Optimal International Borrowing Capital Allocation and Credit-Worthiness Control*

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> *"Official borrowers like any others, wish to borrow on the best available terms in the private market ... After all, they do command the reserves of the country as well as access to domestic capital markets and the central bank. Such factors enter in their balance of payments management and, more particularly, their external debt and reserve management. They know that their external debt management strategies must be played out in the market place."* (*Friedman* 1977 a, p. 16)

The determination of appropriate international borrowing policy has attracted the attention of many economists because economic growth, particularly in developing countries, depends heavily on the inflow of foreign funds. Work on this topic dates back to *Adam Smith;* but more recent contributions have been made by *Hamada* (1966, 1969), *Bardhan* (1967), *Van Long* (1974), *Manning* (1972), and *McCabe* and *Sibley* (1976). A common approach in related economic analyses has involved a "small country" assumption that has been taken to imply an infinitely elastic supply of loans at a given interest rate. It has been argued recently by *Hanson* (1974), however, that the supply of loans may not be completely elastic even for the small country because, as debts get large, the probability of a debt crisis for the individual country increases. That is, as debts get large relative to the country (not the market), it becomes more likely that the borrower will not be able to make repayments on schedule; hence, lenders will become more reluctant to lend as the expected, discounted returns decline. As indicated by *Mohammed* and *Saccomanni* (1973), there is no doubt that this risk plays a major role in the lending practices of commercial banks. Nonprofit-oriented lending institutions are also likely to be concerned with the probability that reschedulings will be required; hence, their lend-

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ing decisions may also be influenced to some degree by their borrowers' credit status (*Cline* and *Sargan* (1975)). It thus follows that even small countries do not face an infinitely elastic supply of foreign funds; rather, the terms of credit are endogenous depending on credit-worthiness. Credit-worthiness, in turn, is determined by the countries' economic performance (usually measured by a few accepted economic indicators).

Since economic-performance indicators are affected by economic policies, it is important to explore borrowing policies for optimal growth, taking into account the relationship between ecnomic performance and terms of credit[1]. Although empirical results suggest that several economic variables are related to debt servicing capacity, one may accept the use of only a few indicators as a useful simplification for theoretical analysis (*Feder* and *Just* (1977 a, b)). *Hanson* has suggested the use of the debt-equity ratio for this purpose. However, in the one-sector model developed by *Hanson,* this approach implicitly leads to the assumption that "resources can always be costlessly allocated to obtain the necessary foreign exchange for debt servicing" [11, p. 619, footnote 10]. Hence, the only factor limiting the availability of foreign exchange is the overall productive capacity of the country which may be represented by the capital stock.

Once installed, however, capital is not a malleable factor than can be equally productive in any sector. Although some types of capital are more flexible than others (transportation equipment, power plants, etc.), it is more likely with many exports, particularly in developing countries where exports are composed mainly of nonmanufactured goods, that investments are highly specialized (mines, dams, etc.). Even when reallocation of capital is possible, the time lag involved may be too long for lenders to consider the productive capacity of other sources as relevant for the evaluation of export potential in the case of debt payment difficulty. Since the export sector is the main source of foreign exchange earnings in many countries and capital reallocation may not be possible, it thus seems that the most appropriate case for developing countries may be where the terms of credit depend specifically on the size of the export sector (as well as the debt burden). This is consistent with the findings of a recent study regarding lending behavior in the Eurodollar market where two variables related to ex-

[1] Such policies have been suggested by observers of international markets; see *Irvine* et al. (1970), *Friedman* (1977 b).

port performance (the ratio of debt service to export earnings and a measure of export variability) appear to be considered as relevant by lenders, while the ratio of debt to gross national product (which is a proxy for the debt-equity ratio) was found insignificant (*Feder* and *Just* 1977 a).

Another balance of payments item which is of importance in credit-worthiness evaluations is the size of foreign exchange reserves, which is usually viewed in comparison to the import bill (*Feder* and *Just* (1977 a), *Goodman* (1977)). That rational reserve policies are carried out with reference to credit worthiness (among other arguments) is evident from *Friedman* (1977 a, p. 18) who states: "Other developing countries, like Brazil, are borrowing both to finance external deficits and to rebuild reserves, profiting from the experience that a strong, visible level of reserves improves creditworthiness as well as providing an additional cushion to meet contingencies."

