export Bonus Scheme (discontinued in 1972) which affected both the import-substitution and export-expansion activities.[5] The author correctly argued that the increase in premium on bonus vouchers widened the difference between the incentives provided to import-substitution and export-oriented industries – with the former being the more favoured one. However, the author was careful not to conclude on this basis that the export bonus scheme had perpetuated the bias against the intra-marginal export-oriented industries. As Professor Naqvi pointed out clearly, while the increase in bonus premium widened the differential between the incentives given to the two types of activities, an increase in the bonus rate tended to reduce it. Since the introduction of bonus scheme led to an increase in the bonus rate from zero to a positive number, the bias against export must have declined; and, in some cases it should have provided sufficient incentives to certain activities so that the bias against them might have been removed completely.

However, even though the bias against exports declined with the introduction of the Export Bonus Scheme, as long as, on margins, the incentives to import-substitution activities exceeded those extended to the export-oriented activities, the allocation of resources to export-oriented industries was not enough to have had the desired effect. It was only in those activities in which the Export Bonus Scheme completely eliminated the bias against exports that the Scheme provided sufficient incentives for net export-expansion. However, it should be noted that taxes on domestic production, such as the excise and the sales taxes, acted as disincentives to the import substitution. Since the rates of excise and sales taxes were quite high in certain industries, the results regarding incentives, arrived at on the basis of the Export Bonus Scheme alone, were certainly significantly affected, once these taxes were also taken into consideration.

[4]These values were not taken from an input-output table. Hypothetical values were chosen to correctly simulate the different phases through which Pakistan's balance of payments went through.

[5]A detailed analysis of these matters is contained in Syed Nawab Haider Naqvi, "On Optimizing Gains from Pakistan's Export Bonus Scheme". *Journal of Political Economy*. Winter 1971.

The model employed by Professor Naqvi did not take into consideration the non-traded activities. It may be noted that a model which does not have a non-traded activity is recursive in the sense that the composition and level of output in various activities are determined independently of the level and composition of the domestic demand. Given the domestic production and the demand, the excess demand (supply) spills over to the international market. Therefore, the correct balance-of-payments policy is to achieve an optimal investment plan and demand management. Though Professor Naqvi pointed out that fiscal and monetary policies should be used in conjunction with the exchange rate policy, yet he did not explicitly take them into consideration while modelling the economy. The works of Professor Hansen and others have modelled simultaneously all the policies influencing various 'activities'.

As soon as non-traded activities are introduced into the model, the system ceases to be recursive. Though the composition of international sectors (traded activities) is determined independently of the national sectors (non-traded activities), yet the level of each activity is constrained by the output of the national sectors. It may be noted that the variables associated with the national sectors influence directly the exchange rate. Moreover, demand management is also not completely independent of the investment allocation when we take into consideration the non-traded activities. Therefore, in the presence of non-traded activities, we have to consider the capacity of national sectors as a constraint which can be eased over time through building greater capacity in the national sectors and investment allocation and demand management simultaneously by taking into consideration the balance-of-payments objectives.

The author's result of devaluation being the best course under free trade with complete specialization was due to the linear programming model employed in the study and absence of the non-traded activities in the model. Such models assume proportionality in the production scale and an infinite demand for the exports. It is also interesting to note that similar results have been derived from various studies on effective protection which also implicitly assume constant returns and infinite demand. Of course, more trade is better than less trade but only when the markets are not distorted. The exceptions to free trade are well known. To the extent that demand is not unlimited for exports the linear programming results may yield a sub-optimal solution. Of course, the author qualified his results by noting the importance of these distortions but since they were not modelled explicitly, one does not know whether the composition and level of output are liable to be affected significantly or not if we took into consideration the factors left out of the model.

In view of the importance of such studies and their conspicuous absence in the Pakistani literature, there is a need of doing similar exercise for recent years, using a more disaggregated model which takes care of non-traded activities as well as demand management. Moreover, because an input-output table, which provides the

input structure for both traded and non-traded sectors, is now being prepared at the Pakistan Institute of Development Economics, there is all the more reason to conduct such an exercise. The model should explicitly introduce non-traded activities, demand management, fiscal and monetary policies and, if possible, a non-linear objective function. However, the merit of the present work has been that it pointed out clearly a systematic method of going about solving the balance-of-payments problems, and that *ad hoc* policies sometimes ended up doing more harm than good.

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The Balance-of-Payments Problem and Resource Allocation in Pakistan - A Linear Programming Approach

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I

The purpose of this study is to examine Pakistan's foreign-trade problems and policies in the context of the wider question of a rational allocation of domestic resources. It will be argued that measures taken in Pakistan to regulate the flow of imports and exports have led to a pattern of resource allocation which may aggravate the balance-of-payments problem.

The difficulty is mainly attributable to the fact that foreign economic policies and policy measures taken to regulate the domestic economy have often been at cross-purposes. For instance, whereas the domestic investment policy has aimed at promoting the most economical use of scarce investment resources, the licensing system has provided a strong incentive for a wasteful use of these resources by encouraging import substitution even where the country may have a long-run comparative disadvantage. While domestic policy has aimed at raising the marginal rate of savings, the policy of protecting consumption goods, particularly the non-essential ones, has tended to liberalize consumption.

In addition, the attack on the balance-of-payments problem has not covered equally the import and export sectors; import-control policies have often run counter to those designed to deal with the export sector. With the system of import licensing started in 1953, government policy concentrated mainly on controlling imports, the export sector having been relatively neglected. The Export Bonus Scheme, introduced in 1959, was designed to throw a bridge between import and export policies, preparing for a coordinated attack on the balance-of-payments problem. Even though it did provide some stimulus to exports, the stimulus to import sub-

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stitution has remained greater due to the licensing system which continues to be the main regulator of imports.

Effective government policy requires that the balance-of-payments problem be not treated in isolation. Measures taken to deal with the balance-of-payments problem should also contribute to a rational allocation of domestic resources. Furthermore, it is desirable that the market incentives and the price mechanism should help rather than hinder government policies in both these areas.

For a system of free markets to lead to the most rational allocation of resources, the market prices of these scarce resources must correspond to their scracity prices. If that were so, the market prices for various imports would make home production 'profitable' in those productive 'activities' in which the country enjoys a real comparative advantage, and unprofitable where this condition does not hold. It is only when such a situation obtains that market profitabilities of various production and import 'activities' correspond to their social profitabilities. For various reasons, the free-market equilibrium may not conform to the social optimum. It is then the task of government policy to reduce the discrepancy, not increase it, in an economy where market incentives and private decisions are influential in the use of scarce resources.

