

The Measurement of The Creditworthiness of Less Developing Countries

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I. INTRODUCTION: THE SIGNIFICANCE AND PURPOSE OF THE STUDY

During the last few years, lending to the less developed countries(LDCs) has been one of the most serious issues facing the international capital markets, because of the rapid increase in the volume of international capital flows to LDCs and the shift in the transfer mechanism from official sources to private commercial banks. The problem of financing LDCs is not new, but the focus of attention has shifted from LDCs' need for foreign credit and access to the international credit to one of the LDCs' ability to fulfill the obligations of existing and future external debts.

Until about 1970, LDCs with limited developmental capital or balance of payments deficits had to rely largely on foreign grants, IMF stand-by credit, suppliers credits, and development loans from official lending agencies of foreign governments as well as international financial institutions. Supplier and trade credit for financing exports from industrial countries was LDCs' major source of private loans until 1970, but much of that money was provided under the umbrella of foreign nations' official credit or insura-

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nce agencies.¹⁾ This was supplemented by some direct bond placements in foreign capital markets. Borrowings of LDCs from foreign bond markets increased from \$612 million for the decade 1956~65, to \$380 million in 1970 alone. This funding was quite limited, however, compared to supplier credits of \$2,297 million and relative to need for \$11.1 billion represented by current account deficits in the same year.

During the 1970s the LDCs' access to commercial banks as well as international bond markets has increased steadily. Especially the worldwide recession and quadrupled oil prices of 1973~74 pushed LDCs' foreign exchange requirements (deficits on current account of balance of payments) far in excess of what they were likely to obtain from their traditional foreign official sources, despite the creation of a significant new official source of financing in the form of the IMF oil facility in 1974~75. While funds from foreign official sources to LDCs have increased consistently in absolute terms, they have been decreasing as a proportion of the total foreign exchange needs of LDCs. Thus LDCs must increasingly rely on commercial banks to meet the remaining financial needs.

According to World Bank statistics on the external debts of 84 developing countries official sources accounted for \$31.7 billion or 62.9 percent of total disbursed outstanding debt, compared with \$18.7 billion from private sources in 1969. By 1975 this amount had changed to \$71.3 billion or 49.7 percent, from official sources and \$72.4 billion from private sources.

Assessing Creditworthiness

The shift in the transfer mechanism of the international capital flow from official sources to private commercial banks, in combination with ever-increasing borrowings of LDCs, has given rise to concerns about "the optimum amount of foreign borrowings," and "How to assess the creditworthiness of LDCs." Unlike the foreign official sources and international financial institutions providing "soft" loans, commercial banks as profit-maximizing entities are concerned more with the risks of lending. In addition, the widespread reports about the economic problems and consequent debt rescheduling of several LDCs which had been major Euromarket borrowers, have intensified the need to establish an appropriate framework for risk analysis.

1) For a detailed study of the development of supplier credits see IMF, "The Use of Commercial Credits by Developing Countries for Financing Imports of Capital Goods," 1968.

Each bank has its own criteria for assessing risk and the debt repayment capability of a country. At present most of the evaluations are based on the qualitative analysis of an index system which uses a number of common indicators such as, debt service ratio and the level of reserves to imports. There are few publicized attempts to devise a reliable statistical method of identifying creditworthiness by either practitioners or scholars.

The purpose of this study is to identify the determinants of a country's creditworthiness. It presents a normative conceptual framework for creditworthiness within which relevant data and forecast can be conveniently analyzed, and attempts to empirically validate that framework.

One reason for lack of a reliable statistical study is that some key elements in assessing creditworthiness, i. e., political stability, willingness to repay, and general economic management and external debt management can be hardly quantified to fit into the statistical model. Thus instead of utilizing statistical methods, bankers rely on first-hand experience and qualitative analysis to develop the composite index techniques of credit rating which do not require the exact quantification of the variables under consideration.

A more important reason for insufficient statistical study is that no single creditor has experience any outright default of repayment by the country borrowing since the 1930s. There have been more than 33 multilateral debt rescheduling cases since 1956, which have provided about \$8.7 billion in debt relief, excluding a number of bilateral reschedulings among individual creditors and debtors and a small multilateral rescheduling for Cambodia. But there has not been a single write-off on creditors' books for economic (balance of payments) reasons. In part this has occurred because governments of LDCs "have been less inclined to renege on commercial debt repayments than they sometimes are to nationalize foreign investments or to stop the repatriation of dividends and private capital, after political coups or in times of economic duress."²⁾

The lack of defaulting makes it impossible to develop a model based on objective historical data. The dependent variable(creditworthiness) in the statistical model cannot be obtained even on an ex post basis. Empirical tests based on actual reschedulings solve the problem of objectivity. They provide information on reschedulings resulting from

2) Antoine W. van Agtmael, "Evaluating the risks of lending to developing countries," *Euromoney* April 1976, p. 16.

short-term liquidity difficulties, and thus indirectly on the possibility of outright default. But they do not answer the question on the outright default or creditworthiness of countries. The approach based on rescheduling does not necessarily measure the creditworthiness of a country, because it deals only with the liquidity problem of the country. Such short-term difficulties indicate a cash-flow problem, but do not necessarily indicate the country's inability to create additional output which is sufficient to cover the cost for input and debt service.

II. MODEL AND METHOD OF THE STUDY

Dependent Variable for Creditworthiness

In this study the loan amounts from the private capital markets, adjusted for differences in external financing demand between countries, will be the dependent variable for creditworthiness. The loan amounts will be divided by the needs for external financing of a country, i. e., $\left(\frac{\text{loan amount}}{\text{needs}}\right)$ so that the dependent variable will become ultimately the creditworthiness index of a country and will have a value ranging between one and zero.