The purpose of the present paper is to consider a two-sector model where export and import activities are defined explicitly. The model recognizes lenders' concern regarding default on international debt through a credit-worthiness dependent supply function of foreign funds. It is assumed that capital, once allocated between the export or nonexport sector, cannot be reallocated[2]. Accordingly the credit-worthiness assessment carried out by lenders (and which focuses on the foreign exchange attributes of the economy) is reflected in an interest rate which is positively related to the volume of anticipated debt service payment relative to the magnitude of export earnings. Similarly, the interest rate is negatively related to the size of foreign exchange reserves relative to the volume of import expenditures.

The model presents a characterization of optimal investment and borrowing decisions and discussed their policy implications in a mixed economy where both governmental and private decision making coexist.

The Model

The model below describes as small, two-sector open economy. One sector produces an export good, while the other sector produces a good which can be used for either consumption or investment. Investment

[2] This assumption has been adopted in several other optimal growth models where terms of credit and optimal borrowing are not the major interest; see works by *Bose* (1968), *Chakravarty* (1969), *Dasgupta* (1969) *Johansen* (1967), and *Ryder* (1969).

can be augmented with imports of capital goods. The economy has access to international capital markets, but the terms of credit it obtains depend on its credit-worthiness status. The planning authority is assumed to be interested in maximizing the discounted utility streams of consumption.

The following notation is used in the analysis. All variables should carry a time subscript, which is omitted for the purpose of brevity. A dot over a variable denotes a rate of change over time.

A. Variables

(i) Flow variables

F = A composite good which can be used for both consumption and/or investment;
G = Export good (not used domestically);
C = Consumption;
I_d = Capital formation from domestic output;
I = Total investment;
M = Quantity of imports of capital goods;
L = Gross loans;
U = Utility of consumption.

(ii) Stock variables

K_f, K_g = Stock of capital in F and G sectors, respectively;
B = Outstanding external debt;
R = International reserves.

(iii) Other variables

α = The proportion of total investment which is directed to the F sector;
r = Interest rate on external debt.

B. Parameters

i = Rate of interest earned on foreign exchange reserves;
ϱ = The planner's rate of time discount;
ϑ = Rate of amortization of external debt;
δ = Rate of capital depreciation;
P_g = International price of the export good;
P_m = International price of the capital good;
$\bar{r}$ = Average interest rate as perceived by lenders.

C. Model equations

(1) $$G = G(K_g) \; ; \quad G' > 0 \; ; \quad G'' < 0 \; .$$

(2) $$F = F(K_f) \; ; \quad F' > 0 \; ; \quad F_g < 0 \; .$$

The above equations describe the production technologies of the two sectors, which utilize capital only. Labor is assumed a non-binding constraint. For simplicity, labor growth is ignored.

$$F(K_f) = C + I_d \ . \tag{3}$$

Equation (3) describes the allocation of the F good output between consumption and investment.

$$r = r\,[P_g\,G - (\vartheta + \bar{r})B,\ R - P_m\,M];\ r_1 \equiv \frac{\partial\, r}{\partial\,[P_g\,G - (\vartheta + \bar{r})\,B]} < 0\ ; \tag{4}$$

$$r_2 \equiv \frac{\partial\, r}{\partial\,(R - P_m\,M)} < 0\ ;\quad r\,(\infty, \infty) = i\ .$$

Equation (4) defines the endogenous interest rate on external debt as a (declining) function of two indicators of debt servicing capacity: (i) The difference between export foreign exchange earnings and the average volume of debt service payments (the latter being approximated by some perceived average rate of interest $\bar{r}$, which lenders expect to prevail on the average); and, (ii) The difference between international reserves held by the economy and the import bill.

These two indicators correspond to two concepts widely used in credit worthiness assessment by lenders in international capital markets: (i) the debt service pressure measure which compares the major source of foreign exchange (exports) to the most rigid expenditure item in the balance of payment (debt service); and, (ii) the import-coverage measure which compares the size of reserves to the volume of imports, thereby reflecting the extent to which imports can be financed by reserve depletion if, for some unexpected reason, foreign currency inflows (exports and new loans) are not available.