Our analysis is based on the assumption that at present in certain crucial respects the market profitabilities of various production activities do not correspond to their social profitabilities. This, in turn, has led to a "distorted" pattern of resource allocation, which has probably aggravated the balance-of-payments problem.

II

To handle complex situations of this sort, we require an analytical framework which comprehends the interrelated problems of an optimum pattern of trade and an optimum allocation of investment and demonstrates *quantitatively* that both are simultaneously determined. Chenery [2] has suggested that linear programming provides such a framework. He has shown how a linear-programming model, by making explicit the interacting nature of considerations relating to comparative advantage and those relating to an optimum allocation of investment, can help in the "measurement of optimum resource allocation" and, therefore, in making correct investment decisions. What he has done in effect is to provide a method of examining the resource allocation problem in the light of comparative-advantage considerations. This approach, as will be shown in this paper, can also be usefully employed to analyse the balance-of-payments problem.

The analysis is made in two steps. First, in Section III we introduce a modified version of Chenery's model[1] to demonstrate the interacting nature of the problems

[1]Chenery's model is modified *i)* by splitting finished products (metal products in his model) into goods 1_A and 1_B to introduce considerations relating to comparative advantage with respect to finished products; and *ii)* by holding the prices of labour and 'other inputs' and capital constant. This latter modification allows us to see clearly how the balance-of-payments solution can be reached by manipulating the price of foreign exchange.

of balance of payments and resource allocation. The model shows that no optimal solution of the balance-of-payments problem can be found if the investment pattern is also not optimal, and that the price of foreign exchange should be equal to its opportunity cost, that is, its "shadow" price.[2] This should not be taken to mean that the manipulation of the price of foreign exchange is the only way of correcting a structural disequilibrium in balance of payments and resource allocation. Suitable fiscal, monetary and commercial policies will have to be adopted to supplement exchange-rate policies.

The model presented in Section III below is not intended to provide any ready prescription for policy. We have used it to construct a more meaningful (though still hypothetical) 'market' model in which the production and import activities assumed to be undertaken in the economy are evaluated by their (hypothetical) 'market' prices, instead of their shadow prices. The optimum solution in this model is found by making market prices approximate to their shadow prices. In this model, we get a result analogous to the one obtained in the 'reference model' not by solving for equilibrium prices but by assuming price relationships which correspond to different balance-of-payments control measures. This analytical apparatus provides us with a different perspective on Pakistan's balance-of-payments problem and enables us to evaluate the adequacy or otherwise of the policy measures taken. The model also provides a method of using 'shadow' prices as a guide to policy. The policy implications of this model, however, are subject to the same qualifications, noted above, which apply to those of the reference model.

III

The model depicted in Table 1 is composed of four production activities X_{1A} through X_3 (Col. (1) to (4)) and four import activities M_{1A} through M_3 (Col. (6) to (9)). Activities X_{1A} and X_{1B} in our model stand for two types of consumer-goods industries with different cost structures. We assume that the country enjoys a real comparative advantage in respect of X_{1A} and a comparative disadvantage in X_{1B}. Activities 2 and 3 represent industries producing capital goods and spare parts, and those producing raw materials respectively. X_4 activity (Col. (5)) represents the export sector. This particular choice of activities permits us to study, within the limits of a truncated model such as we present, the response mechanism of certain strategic investment choices that are made in the economy – between consumer-goods industries (X_{1A} and X_{1B}) and industries producing capital goods, spare parts (X_2) and raw materials (X_3); between importing the latter goods or producing them at home; and between producing for home consumption and for export.

Each column in Table 1 represents a level, specified by the value of coefficients, at which that "activity" or "process" is undertaken. The absolute values of these

[2]'Shadow price', in the context of this paper, represents "the opportunity cost implied by a given resource allocation". *See* [2].

Table 1: Reference Model[a]

The Evaluation on Production and Import Activities by "Shadow Prices"

Commodities and factors	Production activities					Import activities				"Shadow" prices			Final demand
	X_{1A}	X_{1B}	X_2	X_3	X_4	M_{1A}	M_{1B}	M_2	M_3	Trial (a)	Trial (b)	Trial (c)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1. Finished products													
A.	1.00					1.00				4.50	7.20	5.40	1,000
B.		1.00					1.00			4.50	7.20	7.20	1,000
2. Intermediate products	−.30	−.50	1.00					1.00		5.50	8.80	8.00	1,000
3. Raw material			−.30	1.00					1.00	6.50	10.40	10.00	0
4. Foreign exchange					1.00	−.90	−.90	−1.10	−1.30	5.00	8.00	8.00	0
5. Other inputs	−.50	−1.00	−.80	−2.00	−2.00					1.00	1.00		
6. Labour	−1.50	−1.50	−1.20	−3.00	−3.00					1.00	1.00	1.00	
7. Capital	−1.00	−2.00	−3.00	−5.00	−3.00					1.00	1.00	1.00	
Social Profitability													
8. Trial (a)	−.15	−2.75	−1.45	−3.5	−3.00	0	0	0	0				
9. Trial (b)	+1.56	−1.70	+.68	+.40	0	0	0	0	0				
10. Trial (c)	0	−1.30	0	0	0	−1.80	0	−.80	−.40				

[a] This model is a modified version of Chenery's model in [2].

coefficients are arbitrary. However, their relative values have been so chosen as to reflect our basic assumption regarding the actual or potential feasibility of undertaking the activities included in the model. The positive coefficients in each column represent the value of output (assumed equal to 1.00 unit), and the negative coefficients represent the value of inputs required to operate each of the included activities to produce that output. For instance, to produce one unit of 1_A (Col. (1)) requires an input of 0.30 units of 2, 0.50 units of "other inputs", 1.50 units of labour and 1.00 unit of capital; to import 1_A (Col. (5)) from abroad requires 0.90 units of foreign exchange. Activities X_{1A} and M_{1A}, therefore, represent alternative ways of procuring one unit of 1_A. The same holds for activities X_{1B} and M_{1B}, X_2 and M_2, etc. X_4 activity (Col. (5)) indicates the cost, at the margin of the export sector, of producing or earning one unit of foreign exchange (Rs. 8.00 under our assumption).