The reason for using the loan amount is that commercial banks lending to LDCs are more likely to differentiate country exposure limits. Brackenridge asserts that "one of the principal reasons for an international bank to evaluate the creditworthiness is to establish exposure limits for individual countries, because the bank wants to distribute the present and potential risk assets of the bank on a country-by-country basis."³⁾

The recent survey⁴⁾ of Association of Reserve City Bankers in March 1977 showed that almost all the member banks utilized formal country exposure reporting procedures, and the majority of responding banks prepared country exposure reports monthly. Only 12 banks (14 percent) with foreign exposure did not prepare country exposure reports on a regular basis. The international assets of these banks were less than 5 percent of their total assets.

3) A. Bruce Brackenridge, "Evaluating Country Credits." *Institutional Investors*, June 1977, p. 13. Brackenridge, senior vice president of Morgan Guaranty Trust Co., was a member of a task force in 1977 to survey the definitions and computational procedures employed by member banks of Association of Reserve City Bankers in quantifying country exposure.

4) Association of Reserve City Bankers, *Country Exposure Measurement and Reporting Practices of Members Bankers*, March 1977.

Commercial banks could discriminate among LDC borrowers by charging them different interest rates. But because of the rationing process to maximize return subject to a risk constraint, discrimination by interest in the commercial lendings to LDCs is not significant nor consistent enough to identify.

This process of rationing makes the country exposure limit, not the interest rate, an important criterion in selecting the loan portfolio in commercial banks. The actual interest rate behavior shows that the difference in the interest spreads between LDCs and developed countries becomes smaller. In addition, the range of spreads among LDCs are so narrow that they can hardly be differentiated. For example, the spreads to LDCs on publicly announced Eurocurrency credits during 1976 ranged only between 1.125 percent and 2.125 percent over LIBOR.

I. Kapur also explains the rationing of Euromarkets as follows.

(a) If they could, lenders would discriminate among borrowers through interest and noninterest elements in the price of loans, (b) under market conditions where perfect discrimination is not possible, for institutional or other reasonings, while the interest and noninterest price of loans will reflect some of the differences in creditworthiness among borrowers, the allocation of loans will be based on a system of quantity rationing.⁵⁾

Estimation of the capital requirements (needs).

The estimate of capital requirements(needs) which will be used as denominator of the dependent variable can be derived by the aggregate investment requirement method and the project-by-project method. The aggregate investment method is based on the Harrod-Domar model,⁶⁾ which assesses the capital requirement based on a target of growth rate, savings ratio, and capital-output ratio. It begins by setting a target rate of income growth which is to be the goal of the country, then estimates the amount of capital to achieve

5) Isham Kapur, "An Analysis of the Supply of Euro-Currency Finance to Developing Countries", *Oxford Bulletin of Economics and Statistics*, August 1977, p.177.

6) In the Harrod-Domar model, the rate of growth is the product of the savings rate and of the capital-output ratio. Under the assumption that there is no substitutability between capital and labor, and that labor is in surplus supply, capital becomes the overriding constraint for the economic developments of LDCs. The Harrod-Domar model is modified later by R. Solow(1956) and J. Meade(1963), who provided for substitution among factors, rather than the fixed proportions assumed by the original model, and by N. Kaldor(1957) who explained it using a technical-progress function related to investment.

that target based on capital-output relationships. This approach has been used in the United Nations studies on the capital requirement estimate of LDCs as the basis of the presentation made to the first and second UNCTAD conferences. On the other hand, the World Bank Group adopted the second method. Instead of using an explicit overall target, they estimate an overall requirement from a multidimensional examination of the economy in question by estimating project-by-project or sector-by-sector requirements.⁷⁾ The aggregate investment requirement method of the Harrod-Domar model is more appropriate for this study because the estimation of capital requirements can be based on the known factors which can be put into quantitative terms.

The concept of the capital-output ratio in the model is the broad concept of incremental capital-output ratio (ICOR) which is "a comparison of the output that could be obtained with or without the added capital, but with other inputs adapted to work most efficiently with the specified added amount of capital, at any given time."⁸⁾ Thus the ratio carries within it all of the factors affecting growth of output; investment, natural resources, technology, the availability of labor, and management skills. The savings ratio is the ratio of national savings (S) which is different from the domestic savings by investment income payments abroad. Target investment (I^*) is the target gross domestic investment.

Based on these concepts, the external financing requirement (R) can be presented in the following formula:

$$R = I^* - S$$

Since $I^* = GDP \times g^* \times ICOR$, or $\left(Y \cdot \frac{\Delta Y}{Y} \cdot \frac{\Delta K}{\Delta Y} \right)$,

$$R = GDP(g^* \times ICOR - s), \text{ or } Y \left(\frac{\Delta Y}{Y} \cdot \frac{\Delta K}{\Delta Y} - s \right) \quad (1)$$

where g^* = target income growth rate

s = national average savings rate

$Y = GDP$

K = capital

In other words, the external financing requirement is a function of level of income, target income growth rate, incremental capital-output ratio, and national savings ratio.

7) See E. K. Hawkins, "Measuring Capital Requirements," *Development and Finance*, June 1968, pp. 2-7.

8) Everett E. Hagen, *The Economics of Development* (revised edition: Homewood, Ill.: Richard D. Irwin, 1975), p. 350.

Level of income, incremental capital-output ratio, and national savings ratio are the known factors for a given country in a given time period. However, unless a country accepts some given national savings rate as optimum and then plan its growth with that savings potential, the income growth target is determined by the external financing availability. The external financing requirement can be regarded as "a missing element required to permit a larger investment than would be possible given the domestic factor availabilities, local infrastructure, and the savings possibilities opened up the policies and level of performance of the government."⁹⁾

If a country cannot obtain financing from external sources, it has satisfy itself by limiting its growth target within the country's savings potential (intrinsic growth rate). Some countries may try to develop their countries within their savings potential. If, however, every LDC wants economic development as rapidly as possible, it will have to borrow externally as much as possible to the extent that it can find an investment project the return on which exceeds the cost of borrowing. In this sense, the target rate will be infinite within the constraints of the absorptive capacity of the country and the availability of the investment projects.