While in most cases these measures are expressed as ratios (rather than differences), it is more convenient to follow the present formulation. The economic essence of the analysis is unaffected[3]. As both common sense and empirical evidence suggest, the interest rate will be

[3] Evidence on the prevalence of debt service and import coverage measures in credit worthiness analysis is available in many studies. See for instance *Goodman* (1977) who reports the results of a survey conducted among American banks engaging in international lending. Similar evidence is provided in *Feder* and *Just* (1977 a) who analysed factors affecting credit terms in the Eurodollar market. See also the articles by *Friedman* (1977 a), *Brackenridge* (1977), *Puz* (1977) and *van-Agtmael* (1976), all of whom are senior executives in international banks.

lower for borrowers with higher exports (relative to debt service) and higher reserves (relative to imports), thus the partial derivatives r_1 and r_2 are negative. Also, for a risk-free borrower (such that both arguments of the r function tend to infinity), the rate of interest will approach the going rate on international deposits (i).

$$U = U(C) \; ; \quad U' > 0 \; ; \quad U'' < 0 \; ; \quad U'(0) = \infty \; . \tag{5}$$

The utility of consumption has the standard properties of utility functions, namely, positive but decreasing marginal utility, and infinite marginal utility at $C = 0$.

$$I \equiv I_d + M \; . \tag{6}$$

Total investment is composed of domestic capital formation augmented by imports of capital goods. While the present model assumes that imports are composed of capital goods only, one can show that identical results may be derived from a model where imports are composed of consumption goods.

$$\dot{R} \equiv (P_g G + L + iR) - [P_m M + (r + \vartheta) B] \; . \tag{7}$$

The difference between foreign exchange inflows (composed of exports, loans and interest earnings on reserves) and foreign exchange outflows (composed of imports and debt service payments) equals the change in international reserve holdings.

$$\dot{K}_f = \alpha I - \delta K_f \; . \tag{8}$$

$$\dot{K}_g = (1 - \alpha) I - \delta K_g \; . \tag{9}$$

Equations (8) and (9) present the rate of change (over time) of capital stocks in the F and G sectors (i. e., net investments) as the difference between the new investments allocated to each sector and the volume of capital depreciation[4].

$$\dot{B} = L - \vartheta B \; . \tag{10}$$

The change in indebtedness is equal to the difference between gross loans and amortization payments.

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[4] The proportion of investment allocated to each sector should be constrained between zero and one. It will be assumed that this condition holds at the relevant range.

The planner's objective is maximization of discounted utility of consumption. Assuming an infinite horizon the problem can be formulated as

$$\underset{\alpha, M, L, C}{\text{Max}} \int_0^\infty U(C)\, dt \ . \tag{11}$$

subject to initial stock values and equations (1) - (10).

Problem (11) can be solved using the Pontryagin Maximum Principle. Denote the present value Hamiltonian by H and define the constant variables λ, μ, η and φ, which are dynamic shadow prices of the stock variables K_f, K_g, B and R, respectively. Then, using the relation $I = F(K_f) - C + M$ (from (3) and (5)), one can write

$$\begin{aligned} H \cdot e^{-\varrho t} = {} & U(C) + \lambda \{\alpha [F(K_f) - C + M] - \delta K_f\} \\ & + \mu \{(1-\alpha)[F(K_f) - C + M] - \delta K_g\} + \eta (L - \vartheta B) \\ & + \varphi \{[P_g G(K_g) + L + iR] - [P_m M + (r + \vartheta) B]\} \end{aligned} \tag{12}$$

It should be noted that the non-negativity requirement for C is not specified since the assumption $U'(0) = \infty$ eliminates such a solution. The non-negativity of M and L, and the requirement $0 < \alpha < 1$ are assumed to be non-effective constraints at the range of the optimal path described in the present paper. It thus follows that the optimality conditions to be derived below are applicable only at a certain range of the optimal path (including the steady state). Other portions of the optimal path include corner solutions (e. g., zero investment in one sector or the other, zero borrowing, etc.) and seem to us to be less interesting from a practical point of view. Similarly, existence and uniqueness of the solution depend on additional constraints which are not spelled out.