The relative values of the coefficients, indicated in each column, reflect our basic assumptions regarding the cost structure of each production activities. For instance, we assume that the country has a real comparative advantage in the production of 1_A and a comparative disadvantage in the production of 1_B. This assumption is reflected in the model by the lower values of the negative coefficients (i.e. the inputs) required to operate activity X_{1A} at a unit level in contrast to the higher value of coefficients required to operate X_{1B}. An important assumption made in the model is that all activities considered are added to those already undertaken in the country. We also assume a linear homogeneous production function, i.e. constant costs, known as the *proportionality* assumption; and the absence of external economies or diseconomies, known as the *additivity* assumption. These latter two assumptions are common to all linear programming.[3]

Our objective, now, is to minimize the cost of satisfying the final demands subject to two principal constraints. The first constraint is the non-negativity requirement for the activities included in the model. Obviously, there is no sense in operating, say, X_{1A} at a negative output level. The second constraint is that the supply of commodities 1_A, 1_B and 2 must equal 1,000 units each (the assumed final demands). There is, however, no outside demand for 3 and 4, as these are assumed to be entirely used up within the system.

The problem is, therefore, to find an optimum pattern of new investment which at once satisfies the specified restrictions and minimizes the objective (or criterion) function.[4]

[3]As Chenery has shown, external economies felt through the market are registered in the linear-programming model. For example, (in his model) the production of metal products may make the production of steel profitable, which, in turn, may make it profitable to produce iron ore. If the model is extended to embrace all the activities that are being (and/or will be) undertaken in the economy, external economies arising from one activity which has become profitable at the changed rate of exchange will be registered in the rest of the economy. Also, in such a complete model, our 'outside factors' may no longer remain outside; and any change in their values in response, perhaps, to the varying levels of intensity at which the profitable activities operate, may also influence the profitability of those industries. *See* [3].

[4]The objective (or criterion) function is a function of various activity levels considered in the model, and enables us to choose one solution as better than another.

To find the optimum solution, we make use of two sets of equations: *i)* price equations; and *ii)* supply and demand equations.

$$(1)\ a_{ij} P_1 + a_{2j} P_2 \ldots\ldots\ldots + a_{nj} P_n = 0\ (j=1 \ldots\ldots\ldots n)$$

a_{ij} is an input of commodity or factor i in activity j when it is negative, and an output when it is positive. The activity j is assumed to operate at a unit level. By solving these equations, we get the 'shadow price' of each of the activities included. The system has a determinate solution, since there are as many equations (n) as there are unknowns (P_i). The shadow prices (P_i) have been so defined as to equate the value of output of each activity to the cost of its inputs, so that in an optimum situation excess profits in each of the included activities are zero.

Equations (2) consist of the general linear-programming restriction that the supply of each of the inputs (outputs) (1 to 4) is equal to the demand for them.

$$(2.1a) \quad X_{1A} + M_{1A} = 1000$$
$$(2.1b) \quad X_{1B} + M_{1B} = 1000$$
$$(2.2) \quad -.30X_{1A} - .50X_{1B} + X_2 + M_2 = 1000$$
$$(2.3) \quad -.30X_2 + X_3 + M_3 + = 0$$
$$(2.4) \quad X_4 - .90M_{1A} - .90M_{1B} - 1.10M_2 - 1.30M_3 = 0$$

The solution is found by "iteration" – that is we proceed step by step towards our solution. The choice among various activity levels is made by determining their profitability with the help of shadow prices. As we pass from one trial on to the next, we evaluate the profitability of the activities *not* included in the basis[5] and select those which on this criterion turn out to be the most profitable. Thus, each trial is completed by selecting the most profitable activity for introduction into the next trial. This lays the foundation of a new trial. In the optimal solution, all the activities included in the basis are more profitable than any of those outside it. In our model the key price, with reference to which the shadow prices of the rest of activities X_{1A} through X_3 and M_{1A} through M_3 are determined, is the shadow price of foreign exchange (X_4). The price of labour, capital and other inputs are held constant.[6]

As in our model we are interested only in studying the effects of changes in price of foreign exchange, it will be seen that if the price of foreign exchange is held too low (i.e. lower than the opportunity cost of producing it at the margin of the

[5]The 'basis' consists of the profitable activities included in each trial. "Iteration" consists of moving from one basis (containing a feasible solution) to the other till that basis is found which contains the optimum solution.

[6]Chenery has allowed for changes in the opportunity cost of labour and 'other inputs' to study the effect of these changes on the relative profitabilities of various production activities.

export sector), it will seem profitable to satisfy all (assumed) final demands through imports rather than by domestic production. If, on the other extreme, it is held too high, everything will be produced at home and nothing imported. Between these two extremes, as the price of foreign exchange is gradually raised to its opportunity cost, it will become profitable to produce more and more of the commodities which can now be imported only at a high price of foreign exchange.

Trial (a)

In the model, we start out with a situation where the price of foreign exchange, Rs. 5.00 to $ 1.00, is lower than the opportunity cost of producing it in the export sector (X_4), which is assumed to be Rs. 8.00. From this price of foreign exchange, we get a set of shadow prices for goods 1_A through 3 on the assumption that everything is imported.[7] At these "prices", it will not be profitable to engage in any of the production activities, X_{1A} through X_4 (Col. (1) to (4)), that is the social profitability of these activities is negative (see, Row 8 in Table 1). This, however, cannot be the optimum solution, as here we are confronted with a balance-of-payments deficit (i.e. Equation 2.4 is not satisfied).

Trial (a) shows that, in the next step, we need to concern ourselves with activities M_{1A}, M_{1B}, M_2 and M_3 (Col. (6) to (9)) only and to see how they stand up when we try to correct the structural disequilibrium by changing the shadow price of foreign exchange. We, however, also include activity X_4, even though it had a negative profitability ($\pi = -3.00$) in the previous trial, since in Trial (a) we had a large "import surplus" to be eliminated, partly by increased exports.

Trial (b)

We, therefore, conduct Trial (b) by recalculating the shadow prices[8] on the basis of the activities chosen for inclusion (M_{1A}, M_{1B}, M_2, M_3, X_4). The new shadow price of foreign exchange is assumed to be Rs. 8.00 to $ 1.00, equal to its opportunity cost in X_4. At these prices, it becomes profitable to produce everything at home except X_{1B}.

