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A STUDY OF DEBT SERVICING CAPACITY APPLYING LOGIT ANALYSIS

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Giannini Foundation of Agricultural Economics
August 1976

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Working Paper No. 7

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Abstract

This paper empirically investigates the importance of various economic factors in determining debt servicing capacity of borrowing countries. The paper builds on earlier work by Frank and Cline (1971) and Dhonte (1975) who tried to identify empirically the more important factors. Using logit analysis and significance tests, this paper suggests several factors which are important determinants of default probabilities. These findings are consistent with the descriptive literature on international borrowing. The estimates for predictive ability of the model are checked with alternative data and confirm a relatively low rate of error (around 4 percent).

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A STUDY OF DEBT SERVICING CAPACITY APPLYING LOGIT ANALYSIS

Debt servicing capacity of borrowing countries is undoubtedly a subject of interest and concern for international lending organizations and institutions. But quantitative knowledge of the importance of determinants of debt servicing capacity is also useful for borrowing countries in formulating policies which affect their determinants and thus their credit availability and default probability. As in the case of private loans to individuals, lenders consider the possibility that the borrower will fail to repay all agreed principal and interest depending on his ability to honor financial obligations; and interest rates are supposedly determined accordingly. At the international level, much discussion has focused on determining the economic variables which should be considered in making projections regarding the development of the borrower's performance [e.g., Alter (1961), Finch (1951), Mikesell (1962), Gulhati (1967), and Bittermann (1973)]. But most of this work has provided only verbal arguments for considering one variable or another. Only the studies by Frank and Cline (1971) and, to a lesser degree, Dhonte (1975) represent an attempt to quantify the importance of various potential factors suggested in other studies.

Dhonte has used principal component analysis to investigate the relations among several economic variables which are considered to be relevant for debt servicing capacity. No formal testing procedure, however, is employed for the purpose of selecting these variables.

Frank and Cline, on the other hand, investigated the quantitative importance of indicators in determining default probability using discriminant analysis to identify each observation as belonging to one of

two possible populations: default or nondefault. Their results indicate that the debt-service ratio, the debt-amortization ratio, and the ratio of imports to reserves are important determinants of debt servicing capacity.[1]

The present study is an attempt to improve upon the methods offered by previous studies for analyzing debt servicing capacity. Logit analysis is used instead of discriminant analysis because it is a method specifically developed to deal with the binary-valued, dependent-variable case. While discriminant analysis assumes two completely different populations, the logit approach assumes a discrete "event" takes place after the combined effect of certain economic variables reaches some threshold level. The latter approach is especially suitable when several observations (of both default and nondefault years) for a given country are included. That is, it makes more sense to claim that, in a specific period, the country was pushed beyond a critical level leading it to a rescheduling than to claim that the country suddenly became a member of another species. In addition, more appropriate statistical tests can be performed to determine the relevance of various economic indicators of debt servicing capacity. The predictive performance of the estimates is quite good within the sample period as there are only 6 to 11 errors (in predicting default or nondefault) with 238 observations.[2] The results also allow some interesting estimates of the probability of default (rescheduling) for debtor countries given their current economic status.

1. Indicators of debt servicing capacity

Nine economic indicators of debt servicing capacity are used in the analysis but, to facilitate a brief discussion of them, seven are

defined the same as in the Frank and Cline study. The two additional indicators used in this study are capital inflows and growth of per capita domestic product. The measure of noncompressible imports used in the previous study, however, is not included because the data for calculating it were not comparable among countries for all of the years used and because theoretical arguments have been developed which qualify this indicator. The usual argument is that imports of various consumption goods, which are not vital necessities, can be curtailed temporarily so as to increase availability of foreign exchange for debt servicing purposes. The assessment of this factor thus requires detailed data on import composition patterns. Moreover, there may be raw materials and intermediate goods that are imported for production of domestic nonessential goods which can be reduced; but separation of these from other intermediate goods is usually impossible. Furthermore, the possibilities for reducing imports may depend heavily on a government's internal political status rather than on the economic importance of import items. Thus, it seems that the notion of compressible imports may be of little empirical use until a reasonable approach for including political status is developed.[3]

Following the classification suggested by Avramovic et al. (1964, p. 13), a number of variables are apparent that affect debt servicing capacity in the short run. These variables focus mainly on components of the balance of payments which reflect a country's short-run transfer problems. The first variable considered is the debt-service ratio, i.e., the ratio of debt service to exports. As indicated by Bittermann (1973), the debt-service ratio is one of the most common rules of thumb for credit-worthiness evaluation. Supposedly, a high ratio (indicating a

heavy burden on the country's resources) is related to a higher risk of default. Since debt service is a fixed obligation, any shortfall in foreign exchange earnings must be offset by exchange reserves or export reductions.

As a balance against fluctuations, which are caused by factors beyond the control of the economy, one may consider flexible elements in the balance of payments that are controlled by the government within some limits. Foreign exchange reserves, for instance, serve as a buffer against exchange earnings fluctuations. In order to have comparable measures among countries, it is common to consider a reserve/imports ratio (or an imports/reserve ratio). With a larger ratio of imports to reserves, one expects lower debt servicing capacity.

Another variable suggested by Frank and Cline is the average maturity of debt (measured as the ratio of outstanding debt to current amortization).[4] Their argument is that a predominantly long-term debt implies that debt service burden cannot be alleviated in the short run by reducing the amount of borrowing.