Since the external financing requirement in the model refers to external financing requirements from private sources, the other financing sources which could fill the requirements—foreign direct investment, and, loans from governments and loans from international organizations—will be excluded. As a result, the needs will be modified to be the external financing needed from private sources (RC), and its equation will be as follows:

$$RC = GDP(g^* \cdot ICOR - s - p) \quad (2)$$

where p = the ratio of total amounts financing from the public sources to GDP

How can we correctly measure the target rates for the individual countries? This may not be possible. As an alternative, the same target growth rate can be applied to all LDCs because the same opportunity for development should be given to all the LDCs. The question is what target rate should be applied. Because the assumption of this study is that every LDC wants economic development as rapidly as possible and that rapid development is constrained by whether it can find the investment project which yields more than the

9) E. K. Hawkins, *op. cit.*, p. 6.

cost of borrowing, the target growth rate for this study is assumed the highest actual growth rate of all LDCs during the study periods.

As a result, the external financing requirement from private sources will be calculated as follows:

$$RC = GDP_t(\text{the highest actual growth rate}) \left[\frac{I_{t-1}}{\Delta GDP_t} - S_t - P_t \right] \quad (3)$$

A lag of one year will be taken in the incremental capital-output ratio, because investment does not give rise to an increase in production capacity until the investment has been completed.¹⁰⁾

With a given loan level supplied from private sources, the index value of a country is determined in the following way: If a country has a higher savings rate, the index value will be higher, and vice-versa; the lower the ICOR, the higher the index value, and vice-versa; the higher the portion of financing from other sources, the higher the index value, and vice-versa. The first two relationships are self-explanatory. A country with high savings and a low ICOR¹¹⁾ will have effective access to domestic resources which, in turn, can be reallocated to production competing with exports or imports permitting expansion in exports or a further reduction in imports. This will increase the capacity of the country to service foreign borrowings. The third relationship between the index value and the financing source indicates that, given a level of borrowing from private sources, the country with other financing sources will be more creditworthy compared to the country without them. While a creditworthy country can borrow more from private capital markets, those countries with more diversified financing sources will have flexibility in servicing their obligations from the private sources.¹²⁾

10) In this study, the average incremental capital-output ratio for the study period will be used.

11) A low ratio is desirable over a long period of time insofar as it applies to the entire economy. With regard to a particular project or sector, the ratio depends upon many factors and nothing can be said about its being good or bad. For example, most LDCs prefer labor-intensive industry rather than capital-intensive industry to absorb their abundant labor forces.

12) G. Alter asserts that the target growth rate of per capita income, compared with the rate that can be achieved in the absence of foreign capital inflow, may be put at a higher level, and a larger volume of foreign capital inflow is permitted when:

- (1) the marginal savings ratio is higher;
- (2) the incremental capital-output ratio is lower;
- (3) the rate of population increase is lower;
- (4) the required rate of return on foreign capital inflow is lower;
- (5) the degree of independence of foreign capital that must be achieved within a given time period is lower;
- (6) the time period in which a given degree of independence must be achieved is longer.

See Gerald M. Alter, "The Servicing of Foreign Capital Inflow by Under-developed Countries," in *Economic Development of Latin America*, edited by Howard S. Ellis, New York: St Martin's Press, 1962, p. 149.

Conceptual Framework and Explanatory Variables

Foreign borrowings will be justified to the extent that the marginal product of capital is greater than the marginal interest cost of foreign borrowings. All economic analyses for foreign borrowing such as "cumulative lending hypothesis" (C. Kindleberger, 1973), "foreign borrowing with instability of national income" (P. Bardhan, 1967 and R. Bade, 1972), "foreign borrowing with export revenue uncertainty" (J. McCahe and D. Sibley, 1976), support the optimal foreign borrowing is the point where the marginal product of capital equals the marginal interest cost of foreign borrowings.

Knowing this microeconomic principle, then, how do we assess the debt serving capability of LDCs? An answer for this question can be derived from our practical knowledge of evaluating a firm's creditworthiness. In assessing creditworthiness of a firm, we do not evaluate only its profitability—the capacity to create additional output which is sufficient to cover costs for input, debt service, and taxes. The theoretical optimal borrowing condition for the borrower cannot necessarily be the sufficient condition for lenders, because the historical and anticipated profits alone do not guarantee uninterrupted debt servicing or freedom from cash flow bottlenecks and unpredictable, temporary fluctuations. To determine the cash flow and earnings fluctuations, we must evaluate a country's liquidity, debt structure, and coverage ratios in addition to the valuation to profitability.

This analogy can be applied to LDC loans. In fact, D. Avramovic, et al. (1964) have illustrated what kind of analytical assessment would be helpful to lenders with this kind of analogy. They link the capacity of an LDC to serve its foreign debt with "its performance in output (sales), savings(plough-back of earnings) and developmental return of capital (ratio of profit).¹³⁾

What differentiates the international lending from the domestic is the sovereign risk. The sovereign risk can be divided into two categories: political stability and willingness to pay. The degree of political stability is an important component of creditworthiness because (1) political instability might bring about economic or social discontinuities that would be detrimental to the borrower's economy, and which would, in turn, reduce the capacity to serve debts; (2) political instability might develop forces which would be

13) Dragoslav Avramovic, et al., *Economic Growth and External Debt* (Baltimore, Md.: Johns Hopkins Press, 1964), p. 7.