The optimality conditions require (in addition to appropriate transverality conditions), at the range where all controls are positive:

$$\frac{\partial H}{\partial C} = 0 \qquad \Rightarrow U' - \alpha\lambda - (1-\alpha)\mu = 0 \tag{13}$$

$$\frac{\partial H}{\partial M} = 0 \qquad \Rightarrow \alpha\lambda + (1-\alpha)\mu - \varphi P_m [1 - r_2 B] = 0 \tag{14}$$

$$\frac{\partial H}{\partial \alpha} = 0 \qquad \Rightarrow [F(K_f) - C + M] \cdot (\lambda - \mu) = 0 \tag{15}$$

$$\frac{\partial H}{\partial L} = 0 \qquad \Rightarrow \eta + \varphi = 0 \tag{16}$$

$$\dot{\lambda} - \varrho\lambda = -\frac{\partial H}{\partial K_f} \Rightarrow \dot{\lambda} = \lambda(\varrho + \delta) - [\alpha\lambda + (1-\alpha)\mu] \cdot F'(K_f) \tag{17}$$

$$\dot{\mu} - \varrho\mu = -\frac{\partial H}{\partial K_g} \Rightarrow \dot{\mu} = \mu(\varrho + \delta) - \varphi \cdot P_g \cdot G'(K_g) \cdot (1 - r_1 B) \tag{18}$$

$$\dot{\eta} - \varrho\eta = -\frac{\partial H}{\partial B} \Rightarrow \dot{\eta} = \eta(\varrho + \vartheta) + \varphi[r + \vartheta - r_1(\vartheta + \bar{r}) \cdot B] \tag{19}$$

$$\dot{\varphi} - \varrho\varphi = -\frac{\partial H}{\partial R} \Rightarrow \dot{\varphi} = \varphi[\varrho - i + r_2 \cdot B] \tag{20}$$

Analysis of the Results

The economic interpretation of the optimality conditions is fairly straightforward:

Equation (13) implies that the marginal benefit of consumption (i. e., marginal utility) equals its opportunity cost $[\alpha\lambda + (1-\alpha)\mu]$, which is the marginal value of investment foregone. The value of marginal investment is a weighted average of the value of capital in both production sectors. As will become apparent, the value of a unit of capital in both sectors is equal, thus the implication is that the marginal utility of consumption equals the value of a unit of capital which is foregone.

Equation (14) states that the value of a unit of investment $[\alpha\lambda + (1-\alpha)\mu]$ (afforded by one additional unit of imports of capital goods) equals its opportunity cost. The latter is the amount of foreign exchange (withdrawn from reserve stocks), adjusted for the deterioration in credit terms caused by the decline in import coverage by reserves. We note that if imports had no effect on the term of credit (i. e., $r_2 = 0$) then the value of investment equals the shadow price of foreign exchange needed to implement that investment.

Equation (15) implies that value of capital in each of the two production sectors (that is, the export sector and the investment-consumption sector) is equal, (i. e., $\lambda = \mu$) even though capital is not transferable between the sectors once investments are implemented (except in the case $F(K) - C + M = 0$, which implies no investment in the economy). Given $\lambda = \mu$, it follows that the value of capital is higher than the value of the direct foreign exchange cost of a unit of capital imports. This is explained (as indicated above) by the additional cost, in terms of reduced credit worthiness, of imports.

Equation (16) implies that the value of a unit of reserves (or the shadow cost of foreign exchange) equals its opportunity cost (the

reduction of external debt). The value of a unit debt (η) is obviously negative, as the value of reserves (φ) is positive.

Using the result $\lambda = \mu = \varphi P_m (1 - r_2 B)$ (which also implies $\dot{\lambda} = \dot{\mu}$), equations (17) and (18) can be combined to yield

$$\frac{P_m F'}{P_g G'} = \left(\frac{1 - r_1 B}{1 - r_2 B} \right) . \tag{21}$$

Equation (21) implies that in general the value of marginal product of capital in the two production sectors (evaluated at international prices) will not be identical. Obviously, in the case where no credit worthiness considerations are taken into account (i. e., $r_1 = r_2 = 0$), the marginal productivity of capital would be maintained equal in all sectors. Indeed, in an economy where most investments are made by private (and competitive) investors, one would expect them to operate such that $P_m F' = P_g G'$, since each one of them is too small to consider the national credit-worthiness implications of imports and exports. The planner (or the government), however, cannot ignore the impact of such variables as represented by the right hand side of equation (21). Thus, intervention in the sectoral allocation of investment is called for by export promotion and/or import substitution. Export promotion is reflected in the term $- r_1 B$ which measures (in units of output) the amount of subsidy that should be given to producers of the export good. Similarly, $- r_2 B$ measures (in physical units) the subsidy due to producers of the F good (which can substitute imports of capital goods). Private investors will then equate (at the margin) the actual rates of return received by them, namely

$$P_g G' \cdot [1 - r_1 B] = P_m F' \cdot [1 - r_2 B] , \tag{22}$$

which will ensure that the economy maintains the optimal condition given by equation (21). At the steady state, however, the optimal condition for the F sector requires (from equation (17) with $\dot{\lambda} = 0$),

$$F' = \delta + \varrho . \tag{23}$$

Whether the export sector is (at the margin) more profitable than the import substituting sector depends on whether $r_1/r_2 \gtrless 1$. The size of r_1/r_2 is affected by the differential weight attached to the different credit-worthiness indicators and is thus an empirical question.