Moreover, as can be seen in Table 1, at the new rate of exchange, the loss in the export sector has been eliminated ($\pi = 0$). The balance-of-payments problem appears

[7] For instance, the shadow price of 3 is (5.00 X 1.30)=6.50; that of 2, (5.00 X 1.10)=5.50, etc.

[8] To illustrate the derivation of new shadow prices by solving equations of type (1),

(1_A)	$1.00\,(P_{1A})$	–	$0.90\,(P_4)$	=	0
(1_B)	$1.00\,(P_{1B})$	–	$0.90\,(P_4)$	=	0
(2)	$1.00\,(P_2)$	–	$1.10\,(P_4)$	=	0
(3)	$1.00\,(P_3)$	–	$1.30\,(P_4)$	=	0
(4)	$1.00\,(P_4)$	–	$2.00 - 3.00 - 3.00$	=	0

we have: $P_4 = 8.00$, $P_3 = 10.40$, $P_2 = 8.80$, $P_{1B} = 7.20$ and $P_{1A} = 7.20$.

to have been "solved", but this is not the case. At these shadow prices, the relative profitability[9] of import substitution – of producing 1_A, 2 and 3, instead of importing them – is greater than that of production for export (X_4). An equilibrium situation requires the elimination of profits in both types of activities; that is, in terms of our model, the marginal (social) profitability of each of the activities should be zero. A satisfactory solution may also require that marginal (social) profitabilities of the corresponding import activities are actually negative in order to show that, at the new shadow prices, it has become definitely unprofitable to import these commodities. The same argument in reverse applies to activity X_{1B}; its profitability should be negative while that of M_{1B} is zero.

Trial (c)

We, therefore, conduct Trial (c) by recalculating the new shadow prices on the basis of the 'included' activities (X_{1A}, X_2, X_3, X_4 and M_{1B}). At the new set of shadow prices, the marginal profitability is zero throughout the economy. There is no incentive to export expansion or import substitution. It is now just profitable to produce X_{1A}, X_2, X_3, X_4, at home; and also just profitable to import X_{1B} rather than produce it at home. This, therefore, is the optimum solution of the balance-of-payments problem with which we had started.

Before we proceed further, it may be useful to 'look back' at our 'reference model'. It will be noted that it is a 'partial' model, encompassing only four sectors of the economy. As a matter of fact, it is even more restricted than Chenery's model (which he calls a "sub-model") in that it holds labour and "other inputs" and capital costs constant. The reason is that our model is designed only to highlight the complex nature of the balance-of-payments problem and the contribution that exchange-rate policy can make towards its solution, under certain specified conditions. It indicates the *direction* which an exchange-rate policy should take if the price of foreign exchange in equilibrium is to reflect its true opportunity cost.

IV

To deal more directly with actual policy problems, we introduce a "market" model in which the production and import activities are evaluated by their "market" prices, instead of by their shadow prices. Moreover, instead of conducting various trials to reach the optimal solution as in model I, we pass through various 'stages' in model II. The prices are not found by solving equations of type (1). Rather, they are the result of policy measures taken to correct inconsistencies in the pattern of resource allocation which block a solution to the balance-of-payments problem.

[9]Any activity is profitable "if the value of its output is greater than [or equal to] the cost of its inputs when both are measured in terms of the equilibrium prices corresponding to the basis". *See* [4].

The input coefficients in this "market model" are the same as in the "reference model". Each 'stage' in the model represents the effect on the prices (P_i) of various policy measures that are assumed to have been taken to solve the balance-of-payments problem. Then, at these prices the market profitabilities of operating activities X_{1A}, X_2 ..... etc., at a unit level are calculated.[10] This model is subject to all the basic assumptions that applied to the reference model.

Stages (a), (b) and (c) are made to correspond to the three dinstinct phases of our commercial policy. Stage (a) corresponds to the period (July 1950 to December 1952) when almost all imports were placed on Open General Licence (O.G.L.). Stage (b) corresponds to the period between 1953, when imports began to be restricted to provide protection to import-substitution industries, and 1959, when the Export Bonus Scheme was launched. In this period whatever export-promotion measures were adopted were ineffective.[11] Thus, it was on the import side that government policy (licensing of imports) was most effective.

Stage (c) corresponds to the situation created by the introduction of the Export Bonus Scheme in 1959 which is the most ambitious attempt at export promotion ever made in this country.

Stages (d) and (e) correspond to situations arising from 'reforms' of the present system that might be suggested to produce a solution that approaches equilibrium. These suggestions should, however, be treated with caution. They should not be taken as definite policy recommendations, as our model is not designed to yield any. What it does tell is that, to the extent the conditions specified in the model hold, steps such as those introduced in Stages (d) and (e) are indicated.

[10]The equation for market profitability is the same as for social profitability: $\pi j = a_{ij} P_i$, where P_i now refers to "market" prices.

[11]This is not to say that the government completely ignored export promotion during this period (1953 to 1957). As a matter of fact, the first Export Promotion Scheme was started as early as June 1954, under which exporters were allowed to retain 30 percent of their export earnings. The scheme proved ineffective, however, mainly because items qualifying for export promotion were no more than 4 percent of total exports. The scheme was enlarged in October 1955 to include a few more items, but no tangible result was achieved.

In July 1955, the rupee was devalued by 30 percent. It provided some incentive to exports particularly the new exportables, jute manufactures and cotton textiles. The devaluation was, perhaps, not enough, as all it did was to reestablish 1947 parities *vis-a-vis* sterling; and hence, nothing beyond a once-for-all spurt in exports could be expected to result from this measure.

Furthermore, inflationary pressures during 1956-57 had an adverse effect on Pakistan export trade. A new "Export Industries Licensing Scheme" was introduced in May 1957 for the import of raw materials and other essentials needed by export industries. The scheme, like its' predecessors, did not result in any tangible contribution to exports; it was an attempt to remove supply bottlenecks in respect of the import component of these products, but did not provide any positive incentive to the export of these goods.

In June 1959, all these export-promotion measures were withdrawn and in their place was substituted the new Export Bonus Scheme.