Table 1. Indicators of Creditworthiness

	Financial analysis for a firm*	Economic analysis for a country
Liquidity	Current ratio = $\frac{\text{current assets}}{\text{current liabilities}}$ Acid-test ratio = $\frac{\text{quick assets}}{\text{current liabilities}}$	(Change in) Debt service ratio = $\frac{\text{debt service}}{\text{exports}}$ Reserves/imports ratio
Debt structure	Total debt/total capitalization or total debt/net worth	Total external outstanding debt/exports
Coverage ratio	The cash flow coverage ratio = $\frac{\text{annual cash flow before interest and taxes}}{\text{interest and principal}}$	Debt service payment/net capital inflow
Profitability	Net profit/total assets or net profit/net worth Net profit or sales per employee	Growth in GDP Per capita income (level of development)
Political stability	Not applicable	General strikes, riots, coups, revolutions, etc.
Willingness to pay	Not applicable	Level of external financing to investment Minimum tolerable level of imports (or level of government revenues to GDP)

* An analysis for a municipal unit's creditworthiness (in measuring municipal bond quality) can be similarly applied.

detrimental to the interest of foreign lenders, such as repudiation of debt or prevention of foreign currency transfer; (3) the international lenders might not be totally familiar with the political and economic systems of the borrowing country and this unfamiliarity would increase the discount factor of risk.

In international lending, commercial bankers emphasize the importance of a country's willingness to repay. Even when the individual projects are economically feasible enough to permit borrowers to repay their obligations, the government of the country could prevent the borrower from complying with its obligations. Unlike domestic credit, foreign lenders have no resort when a country is not willing to pay its obligations. In fact, the immediate cause for a number of defaults in Eastern Europe during the 1930s was the inability to transfer funds rather than the borrowers' inability to repay their obligations. Many defaults on Latin American obligations in the 1930s were governmental defaults as a consequence of the decrease in government revenues. "The unwillingness of govern-

ments to reduce their total expenditures by the amount of the shrinkage of revenues helped prevent a decline of national income proportional to the fall in foreign exchange earnings; and this in turn led to restriction on the convertability of their currencies."¹⁴⁾

On the other hand, if a country is willing to pay, "a strong government may be able to squeeze domestic consumption to such an extent that debt service poses no problem even if the foreign funds wind up on investments that do not create sufficient additional output."¹⁵⁾ Thus political consideration and willingness to pay are important parameters in the international lendings.

This study measures this political stability, using an index of political instability (stability) which was developed based on the available scalogram analysis of political instability.¹⁶⁾ The operational definition of political instability is the irregular political actions which the law of the country does not forbid. These actions differ depending upon the political structure of the country. For example, a certain demonstration which is an irregular political action in one country may be allowed in other countries as a regular political action. Nonetheless the following actions are considered to be political irregularities representing political instability: demonstrations, strikes, riots, politically motivated assassinations, coup d'etat, revolts, guerrillas, civil wars and revolutions.¹⁷⁾

In this study the measure of political instability developed by I. Feierabend and R. Feierabend (1969, 1973) is used, because the validity of scaling has been confirmed by

14) Raymond F. Mikesell, "The Capacity to Service Foreign Investment," in *U.S. Private and Government Investment Abroad*, edited by R. F. Mikesell (Eugene: University of Oregon, 1962), p. 378.

15) Gunter Dufey and Sangkee Min, *The Access of Developing Countries to International Credit*, Working Paper #148, Graduate School of Business Administration, The University of Michigan, p. 24.

16) There are many ways to ascertain the political stability of a country through the use of cross-national data. Among them, two methods are most frequently used: factor analysis and scalogram analysis. The factor analysis involves "the identification of several dimensions (factors) of conflict behavior--that is, clusters of violent events that frequently occur together but are unrelated to such clusters." Scalogram analysis develops "several scaling instruments of irregular political events ranging from simple consensual and construct validity scales to more complicated ones, such as the Guttman scalogram." See Ivo K. Feierabend, et al., "The Comparative Study of Revolution Violence, *Comparative Politics*, pp. 393-424.

17) See Betty A. Nesvold, "Scalogram Analysis of Political Violence," *Comparative Political Studies*, July 1969, pp. 172-194, and I. Feierabend, et al., op. cit., p. 396. B. Nesvold (1969) used a four position scale and I. Feierabend, et al. (1973) used a seven position scale. Despite the difference in total number of scale positions, the pattern of scaling in both cases is similar except for riots. Nesvold also was a participant in the study by Feierabend.

Guttman scaling and consensual validation techniques which ask judges to sort the same events along the same continuum. In this measure the intensity of irregular events as well as the frequency of their occurrence are taken into account, because these irregular events have different impacts on political stability. Their measure is a seven-point scale of political stability, ranging from zero to six. Each point of the scale is observantly defined differing degrees of stability. The scale is as follows:

	<u>scale position(weight)</u>
general elections	0
dismissals or resignations of officeholders	1
strikes and demonstrations	2
riots and assassinations	3
large-scale arrests and imprisonments	4
revolts and coup d'etat	5
guerrilla and civil wars and revolutions	6

The highest numbered positions represent the more serious irregular events.

Based on these scale positions, a three-digit political instability index score is calculated for each nation which ranges from 0 to 699. The first digit represents the scale position attached to the most irregular event occurring within the country over the time period being considered. Thus the countries with the same most irregular event are assigned to the same first digit group. The remaining two digits represent the sum of the weights (up to 99) assigned to each of the irregular events occurring within the country over the time period. These digits determine a country's relative position within the first digit group. The last two digits are measured in the following way:

$$PI = X_i \cdot W_j$$

where PI_i = index of political instability (stability) of a country;

X_i = number of irregular events of a country;

W = weights of the irregular events

The number of irregular political events will be the sum of the last five years.