It should be noted that in practice, many governments find it more convenient to control the volume of imports (by tariffs or quotas), so as

to avoid foreign exchange crises which will deteriorate their credit status. In terms of the present model, the optimal tariff on imports is $-r_2 B$. Imposing such an import tax will eliminate the need to subsidize the F sector.

Using the equality $\eta = -\varphi$, which implies $\dot{\varphi}/\varphi = \dot{\eta}/\eta$, equations (19) and (20) can be combined to yield

$$r - r_1(\vartheta + \bar{r})B = i - r_2 B \ . \tag{24}$$

The left hand side of equation (24) is the marginal cost of borrowing to the economy, which is necessarily higher than the rate of interest r, since it includes the extra cost due to the deterioration in terms of credit brought about by higher debt (the latter effect is represented by the term $-r_1 \cdot (\vartheta + \bar{r}) \cdot B$). The right hand side represents the marginal benefit from reserve holdings, which is composed of the direct rate of interest plus the contribution to credit worthiness gained by additional reserves (given by $-r_2 B$). Equation (24) thus describes the optimality relation for reserve and debt stocks. Obviously, in the present model, if reserves had no impact on credit worthiness ($r_2 = 0$), then a zero reserves level should be maintained. This can be seen by observing that with $r_2 = 0$, it is impossible for equation (24) to hold (since $r - r_1(\vartheta + \bar{r})B > r > i$ for all values of the arguments of r, as indicated in (4)). To approach the equality, R will be depleted (and B reduced by an equal amount), which verifies the assertion made above.

In an economy where part of the external borrowing is done by private corporations, the model points out the necessity of imposing a tax on foreign borrowing. The reason for such a tax is that while the cost of borrowing for each individual borrower is r (the rate of interest) the cost to the economy is the marginal borrowing cost which includes the terms of credit effect. The presence of credit worthiness considerations thus implies an externality, which may be corrected by an appropriate tax. Obviously, direct measures can also be applied. For instance, recently, the government of Turkey banned foreign loans which are obtained at a rate of interest higher than a certain upper limit (*Clarke*, 1977). Other governments imposed administrative restrictions which amount to an implicit tax on borrowing from foreign sources.

Comparisons between the marginal rate of return and the external interest are possible, in the present model, only at the steady state. Thus, setting $\dot{\lambda} = \dot{\eta} = 0$ and using the results $\lambda = \mu$, $-\eta = \varphi$, one obtains from (17) and (19):

$$F' - \delta = r - r_1 \cdot (\vartheta + \bar{r})\, B \ . \tag{25}$$

Equation (25) implies that at the steady-state, the marginal productivity of capital in the import-substituting sector (net of capital depreciation allowance) should be maintained at a level higher then the rate of interest of external debt. The difference is equal to the credit-worthiness effect of marginal borrowing. When credit-worthiness considerations are negligible ($r_1 \cong 0$), the standard result is obtained, namely, the net marginal productivity of capital equals the interest rate.

The relation between the marginal rate of return of capital in the export sector and the rate of interest is less straightforward. Setting $\dot{\mu} = \dot{\eta} = 0$, and using the relation $-\eta = \varphi = \mu/[P_m \cdot (1 - r_2 \cdot B)]$, one obtains from (18) and (19), at the steady state,

$$\frac{P_g\, G'}{P_m} \cdot \frac{(1 - r_1\, B)}{(1 - r_2\, B)} - \delta = r - r_1\, (\bar{r} + \vartheta) \cdot B \ . \tag{26}$$

Since the magnitude of the various terms on the left hand side is not known a-priori, one can not conclude as to whether the rate of return to capital should optimally be higher or lower then the direct rate of interest. We note, however, that the left hand side describes the full impact of the marginal investment in the export sector: the direct contribution to export plus the improvement in credit terms induced by higher export $[P_g\, G'\, (1 - r_1\, B)]$ discounted by the total cost of a unit of capital imports (that is, both direct and indirect cost). Equation (26) thus states that the full marginal contribution of investment in the export sector should equal the marginal cost of borrowing.