Stage (a)

In Stage (a), we start with a situation identical to Trial (a) in our "reference model": the rate of exchange is overvalued at Rs. 5.00 to $ 1.00, and all imports are valued at the low import-price. As shown in Table 2, it is profitable to import 1_A through 3 and not to produce anything at home. And, no additional export activity seems profitable.

Historically, in Stage (a) we are at the threshold of the post-Korean recession. The situation immediately before this period was one where the supply of foreign exchange was more than enough to meet import requirements. With the onset of recession, however, prices of raw jute and raw cotton came tumbling down, creating a balance-of-payments deficit. This shortfall in exchange earnings evoked measures to correct the situation.

Stage (b)

We now pass on to Stage (b). Import restrictions are imposed on the imports of finished products 1_A and 1_B to eliminate the payments deficit. The effect of these restrictions is incorporated in our model by assuming that the market prices of 1_A and 1_B rise to Rs. 11.25. No import restrictions, and hence no price rises, are assumed for commodities 2 and 3, since 2 is needed in the manufacture of 1_A and 1_B and there is no demand for 3 in the absence of the production of 2. Nothing is done to promote exports. As a result, it becomes highly profitable to produce 1_A and 1_B. (Let it be recalled that we have assumed a real comparative advantage in the production of 1_A only.) Since the low import-price of 2 makes it unprofitable to produce, it continues to be imported. As nothing is done to raise the market price of foreign exchange, the export activity continues to be unprofitable. The balance-of-payments situation remains unsolved.

It will be readily appreciated that the 'hypothetical' situation in the model helps us to analyse the actual situation prevailing between 1953 and 1959. A licensing system was introduced in 1953 and severe restrictions were placed on the imports of consumer goods, while allowing more liberal imports of raw materials and machinery and spare parts. The market was, as a result, 'rigged' in favour of producing finished consumer goods, particularly the 'nonessential' ones (since their import was most severely restricted), and against intermediate goods and capital goods. Furthermore, as no domestic taxes were imposed to offset this bias, it became highly profitable to produce these goods domestically regardless of comparative-advantage considerations. Every finished consumer-goods industry looked like a good investment, while the development of Pakistan's raw materials and capital goods never appeared to promise any profits. Thus, pressures were created tending to "distort" the pattern of investment in this respect.[12] The marked was

[12]Let it be noted that our solution is a "price solution". It is assumed that the investors are guided by price signals, so that if a certain line of investment (in our model, activity) becomes profitable, new investment will tend to flow into that activity.

also 'rigged' against exports. The licensing system made the exporter "pay" a hidden levy by requiring him to surrender his exchange earnings at the unfavourable official rate, while the importer was 'paid' a premium by allowing him to import scarce goods which could be sold at high profits.

Thus, the licensing system failed to indicate real comparative advantage and created incentives against exports and in favour of import substitution. Within the latter sector it encouraged finished consumer goods, as against intermediate and capital goods.[13] As a result, a situation of disequilibrium, similar to the one indicated in Stage (b), prevailed in respect of resource allocation and the balance of payments during this period, despite government's attempt to remedy it. However, one can guess that import substitution, particularly of those goods where the country may have a comparative advantage, led to some reduction in the cost to the economy of satisfying the final demand. Such a situation obtains in our model: the cost of production is reduced from 23,200 to 22,700 (see at the bottom of Table 2).

Stage (c)

In Stage (c), it is assumed that an Export Bonus Scheme is launched. The Scheme[14] operates by allowing exporters to recover the losses they are likely to incur in the foreign market at the overvalued rate for the rupee. The exporter receives in the form of a bonus voucher a right to retain a certain percentage of the foreign exchange earned by him (referred to hereinafter as the rate of bonus or b). These bonus vouchers are marketable. At the current rate of exchange, there exists an excess demand for imports suggesting that the rupee is overvalued. An equilibrium rate would make this demand zero. Thus, the bonus vouchers will be sold at a price at which the excess demand for goods allowed to be imported against them is zero. The price reflects a premium which the importer has to pay to acquire foreign exchange. The price of bonus vouchers divided by the official rate of exchange is the rate of premium (referred to as v).

It is important, at this point, to be clear about the relative roles of b and v. A positive $v(v > 0)$ raises the price of foreign exchange above the official par value. It also sets an upper limit to the subsidy that the exporter can get if b is positive ($b > 0$). Thus, the Export Bonus Scheme has two simultaneous effects: it maintains the incentive to import substitution of those commodities whose import is restricted by a positive v; and it also lends support to export expansion to the extent that a positive b multiplied by a positive v (bv) raises the rate at which the exporter can sell his retained foreign exchange.

[13] Moreover where import substitution took place (e.g. cotton textiles), it appears to have led, in the absence of any compensating taxes, to "consumption liberalization", adversely affecting the saving rate. *See* [5].

[14] For a detailed discussion of the Scheme, *see* [1].

Table 2:

The Evaluation of Production and

Commodities and factors	Production activities					
	x_{1A}	x_{1B}	x_2	x_3	x_4	M_{1A}
	(1)	(2)	(3)	(4)	(5)	(6)
1. Finished products						
A.	**1.00**					**LOO**
B.		**LOO**				
2. Intermediate products	**-.30**	**-.50**	**1.00**			
3. Raw material			**-.30**	**1.00**		
4, Foreign exchange					**1.00**	**-.90**
5. Other inputs	**-.50**	**-1.00**	**-.80**	**-2.00**	**-2.00**	
6. Labour	***-1.50***	**-1.50**	**-1.20**	**-3.00**	**-3.00**	
7. Capital	**-1.00**	**-2.00**	**-3.00**	**-5.00**	**-3.00**	
Market Profitability						
8. Stage (a)	**-.15**	**-2.75**	**-1.45**	**-3.50**	**-3.00**	**0**
9. Stage (b)	**+6.60**	**+4.00**	**-1.45**	**-3.50**	**-3.00**	-
10. Stage (c)	**+6.60**	**+4.00**	**-1.45**	**-3.50**	**0**	**0**
11. Stage (d)	**+4.13**	**-.13**	**+3.87**	**+6.25**	**+4.50**	**0**
12. Stage (e)	**+1.56**	**-1.70**	**+.68**	**+.40**	**0**	**0**
***Cost* of Production**						
13. Stage (a)	—	-			**23,200**	
14. Stage (b)	**3,000**	**4,500**			**15,200**	
15. Stage (c)	**3,000**	**4,500**			**15,200**	
16. Stage (d)	**3,000**	-	**6,500**	**3,900**	**15,200**	
17. Stage (e)	**3,000**	-	**6,500**	**3,700**	**7,200**	