This study measures willingness to pay, using the proxy variable of level of external financing to investment. To be creditworthy, it is necessary for a country to channel its foreign borrowings into profitable investments. But the country also should have a

capacity to reconcile the competing claims on total resources, savings, and foreign exchange resources. Otherwise, the country would allow the public and private consumption to rise at a rate that exceeds the growth of additional output.¹⁸⁾ Under what conditions, then, will a country be able to develop a margin for debt service substantial enough to fulfill debt servicing without interruptions? The country's political and economic structures and ability to enhance governmental efficiency in utilizing resources for national goals are important factors in the answer. Specifically, a strong government supported by general consensus may be able to squeeze domestic consumption more efficiently. A country which imports more compressible goods and services, such as the non-necessary consumption goods, may have leeway to cut imports in times of foreign exchange shortage without having a serious impact on the economy.¹⁹⁾ But willingness to pay will be ultimately determined by future borrowings. If a country continues to borrow externally, it cannot repudiate its previous borrowings, which will precipitate a sudden fall in the creditworthiness of the country. This will, in turn, greatly diminish the country's future access to private capital markets as well as to international financing organizations. Thus in this study the proxy for willingness to pay will be the future anticipated borrowings. Since we cannot exactly quantify the future borrowings, the country's borrowing trends will be used as proxy. The trend will be based on the percentage change over the last three years in borrowings from the private capital markets as well as the international financing organization.

In summary, creditworthiness of LDCs can be measured in terms of growth, level of development, liquidity, debt structure, coverage ratio, political stability, and willingness to pay:

$$CW_i = f(GI_i, GE_i, I_i, DSR_i, RI_i, D_i, C_i, P_i, W_i) \quad (4)$$

where,

CW = creditworthiness of an individual country proxied by $\frac{\text{loans supplied}}{\text{needs}}$. The loan

amounts supplied is the annual commitments by the private financial markets.

GI = average annual rate of growth in per capita income over the last four years

GE = average annual rate of growth in exports over the last four years

DSR = expected change in debt service ratio $\frac{DSR_{t+2} - DSR_{t-1}}{DSR_{t-1}}$

18) G. Dufey and S. Min, op. cit., p.24.

19) One common quantitative measure of willingness to pay of a municipal unit to pay its debt obligations (in measuring municipal bond quality)

RI =ratio of reserves to imports for the year T-1

D =total outstanding debt to exports for the year T-1

C =coverage ratio represented by the ratio of debt service payments to net capital inflow for the year T-1

P =political stability index proxied by the product of the number of occurrences of irregular political events and the weights thereon over the previous five years (Feierabend & Feierabend political instability index)

W=willingness to pay proxied by the percentage change in borrowings in last three years from the private capital markets and the international organizations

III. EMPIRICAL EVIDENCE

The function hypothesized in equation (4) was tested by cross-section regression analysis on the data of the 33 LDCs which had borrowed from commercial financing sources during the period 1971~1975. The countries included most of the LDCs listed in the World Debt Tables: External Public Debt of Developing Countries. For these countries, total debt outstanding from private financial markets was \$26.5 billion as of 1975, or 72.6 percent of LDC's total financing. The test excluded: (a) the oil exporting countries such as Iran, Iraq, Venezuela, Ecuador, Indonesia, Syria, and Trinidad and Tobago; (b) small and/or recently independent countries such as Benin, Botswana, Burundi, Cameroon, and Chad; and, (c) communist countries such as Yugoslavia and the Peoples' Republic of Congo.

Creditworthiness Index (Dependent Variable)

The dependent variable in the regression was the creditworthiness index developed from the Harrod-Domar model, as explained in the previous chapter. The index was the product of the loan amounts supplied from the commercial financing sources, divided by the external financing requirements. Its value ranged between one and zero:

As discussed in the previous chapter, the index values changed depending upon target income growth rate, g^* , so selection of the applicable target rate was important. Using heuristic procedures, we determined the target growth rate to be 18 percent. When the target growth rate of 16 percent was applied, some of the index values were negative;

when the target growth rate of 17 percent was applied, the maximum index value was 1.296, which was beyond the hypothesized maximum index value, 1.0 (see Table 2). Thus any target growth rate above 18 percent could be applied for the creditworthiness index.

Table 2. Descriptive Measure of Creditworthiness Index with Various Target Growth Rates

Target Growth Rate (percentage)	Index Values			
	Minimum	Maximum	Mean	Std. Dev.
21	.0003	.2017	.0377	.0426
20	.0003	.2197	.0415	.0477
19	.0004	.2514	.0465	.0553
18	.0004	.4146	.0537	.0696
17	.0004	1.2955	.0705	.1365
16	-1.1515	2.1903	.0712	.2418

For this study, the index based on 18 percent growth rate was chosen. (The stability of the model depending upon the index values will be mentioned later in this chapter.) Because the index values vary according to the target growth rate applied, importance should be given to the relative value, rather than the absolute value of the indices.

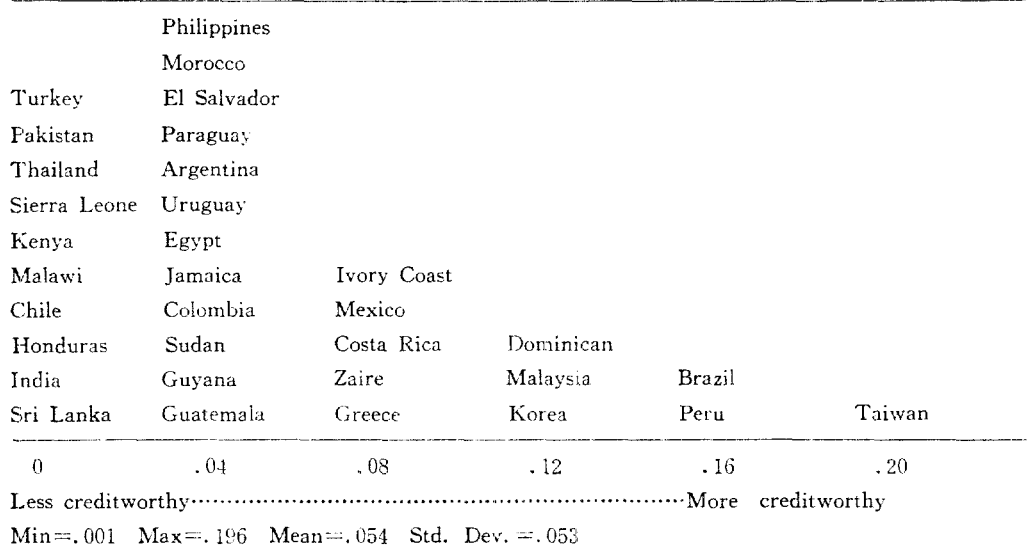


Figure 1. Frequency Distribution of Countries in Terms of Their Degree of Relative Creditworthiness, 1971-1975