Setting $\dot{\eta} = 0$ also implies (by equation (19)) that at the steady state the rate of time preference of the economy (ϱ) exceeds the interest rate on external debt, as it needs to equal the marginal cost of borrowing.

From equation (17) with $\dot{\lambda} = 0$, one obtains the familiar "golden rule" of neo-classical models, asserting that at the steady state capital accumulation is maintained at a level such that the net marginal productivity equals the rate of time preference (if labor growth is nil). This rule applies, in the present model, only to the import substituting sector. For the export sector the optimal steady state accumulation law is more complicated and depends on credit-worthiness effects.

Conclusion

By way of summary, the model implies the following set of policies for an economy with private borrowing, investment and production:

(i) Export promotion through a subsidy (of magnitude $-P_g r_1 \cdot B$) to the export sector;

(ii) Tax on capital goods imports (of magnitude $-P_m r_2 B$), which amounts to a policy of import substitution;

(iii) Tax on foreign borrowing by private corporations (of magnitude $r_1 (\vartheta + \bar{r}) B$).

These recommendations are, of course, of a partial nature, due to the simplistic structure of the model. But the paper makes the general argument that development policies should take into account the relationship between economic policies and the supply of foreign funds, and it demonstrates that such considerations require central government intervention in the operation of the market. This conclusion is most relevant for developing economies who depend on commercial international capital markets for a substantial portion of their foreign exchange inflow.

References

[1] *Bardhan*, P. K.: "Optimum Foreign Borrowing", in *K. Shell* (ed.), *Essays on the Theory of Optimal Economic Growth*. Cambridge: MIT Press. 1967. pp. 117 - 128. — [2] *Bose*, S.: "Optimal Growth and Investment Allocation", *Review of Economic Studies*, Vol. 35. October 1968. pp. 465 - 480. — [3] *Brackenridge*, A. B.: "Evaluating Country Credits", *Institutional Investors*. June 1977. pp. 13 - 16. — [4] *Chakravarty*, S.: *Capital and Development Planning*. Cambridge: MIT Press. 1969. — [5] *Clarke*, P.: "Will the Banks and the Fund Make an Example of Turkey?" *Euromoney*. September 1977. pp. 16 - 23. — [6] *Cline*, W. R. and N. P. *Sargan:* "Performance Criteria and Multilateral Aid Allocation". *World Development*. Vol. 3. June 1975. pp. 383 - 391. — [7] *Dasgupta*, P. S.: "Optimum Growth When Capital Is Nontransferable". *Review of Economic Studies*. Vol. 36. January 1969. pp. 145 - 154. — [8] *Feder*, G. and R. E. *Just:* "An Analysis of Credit Terms in the Eurodollar Market". *European Economic Review*. Vol. 9. May 1977 a. pp. 221 - 243. — [9] *Feder*, G. and R. E. *Just:* "A Study of Debt Servicing Capacity Applying Logit Analysis". *Journal of Development Economics*. Vol. 4. March 1977 b. pp. 25 - 39. — [10] *Feder*, G. and U. *Regev:* "International Loans, Direct Foreign Investment, and Optimal Capital Accumulation". *The Economic Record*. Vol. 51. September 1975. pp. 320 - 325. — [11] *Friedman*, I. S.: "Most Eurocurrency Borrowers Remain Good Risks". *Euromoney*. March 1977 a. pp. 16 - 21. —