Market Model

Import Activities by Market Prices

Import activities			Market prices					
M_1B	M_2	M_3	Stage (a) O.G.L.	Stage (b) import restrictions on 1_A and 1_B only	Stage (c) v=150% b=40%	Stage (d) v=150% b=100%	Stage (e) v=60% b=100%	Final demand
(7)	(8)	(9)	(10)	(11)a	(12)b	(13)b	(14)b	(15)
			4.50	11.25	11.25	11.25	7.20	1,000
1.00			4.50	11.25	11.25	11.25	7.20	1,000
	1.00		5.50	5.50	5.50	13.75	8.80	1,000
		1.00	6.50	6.50	6.50	16.25	10.40	0
					(12.50)b	(12.50)b	(8.00)b	
-.90	-1.10	-1.30	5.00	5.00	5.00	5.00	5.00	0
					(8.00)	(12.50)	(8.00)	
			1.00	1.00	1.00	1.00	1.00	
			1.00	1.00	1.00	1.00	1.00	
			1.00	1.00	1.00	1.00	1.00	
0	0	0						
	0	0						
0	0	0						
0	0	0						
0	0	0						

Notes:

a) *'v'* is the rate of premium and *'b'* is the rate of bonus as defined in the text,

b) Rs. 5.00 is the official rate of exchange. The figure in parentheses above the official rate is the price of foreign exchange to the importer under bonus-voucher imports, and the figure in parentheses below the official rate is the price received by the exporter.

Total cost
23,200
22,700
22,700
20,600
20,600

If r_e is the implicit rate of exchange to the exporter and r_m that to the importer, and r the official rate of exchange, the above-noted relationship between b and v can be stated as:

$$r_m = r(1 + v)$$
and $$r_e = r(1 + bv)$$

These relationships are illustrated in Fig. 1, where on the vertical axis are measured r_e and r_m, and on the horizontal axis various values of v. The linear equation $r_m = r(1 + v)$ is represented by a straight line AA' which has an intercept of Rs. 5.00 on the vertical axis. To each point on the AA' line, there corresponds an implicit rate of exchange to the importers, indicated on the vertical axis. Thus, with v = 100 percent, r_e is Rs. 10.00 to $ 1.00. The equation $r_e = r(1 + bv)$ is represented by a family of rays originating at point A on the vertical axis, and corresponding to various levels of the bonus rate (b). Each point on one of these rays indicates an implicit rate to the exporter, at given values of b and v. Thus with v = 100 percent, the point B on b_2 (=40 percent) corresponds to an r_e = Rs. 7.00 to $ 1.00.

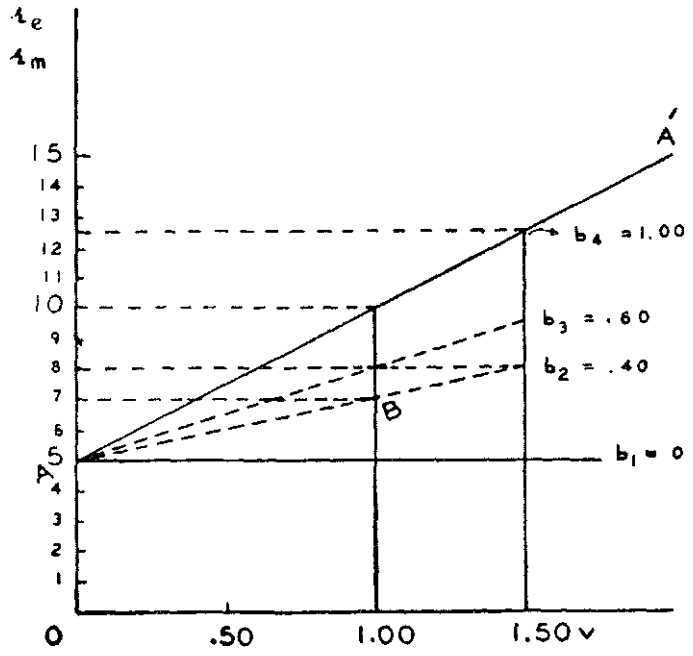

Fig. 1. Showing the Relationship Between r_e and r_m.

It is clear that the rates of exchange for exports and for import substitution are equalized only when the r_e line coincides with the line AA'. This happens only when b = 100 percent. The two rates are also equal at v = 0. But this implies an equilibrium rate of exchange to begin with. It is, therefore, irrelevent in the present context.

At any value of $b < 100$, $r_m > r_e$. A look at Fig. 1 will make this clear. So long as $b < 100$, the slope of the r_m line will always be greater than that of the r_e line, however high the level of v may be. As a matter of fact, any increase in v with $b < 100$ widens the discrepancy between the two rates. Again this can be read off from Fig. 1. With a b = 40 percent and v = 100 percent, r_e = 7.00 and r_m = 10.00.[15] Now as v is increased from 100 to 150 percent, with b constant at 40 percent, r_m increases from 10.00 to 12.50, while r_e increases only from 7.00 to 8.00. Investment in import substitution is thereby encouraged, possibly at the expense of investment in export expansion. *Whereas a large v primarily strengthens the incentive to import substitution, the subsidy to the exporter, at a given level of v, depends also upon b.* It follows that the 'potential' subsidy mobilized by a positive v can be fully transferred to the export sector only if b = 100. This result has an extremely important implication for policy. The full export-promoting potential of the scheme can be realized only with the high values of *both b* and v and not by a high v alone.

Returning now to our model, we assume that the exporter gets a bonus of 40 percent on his export earnings; and the rate of premium (v) at which he can sell his retained foreign exchange stands at 150 percent. At these rates of b and v, the implicit rate of exchange is Rs. 12.50 to $ 1.00 for import substitution and only Rs. 8.00 to $ 1.00[16] for export expansion. Secondly, while the market price for commodities 1_A and 1_B stands at Rs. 11.25, it is only Rs. 5.00 for 2 and 3; the latter continue to be liberally imported at the official rate of exchange, while the former can now be imported only at a 150-percent premium. With these changes in Stage (c), it is profitable to produce 1_A and 1_B only, and to continue to import 2 and 3. Also as the rate of exchange is moved to the opportunity cost of producing it in the export sector (i.e. Rs. 8.00), the incentive to import-replacing activities, particularly the activities 1_A and 1_B, is far greater than the incentive to produce for exports. As a result, the market continues to be 'rigged' against the home production of capital goods, intermediate goods (commodity 2), raw materials (commodity 3) and exports (commodity 4). And it still remains profitable to produce those goods (i.e. 1_B) in which we do not have any real comparative advantage.