Frequency distribution of countries in terms of their degree of relative creditworthiness is presented in Figure 1. The distribution is skewed. Lower index values are more prevalent than higher within the sample of countries, and the majority of countries are classified under the lower creditworthiness indices. The distribution is not surprising since most LDCs probably have limited access to the private financing sources, thus the numerator of the index (the amounts supplied) would be very low compared to the denominator (the financing requirements).

Determinants of Creditworthiness

Since 1973 was the latest year for which data on the political stability variable was available, two stages of analysis were performed: (1) estimation without the political stability variable for the period 1971-1975; (2) estimation with the political stability variable for the period 1971-1974.

Estimation Without the Political Stability Variable

Least square multiple regressions of the equation without the political stability variable were performed on yearly data for the period 1971-1975. Yearly data were used because, based on the country exposure reporting procedures, although the majority of commercial banks set country limits on a quarterly basis, consistent available data for analysis are available on a yearly basis. In addition, the loan amounts used in the creditworthiness index are yearly commitments by the private financial markets.

The regression yielded the following results:

$$\begin{aligned}
 CW = & -2.861 + 0.267GI + 0.00001I - 2,867DSR - 0.031RI - 0.00001D \\
 & (-2.061) (10.284)* (1.299) (-2.056)* (-1.143) (-2.350)* \\
 & -0.0004C + 0.00007W \qquad \qquad \qquad (5) \\
 & (-0.811) (0.928)
 \end{aligned}$$

$$R^2 = 0.471 \quad S. E. E. = 0.052$$

*statistically significant at the .05 level

The signs of all coefficients except the reserves/imports ratio were as expected. The sign of coefficient of the reserves/imports ratio was negatively related with the creditworthiness index, while the ratio was not statistically significant even at .2 level. The estimates of the coefficients were significant at the .05 level for three variables: GDP

growth, change in debt service ratio, and debt/exports ratio. The coefficient of determination, R^2 , was good for a cross-section regression of this size which did not have any trend variables; diagnostic checking did not reveal any systematic pattern underlying the generated residuals.

The average growth rate of real GDP and per capita income were positively related to the creditworthiness index. The growth of real GDP was absolutely significant at all levels, while the per capita income was statistically significant only at the .20 level. This confirms that the present stage of economic development is an important short term consideration in determining the creditworthiness of a country, but for the long run, the growth of GDP is the only important factor in the creditworthiness of a country.

Both liquidity ratios, the debt service ratio and the reserves/imports ratio in the previous year were not statistically significant, suggesting that such single point indicators of a country's liquidity position were not as important as changing trends over a period of time. In fact, contrary to the theoretical argument, the debt service ratio in the year $t-1$ was positively related to the creditworthiness index, and the reserves/imports ratio was negatively related. This outcome of the debt service ratio can be explained, however, because the country with greater creditworthiness could borrow a relatively higher amount of external debt so that the service requirements in the following years could become higher compared to the export income.

The change in the expected debt service ratio $\left(\frac{DSR_{t+2}-DSR_{t-1}}{DSR_{t-1}}\right)$ was defined as an expected change in the debt service ratio between periods $t-1$ and $t+2$. The data on debt service in period $t+2$ were readily available from the *World Bank's World Debt Tables* and were based on debt disbursed and outstanding in period t . The average annual rate of growth of exports during the three years prior to t was used to project exports in periods $t+1$ and $t+2$. The coefficient for the change in expected debt service ratio was negatively related to the creditworthiness index, indicating that the absolute level of the debt service ratio at any point in time was important largely in relation to possible future changes in that ratio. The result of the reserves/imports ratio was surprising because the

20) The result of the estimation without the reserve/import ratio variable was as follows:
 CW = -2.6666 + 0.261 GI + 0.00001 I - 2.665 DSR - 0.00001 D - 0.0004 C + 0.00008 W
 (-1.936) (10.244)* (1.222) (-1.925)* (-2.377)* (-0.767) (1.021)
 $R^2 = 0.466$ S. E. E. = 0.052

* Statistically significant at the .05 level.

sign of its coefficient was not as expected, even though the coefficient was not statistically significant.²⁰⁾ This result has two possible explanations: bankers who made decisions on country exposure limits did not care about the reserves/imports ratio, or the analysis might have some sort of statistical problem. The latter explanation is less likely because, there was no significant multicollinearity between the reserves/imports ratio and other explanatory variables, and the specification of the variable itself followed those used by practitioners and academicians.

The coefficient of the debt/exports ratio was negatively related to the creditworthiness and was significant at the .05 level. When the debt/GDP ratio was applied in the regression instead of the debt/exports ratio, it was positively related to the creditworthiness index. The creditworthy countries would have greater access to the external capital markets so that their debt/GDP ratios would become higher than those of less creditworthy countries. This result confirms that the high ratio of debt/GDP is not always a serious indication of creditworthiness without analyzing the use of the funds borrowed externally. In addition, for the analysis of debt structure or long-term liquidity, debt/exports is a more relevant indicator than debt/GDP ratio.