[12] *Friedman*, I. S.: *The Emerging Role of Private Banks in the Developing World*. New York: Citicorp. 1977. — [13] *Goodman*, S.: "How the Big U.S. Banks Really Evaluate Sovereign Risks". *Euromoney*. February 1977. — [14] *Hamada*, K.: "Economic Growth and Long-Term International Capital Movements". *Yale Economic Essays*. Vol. 6. Spring 1966. pp. 49 - 96. — [15] *Hamada*, K.: "Optimal Capital Accumulation by an Economic Facing an International Capital Market". *Journal of Political Economy*. Vol. 77. July/August 1969. pp. 684 - 697. — [16] *Hanson*, J. A.: "Optimal International Borrowing and Lending". *American Economic Review*. Vol. 64. September 1974. pp. 616 - 630. — [17] *Irvine*, R. J.; Y. *Maroni* and H. F. *Lee:* "How to Borrow Successfully". *Columbia Journal of World Business*. Vol. 5. 1970. pp. 42 - 48. — [18] *Johansen*, L.: "Some Theoretical Properties of a Two-Sector Model of Optimal Growth". *Review of Economic Studies*. Vol. 34. January 1967. pp. 125 - 141. — [19] *Manning*, R.: "Optimal Taxation When Borrowing Alters the Foreign Supply Curve for Capital". *The Economic Record*. Vol. 48. September 1972. pp. 400 - 410. — [20] *McCabe*, J. L. and D. S. *Sibley:* "Optimal Foreign Debt Accumulation With Export Revenue Uncertainty". *International Economic Review*. Vol. 17. October 1976. pp. 675 - 686. — [21] *Mohammed*, A. F. and F. *Saccomanni:* "Short Term Banking and Euro Currency Credits to Developing Countries". *IMF Staff Papers*. Vol. 20. November 1973. pp. 612 - 638. — [22] *Puz*, R.: "How to Find Out When a Sovereign Borrower Slips from A-1 to C-3." *Euromoney*. December 1977. pp. 65 - 68. — [23] *Ryder*, H. E.: "Optimal Accumulation in a Two-Sector Neoclassical Economy with Nonshiftable Capital". *Journal of Political Economy*. Vol. 77. July/August 1969. pp. 665 - 683. — [24] *van Agtmael*, A. W.: "Evaluating the Risks of Lending to Developing Countries". *Euromoney*. April 1976. pp. 16 - 30. — [25] *van Long*, N.: "International Borrowing for Resource Extraction". *International Economic Review*. Vol. 15. February 1974. pp. 168 - 183.

Zusammenfassung

Optimale internationale Schuldenaufnahme Kapitalallokation und Kreditwürdigkeitskontrolle

In diesem Beitrag wird ein Zweisektorenmodell einer wachsenden Wirtschaft einschließlich des Verhältnisses zwischen der Kapazität des Schuldendienstes und den Kreditbedingungen eines Landes entwickelt. Diese Bedingungen werden durch makroökonomische Variablen beeinflußt, wie z. B. durch das Ein- und Ausfuhrvolumen, die Höhe der Devisenreserven, die Höhe der Schuldendienstzahlungen entsprechend der bestehenden Schuld. Die Tatsache, daß Importeure, Exporteure und Hersteller oftmals zu unbedeutend sein können, um die Auswirkungen ihrer Handlungsweisen auf die Kreditbedingungen der Wirtschaft in Rechnung zu stellen, schafft Diskrepanzen zwischen den optimalen privaten und öffentlichen Kreditlösungen. Das Modell kommt daher zu dem Ergebnis, daß optimales Wachstum Exportförderung verlangt, während gleichzeitig sowohl die private Schuldenaufnahme von Auslandsgeldern als auch der Import von Kapitalgütern besteuert wird.

Summary

Optimal International Borrowing, Capital Allocation and Credit-Worthiness Control

The paper develops a two-sector model of a growing economy, incorporating the relation between debt servicing capacity and the terms of credit facing the country. These terms are affected by macro-economic variables such as the volume of imports and exports, the size of foreign exchange reserves and the magnitude of debt service payments due on outstanding debt. The fact that importers, exporters and producers may be too small to take account of the impact their actions have on the economy's terms of credit creates discrepancies between private and public optimal solutions. The model suggests that optimal growth may require export promotion while simultaneously taxing both private borrowing of foreign funds and importation of capital goods.

Résumé

Endettement international optimal, allocation de capital et contrôle de la solvabilité

La présente étude développe un modèle bisectoriel d'économie en expansion, incluant la relation entre la capacité d'endettement et les conditions de crédit d'un pays. Ces conditions sont influencées par des variables macro-économiques telles que le volume des importations et des exportations, le stock des réserves de devises, le montant des paiements du service de la dette correspondant à l'endettement en cours. Le fait que les importateurs, les exportateurs et les producteurs n'ont fréquemment pas la taille requise pour influer par leur manière d'agir sur les conditions du crédit de l'économie provoque des disparités entre les endettements optimaux privé et public. Le modèle conclut que la croissance optimale requiert la promotion des exportations et parallèlement la taxation des emprunts privés en devises étrangères et de l'importation de biens d'investissement.