[15]Table in the Appendix gives calculations of r_m and r_e with the actual rate of exchange of Rs. 4.75 to $ 1.00 and various levels of b and v.

[16]With the official rate of exchange r = Rs. 5.00 to $ 1.00, v = 150 percent and b = 40 percent, r_e = Rs. 5.00 (1 + .40 x 1.50) = Rs. 8.00, r_m = Rs. 5.00 (1 + 1.50) = Rs. 12.50.

It is now easy to see why in Stage (c), in spite of a bonus of 40 percent and a premium of 150 percent, export activity continues to be relatively far less profitable than import substitution. The problem of resource allocation also remains unsolved, for the bias against the home production of 2 and 3 could be eliminated only if they, like 1_A and 1_{11}, were also imported on a 150-percent premium. Obviously, the true relative profitabilities of activities X_{1A} through X_3 can be ascertained only if all of them are *equally* protected.

This completes our analysis of the existing situation. Our model was, as a matter of fact, primarily designed to do precisely this. It is, however, instructive to see how the solution of this model can be made to correspond to that we obtained in our reference model. Such an attempt will be fruitful in two ways: *i)* it will illustrate the way market prices can do the same job that shadow prices are supposed to do; it) if the main implication of our analysis — that the rate of exchange should reflect the real opportunity cost of producing it at the margin of the export sector — is accepted, then such an attempt will also indicate the direction that exchange-rate policy might take to achieve an equilibrium solution.

Stage (d)

We, therefore, pass on to Stage (d). We put $b = 100$. Also we now import all the commodities 1_A to 3 on bonus vouchers (at $v = 150$ percent). (The reasons for both of these changes have already been given in Stage (c).)

The export activity (X_4) now becomes highly profitable (perhaps too profitable). Secondly, it has become profitable also to undertake activities X_2 and Xj. Thirdly, activity X_{1B}, where we did not have any real comparative advantage, attracts investment no more as its market profitability has become negative. It is now more profitable to import it. Fourthly, the aggregate cost of production is lowered substantially from 22,700 to 20,600.

We can, therefore, see that by making $b = 100$ and by putting all the commodities on the bonus list we eliminate at once the market bias against exports and against producing capital goods, spare parts and raw materials. Also, the market incentives cause investment to flow only into industries where we enjoy a real comparative advantage (X_{1A}) and not into those where no such advantage exists

0 W -

Although, we have here the necessary conditions of an equilibrium solution, these are by no means sufficient. Our "solution" still suffers from the defect that all except 1_B earn substantial excess profits. This might lead to an excess of investment in import substitution and export expansion, leading to a balance-of-payments surplus. Such a situation implies that v is too high. Now v will, other things being equal, decline as b is increased to 100 percent. With $b = 100$, a high v will, by providing a greater encouragement to exports, increase the supply of bonus vouchers, which, in turn, will tend to depress v. On the other hand, an increase also in bonus-voucher import list (i.e. as goods 2 and 3 are added to the list) would, other things

being equal, tend to raise *v*. We, however, assume that this influence is swamped by the effect of the increased supply of bonus vouchers.

Stage (e)

With these considerations in mind, we pass on to Stage (e). As *b* is increased from 40 percent (in Stage (c)) to 100 percent (in Stage (e)) we assume that *v* falls from 150 percent to 60 percent. A look at the matrix (Table in the Appendix) will show that, with this change, while the incentive to exports would be the same as before, that to import substitution will weaken considerably. Relatively speaking, the new combination of *b* and *v* provides a greater incentive to exports. As a result, the excess profits earned in X_{1A}, X_2 and X_3 are reduced to more modest proportions; while the unprofitability of X_{1B} gets more pronounced.

In a true optimum situation, however, the profitability of undertaking activities X_{1A}, X_2 and X_3, must also be zero. What is required to obtain a complete solution is to equate not only the marginal revenue from producing one unit of exports (X_4) with the marginal cost of producing it, but also to equate the marginal revenue from import substitution to its marginal cost. Here, in this model, we have met only condition (1). To meet condtion (2), the market prices of all the commodities would have to equal their real opportunity costs. However, we need not carry this market model further since the basic principles are illustrated clearly enough.

V

The picture depicted in Stage (e) indicates certain guidelines for government policy designed to influence market forces to operate rationally and consistently. It tells us what direction the exchange-rate policy might take to solve the balance-of-payments problem. However, to repeat, this does not suggest that an appropriate exchange-rate policy is *sufficient* to do the job. Fiscal and monetary policies, import controls and direct subsidies may be as effective as exchang-rate policy. As a matter of fact, our argument presumes that monetary and fiscal policies are also consistent with the objectives achieved in our model by exchange-rate policy. However, as pointed out in the introductory part of this paper, our model is designed to help trace the repercussions of changes in the exchange rate only. Furthermore, a linear-programming model cannot comprehend relationships which cannot be expressed quantitatively. But our model does show that *if* price incentives are to be used as a guide to resource allocation, the exchange-rate policy must be such as removes biases in the market; and it can accomplish this task, within a free-market setting, only if the price of foreign exchange is made equal to its true opportunity cost. We have noted that the licensing system provided a hidden 'subsidy' to the importer and imposed a 'penalty' on the exporter. The system was, thus, biased against export expansion and in favour of import substitution. Furthermore, by giving

"greater protection to finished goods than to intermediate goods or capital equipment, it encouraged investment in the former rather than in the latter" [7]. The Export Bonus Scheme was introduced to promote exports (to allow greater imports) and relied on the market for subsidizing exporters. We have, however, noticed that the incentive pattern set up by the Scheme tends to perpetuate the biases of the previous system. It provides greater incentive to import substitution than to export expansion. Furthermore, by affording discriminatory protection to finished consumer-goods industries, it also perpetuates the other bias that we noted above. Both the licensing system and the Export Bonus Scheme, thus, create incentives which make it difficult for the government to prevent a distorted pattern of investment that may be inconsistent with progress towards balance-of-payments equilibrium.