Although the coverage ratio was, as expected, negatively related to the creditworthiness index, it was not statistically significant. This may indicate that the coverage ratio for balance-of-payments has little meaning because, unlike the profit in the company, the net value added in the economy is not reflected in the balance-of-payments. In addition, any countries wanting to develop beyond their domestic resources, should import more goods and services, but this deficit in trade would be neutralized by a surplus in one of the capital accounts.

The willingness-to-pay variable was positively related to the creditworthiness index, but it was statistically significant only at the .25 level. It was proxied by the percentage change over the last three years in borrowings from the private capital markets as well as the international financing organizations. An alternative measure of willingness to pay was the ratio of the government revenue to GDP. It was negatively related to the creditworthiness index,²¹⁾ and was statistically significant at the .05 level. It also suggests that countries with lower ratios have more leeway to cut private consumption in times of foreign exchange shortage in order to appear more creditworthy.

To compare the difference in the contributions of respective variables in explaining

creditworthiness, a stepwise(forward) regression was run. GDP growth was included in the first step. GDP growth alone explained 42 percent of the variations in credit worthiness. Debt/exports, change in debt service ratio, the ratio of government revenue to GDP, and per capita income were added but were not very significant in improving R². In other words, at the .20 level all the variables for growth, debt structure, liquidity, willingness to pay, and level of development(except for coverage) were statistically significant, but not as important as the variables for growth.

Estimation With Political Stability Variable

Least square multiple regressions of equation (4) including the political stability variable was performed on yearly data for the period 1971-1974. The political stability variable was adopted from the available scalogram index of political instability developed by I. Feierabend and R. Feierabend(1969, 1973).

The average political stability indices of the 33 countries included in this study are shown in Figure 2. About half of the countries fell into the least stable position. (The 6

					Argentina
					Philippines
					Chile
					Brazil
					Sudan
					Pakistan
					Guatemala
					Uruguay
					Greece
					Dominican
					Malaysia
			Ivory Coast		Thailand
Costa Rica			Taiwan	Mexico	Colombia
El Salvador	Kenya		Egypt	Sri Lanka	Turkey
Jamaica	Peru		Morocco	Honduras	Korea
Malawi	Guyana		Paraguay	Sierra Leone	Zaire
1	2	3	4	5	6
Min=50.5	Max=699		Mean=515	Std. Dev. =191	

Figure 2. Frequency Distribution of Countries by Relative Political Stability, 1968--1973

position included at least one incidence of guerrilla or civil war.)²¹⁾ The regression yielded the following results:

$$\begin{aligned}
 CW = & -3.368 + 0.297GI + 0.00002I - 3.375DSR - 0.387RI - 0.00001D - 0.00002C + \\
 & (-1.962)(10.535)* (1.498) (-1.953)*(-1.289) (-1.828) (-1.284) \\
 & + 0.00007W - 0.0002P \\
 & (0.934) (0.871) \\
 R^2 = & 0.528 \quad S. E. E. = 0.052
 \end{aligned}$$

* Significant at the .05 level

The signs of all coefficients except the reserves/imports ratio in multiple regression were as theoretically expected. The coefficient for political instability was negatively related to creditworthiness as expected. The higher the political instability index, the lower the creditworthiness. However, the introduction of the political instability variable improved the R^2 to only a very limited extent. The coefficient was statistically insignificant at the .20 level. In addition, the size of the coefficient did not indicate any strong relationship between the creditworthiness of a country and its political stability.

The result can be interpreted so that the assessment of a country's political stability is important for creditworthiness to the extent of our *a priori* knowledge that bankers assign considerable weight to what they consider to be a politically stable government, but only as a subjective evaluation. If one could make the quantitative assessment, any quantification similar to the Feierabend and Feierabend method used for this study could not be the sole measure for assessing political stability, because any one measure of political stability could hardly capture the complex web of political relationships.

Stability of Model

Stability of the model was determined through three different exercises: (1) a test of stability of the creditworthiness index, (2) a test using yearly data, and (3) a test using average values of yearly data.

As mentioned before, the index value of creditworthiness in the model changes depending

21) Feierabend and Feierabend(1966) tested a sample of 84 nations for the seven-year period 1955-1961. The test results showed that "the distribution is skewed. Instability is more prevalent than stability within the sample of nations, and the largest proportion of countries are those experiencing an instability event with a scale weighting of 4."

upon the target growth rate, g^* . The higher the target growth rates, the lower the values of indices for the countries which borrowed less from the private capital markets. If the estimation results differ depending upon the different target rates, the use of the model using this creditworthiness index will be limited. Thus we should test the stability of the model for the different target growth rates.

Four different index values based on different target growth rates were taken as dependent variables in the regressions. Although there were some variations, the result of any one regression was not substantially different from those of other regressions. All the signs of the coefficients were the same; the statistical significance of coefficients changed to the limited extent; the R^2 's decreased somewhat as the target growth rates increased, but not extremely. For example, the R^2 decreased from 0.471 in the estimation using an 18 percent target growth rate to 0.380 of the estimation using a 21 percent target growth rate for 1971~1975 data without political stability data. For 1971~1975 data with political stability data, R^2 decreased from 0.528 to 0.429. One possible explanation of the R^2 variations is that the data are somewhat heteroscedastic, almost all the indices have variances that increase with values.

The second exercise regressed the model to the yearly data from 1971 to 1975. While there were some variations in R^2 's and the significance of the coefficients, the results were basically the same.