VI

In this section we note certain other qualifications to our analysis.

i) The argument that free-market forces corrected for biases may be permitted to regulate the choice between import substitution of consumption, of capital, or of intermediate goods on the one hand, and exports on the other, depends crucially on the condition that fiscal and monetary policies (and wage-profit factors etc.) enforce the planned marginal saving rate from the demand side to match this type of investment pattern. If this condition does not hold, we may have to 'rig' the investment pattern itself in such a way that it can generate the required marginal rate of saving. What this implies in terms of our market model is that prices are such as give *greater* protection to activities X_2, X_3, and X_4 than to $X_{j\neq}$, thereby making it more profitable to undertake the former set of activities than the latter one. It is a clear departure from our solution which 'calls for' equalizing marginal profitabilities throughout the economy. Yet it is a possible line of action that must be noted.

ii) Our analysis suggests that the bonus rate be raised (perhaps gradually) to 100 percent on all exports. Now this may not be desirable, since for many exports the elasticity of world demand may be less than infinity. In the case of such exports, the rate of bonus should be less than 100 percent. It may have to be zero or even negative (which means an export tax) in certain cases. Any such step must, however, take into account the domestic structure of competition. If there is domestic monopoly in respect of certain exports, no departure from the model is needed, since the decisions of the monopolist should be based on marginal revenue (MR) rather than on price. However, if competitive conditions prevail, the exporters' decisions will be based on price (P = MR under these conditions) and considerations relating to world price-elasticity of demand become highly relevant. However, it may not be advisable to make too many exceptions to the general premium for export (i.e. *b).*

iii) Our model also suggests that all imports should be made against import bonus vouchers only. One may ask what about public-sector imports? Should the government also be required to pay the penalty rate? The answer is in the affirmative. In order to ensure rationality in investment planning in the public sector even for imports whose social profitability is not usually decided by economic considerations (such as defence imports), there would be some advantage in allowing the economic calculus to determine lines where home production could profitably substitute for imports.

iv) There is yet another respect in which slight modifications in our model may seem called for. We have assumed that the opportunity cost of labour is equal to its market price throughout the economy. The rate of exchange (in terms of our model) should, therefore, be manipulated also to correct this bias (against the employment of labour). Lary [6], has suggested a dual rate of exchange: one for manufactured-goods exports and the other for agriculture, the rate (in terms of domestic currency) being higher for the former than for the latter. Such a policy, however, may turn out to be of limited usefulness, for the policy of making labour (money) costs equal to their real opportunity-cost has direct implications also for the choice of techniques in production. While manipulating the rate of exchange may help to correct the bias against domestic manufacture, it will have no impact on the choice of techniques. A direct subsidy given on the employment of labour may achieve this result more effectively. We are, however, not concerned with the details of any such proposal. What this means is that the situation in our model, which takes the rate of exchange as the key variable, must be supplemented by the use of other shadow prices where applicable.

v) Again, some further correction must be undertaken in the case of industries in which economies of scale are important. A higher bonus for exports might be given in these cases. Again, however, a direct subsidy may also be employed if it is desirable to avoid making exceptions to the bonus rule.

vi) In our model, we could not take account of the problems arising from the rather sharp fluctuations in the level of premium on bonus vouchers. Such a system suffers from all the defects associated with a system of fluctuating exchange rates. It impedes long-term investment planning of productive activities in respect of both import substitution and exports. It follows that some scheme for stabilizing v must be devised. This, however, falls outside the scope of this paper.

VII

' We can be very brief in our conclusions. Our 'reference model' showed *quantitatively* the complex nature of the balance-of-payments problem: an optimum pattern of trade is determined simultaneously with an optimum allocation of domestic resources. It also highlighted the crucial role that a correct foreign-

exchange price plays in bringing the two magnitudes into approximate balance. More importantly, the model served as a springboard from where we could proceed to a more concrete (though still hypothetical) 'market model'. This market model enabled us explicitly to analyse the Pakistan balance-of-payments problem and to show the inadequacy of the various policies taken to deal with this problem. The model also provides broad guidelines for a rational exchange-rate policy. It tells us explicitly that the exchange-rate policy must be so manipulated as to make the official price of foreign exchange equal to its true opportunity-cost — defined as the cost of producing (or earning) a unit of foreign exchange at the margin of the export sector. The limited nature of our solution has, however, been noted. Our model does not imply the sufficiency of exchange-rate policy to deal with the balance-of-payments problem in its full complexity. Supplementary fiscal and monetary policies must also be taken. It also does not say that a market solution, such as we have proposed, is the best solution. All it tells us is that *if* free-market forces are to be used, *then,* within the conditions specified in the model, the exchange-rate policy will have to follow the lines indicated in our market model.

Appendix

Table 1

Matrix: Showing Implicit Rates of Exchange Corresponding to Given Values of b and v

b \ v	0	50	100	150	200	250
0	4.75 / 4.75	4.75 / 7.12	4.75 / 9.50	4.75 / 11.88	4.75 / 14.25	4.75 / 16.63
20	4.75 / 4.75	5.33 / 7.12	5.70 / 9.50	6.18 / 11.88	6.65 / 14.25	7.12 / 16.63
40	4.75 / 4.75	5.70 / 7.12	6.65 / 9.50	7.60 / 11.88	8.55 / 14.25	9.50 / 16.63
60	4.75 / 4.75	6.18 / 7.12	7.60 / 9.50	9.26 / 11.88	10.45 / 14.25	11.88 / 16.63
80	4.75 / 4.75	6.65 / 7.12	8.55 / 9.50	10.45 / 11.88	12.35 / 14.25	14.25 / 16.63
100	4.75 / 4.75	7.12 / 7.12	9.50 / 9.50	11.88 / 11.88	14.25 / 14.25	16.63 / 16.63

Footnotes:
1. Figures in the upper half and lower half of each of squares indicate the rate of exchange for the exporter and importer respectively for each value of b and v.
2. Here computations have been made on the basis of the actual rate of exchange of Rs. 4.75 to $ 1, instead of Rs. 5.00 to $ 1 used in the model.
   The formula used here for calculating $r_m = 4.75\ (1 + v)$.
   The formula used here for calculating $r_e = 4.75\ (1 + bv)$.

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