The third exercise regressed the model to the average values of yearly data to remove possible serial correlations. Any data including time series observations may have some serial correlation among the regression residuals. The data for this study were partially in time series with five-year observations of 33 countries. But since all the variables in the model were either ratios or per capita data, the trend influence would be eliminated²². For the pooling of cross-sectional and time series data, there is no available method (like the Durbin-Watson test) to measure the existence of serial correlations in the unexplained variations from an equation fitted by the least-square method. Thus, to determine the absence of trend influence, one-time horizon (1975~1971) observations of each country

22) Some methods suggested to correct serial correlations are: (a) correlation of first differential, (b) correlation of cycles, (c) correlation of per capita data, (d) time as separate independent variables. See Dick A. Leabo, *Business Statistics* (Homewood, Ill.: Irwin, 1972), p.445--50.

were regressed. The one-time horizon observations obtained were to be the average values for the five-year period (e. g., $\bar{D} = \left(\frac{\text{Debt Outstanding } 1974 \sim 1970}{\text{Exports } 1974 \sim 1970} \right)$) The results are as follows:

(For the period 1971~1975 without the political stability variable)

$$\begin{aligned}
 CW = & -1.676 + 0.218 \text{ GI} + 0.00002 \text{ I} - 1.657 \text{ DSR} - 0.063 \text{ RI} - 0.000001 \text{ D} - 0.0021 \text{ C} \\
 & (-0.882)(5.042)^* \quad (1.266) \quad (-0.864) \quad (-1.390) \quad (-0.057) \quad (-0.372) \\
 & + 0.016 \text{ W} \\
 & (3.065)^*
 \end{aligned} \tag{8}$$

$$R^2 = .654 \quad \text{S. E. E.} = 0.0297$$

*Significant at the .50 level

(For the period 1971~1974 with the political stability variable)

$$\begin{aligned}
 CW = & -3.418 + 0.265 \text{ GI} + 0.00001 \text{ I} - 3.417 \text{ DSR} - 0.071 \text{ RI} \\
 & (-1.159) (5.586)^* \quad (0.720) \quad (-1.149) \quad (-1.531) \\
 & - 0.0000002 \text{ D} - 0.0049 \text{ C} + 0.010 \text{ W} - 0.000018 \\
 & (-0.023) \quad (-0.771) \quad (2.306)^* \quad (-0.437) \\
 R^2 = & 0.667 \quad \text{S. E. E.} = 0.0356
 \end{aligned} \tag{9}$$

Compared to the estimation (5), the results were not significantly different. In the estimation (5) three variables, GDP growth, change in debt service ratio, and debt/export were significant at the 0.05 level, but two variables, GDP growth and willingness to pay were significant while the signs of all coefficients remained the same. The R^2 's have improved because of the reduction in yearly variations of the residuals.

From the above three exercises, we can assume that the model used in this study is stable within the appropriate target growth rates, and there is no significant variation in estimations on year-by-year data.

IV. CONCLUSIONS

The primary purpose of this study was to identify empirically the determinants of a country's creditworthiness, using a normative conceptual framework for creditworthiness.

The importance of this finding is its reconfirmation that, from a long-run point of view, foreign borrowing is justified only to the extent that the marginal product of capital is greater than the marginal interest cost of foreign borrowings. For consistent growth in GDP to materialize, public and private consumption should not be allowed to

rise at a rate that exceeds the growth in GDP and the savings out of newly generated income must be sufficient to enable the economy to finance an increasing proportion of its own investment requirements out of domestic resources. In previous studies based on the reschedulings, growth in GDP was not considered an important determinant of the creditworthiness of a country, because these studies dealt only with the liquidity problem of rescheduled countries, but not with the "profitability" issue.

Limitations of the Study

This study has developed creditworthiness indices of LDCs based on the actual loan amounts from the private capital markets and has proceeded to analyze the determinants of creditworthiness within a normative conceptual framework. However, the application of this study to the general explanation of a country's creditworthiness is partially limited by two assumptions made in the study: (1) the target income growth rate used for the creditworthiness index is constant to all countries and time periods. (2) Commercial banks ration their loans to LDCs based on past patterns of economic and political behavior.

The first assumption was based on the argument that every LDC wants economic development as rapidly as possible, and that rapid development is constrained by whether the country can find an investment project which yields more than the cost of borrowing. In this sense, the target growth rate will be infinite within the constraints of the absorptive capacity of the country and the availability of the investment projects. The actual target growth rates of all LDCs have already reflected those constraints, and those cannot be the unconstrained (desired) target growth rates. Thus, to compare objectively the creditworthiness of countries, the limitation on the absorptive capacity and the availability of investment projects to each country should not be considered. Under these circumstances, the same target for income growth should be applied equally to every country. One question to be answered in this assumption is which particular target rate should be applied.

A counter-argument for this assumption would be that there are different desired target rates for different countries. Even though the absorptive capacity and the availability of the investment projects are unlimited, countries may not try to develop as fast as possible. Most countries try to harmonize their rapid economic development with their

economic and political stability. A practical problem of this argument is that there is no way to determine the unconstrained desired target growth rate for each country.

On the issue of which one particular target growth rate should be applied, the first assumption was justified in this study by a test of stability of the creditworthiness index values based on different target growth rates. The test shows that the result of any one regression using a certain target growth rate was not substantially different from those of other regressions using different target growth rates.

The second assumption in this study was that the rationing of loans to LDCs by the commercial banks are based on the past pattern of economic and political behavior. Many say that lending is an art and not a science. Bankers have to take into account not only what was the growth in GDP, but also what is likely to be in the future. First-hand experience and qualitative analysis are included in the evaluation; bankers will evaluate the competence of the present administrators of the country and may visualize how the country will react on debt service difficulties, if any. These arguments are reasonable and acceptable, but this shortcoming of the second assumption can exist in any econometric model based on the ex post data.

Notwithstanding the limitations arising from the two assumptions, this study has answered many important questions about evaluating the creditworthiness of countries. It has developed for the first time an objective creditworthiness index, it has provide a conceptual framework within which relevant data and forecast can be conveniently analyzed, and it has assigned weights (or importance) to the relevant indicators of creditworthiness using statistical methods rather than subjective judgments.

Hopefully, this study will facilitate the understanding of the subjective evaluation of the creditworthiness of a country, and will provide public and private policymakers with parameters within which to formulate better external borrowing or lending strategies.