It has also been suggested by Irvine et al. (1970) that capital inflows should be taken into account in the short run. Capital flows--in the form of loans, grants, direct investments, and transfer payments--are an important source of foreign exchange receipts which can be used for debt service. Hence, higher capital inflows should be associated with lower default probabilities. To include capital inflows, one may define a ratio analogous to the debt-service ratio--i.e., the ratio of debt service payments to capital inflows[5]--or combine the two in a "modified debt service ratio" where the denominator is the total of foreign exchange earnings.

Given the difficulty of calculating a reasonable measure of compressible imports and the need to have some measure of dependency on imports, another possible variable is the ratio of imports to Gross National Product (GNP). In many developing countries (especially those which have undergone an extensive process of import substitution like many Latin American countries), a substantial part of imports is capital and intermediate goods. Thus, the share of imports in GNP reflects a degree of rigidity since a substantial cut in imports implies a considerable level of unemployment. Even if mostly nonessential industries are affected, unemployment is still a cost not easily accepted. Therefore, it seems that a higher import/GNP ratio would lead to higher probability of default in the short run.

Turning to a somewhat longer time horizon, the growth of the export sector is considered to be an important element in debt servicing capacity since, if the economy is not stagnating, its imports expenditures (and, very likely, its debt service obligations) are bound to increase. A growth of exports is thus necessary for countering these developments [see Mikesell (p. 385)]. Presumably, a country with a high rate of export growth is less likely to default or ask for rescheduling than otherwise.

A related variable can also affect the risk of default in export fluctuations. Higher export fluctuations should generally be associated with higher probabilities of a balance-of-payments crisis and, hence, higher default probabilities. For example, a country exporting primarily agricultural commodities subject to periodical crop failures may be regarded as having a lower debt servicing capacity, ceteris paribus. Alter has suggested that export fluctuations should be calculated around a rising trend since export growth is a desirable indicator. Since Frank

and Cline have used such a measure of deviation from a rising trend, a similar approach is also taken here for comparability (a high value of the index indicates instability and thus higher risks).

In the long run, it has been argued that perhaps one of the most important factors affecting debt servicing capacity is the growth of per capita domestic product.[6] The underlying assumption is that the limiting factor in the long run is the savings gap. Increased per capita output provides additional resources for both debt service and increased consumption. It is usually assumed that the process of growth is such that export capacity is increased both through expansion of the traditional exports sector and by developing new industries producing for export or producing marketable goods which can be redirected into export channels. Hence, one would expect an improving debt servicing capacity and a declining probability of default.

An additional factor which may affect either short-run or long-run debt servicing capacity is the level of per capita income. The argument here is that a higher level of income implies higher levels of nonessential consumption (both private and public). This allows the government more flexibility in terms of releasing resources for debt-service payments and, hence, a lower probability of default.

2. Logit analysis of debt servicing capacity

The underlying logit model of the present study assumes that the probability of default (P) is related to the vector of economic indicators (X) by the functional relationship,

$$P(X) = \frac{\exp(\beta'X)}{1 + \exp(\beta'X)}, \qquad (1)$$

where β is a vector of fixed coefficients. Although the left-hand side of (1) cannot be observed, one can define a random variable Y such that $Y = 1$ if a default takes place and $Y = 0$ otherwise. It must then hold that

$$\Pr(Y = 0 \mid X = X_i) = [1 + \exp(\beta' X_i)]^{-1}$$

$$\Pr(Y = 1 \mid X = X_i) = \frac{\exp(\beta' X_i)}{1 + \exp(\beta' X_i)} \tag{2}$$

where X_i is the vector of economic indicators for observation i, $i = 1, 2, \ldots, n$. The likelihood function L is thus

$$L = \frac{\prod_{i=1}^{n} \exp(\beta' X_i Y_i)}{\prod_{i=1}^{n} [1 + \exp(\beta' X_i)]} \tag{3}$$

where Y_i is assigned the value 1 for observations on default and zero otherwise [see Cox (1970) for a detailed discussion]. Maximizing the likelihood function with respect to the elements of the vector β, one derives a set of nonlinear equations that can be solved by an iterative procedure. The maximum likelihood estimators can be shown to be consistent and asymptotically unbiased and efficient. Furthermore, because of asymptotic normality of coefficient estimates, asymptotic tests are available for considering the exclusion of potential independent variables [see McFadden (1973)].

3. Empirical results

To apply the logit model to the estimation of default probabilities, it is necessary to define precisely the concept of default. In the present study, a "default" is considered broadly as any case in which public or publicly guaranteed payments to lending institutions are delayed or rescheduled with or without the consent of creditors.[7] In many cases, such a deferment of payments also involves changes favorable to the debtor in the rate of interest on the principal and interest due.[8] But for cases where a rescheduling agreement was arranged after service difficulties were already apparent, a default is assumed to have taken place in the year in which significant arrears occurred. In other cases where an agreement was reached ahead of time, the default date is assigned to the year in which payments were first deferred.[9] However, it is still difficult to pinpoint dates precisely because rescheduling is more of a process than an event and, in some cases, the full details are not publicly known. Therefore, no observations are taken for nondefault cases relating to a country which had previously defaulted unless several years (at least two) are omitted between the two observations. Countries which have thus rescheduled several times in a row may be treated as different default cases unless data are not available to distinguish between two successive reschedulings.

Table 1 lists the rescheduling cases that are considered along with the year that was assigned as a default date. The period of time that was considered is 1965-1972; data relating to previous years were not available from public sources. In total, there were 21 observations on default involving 11 countries. Table 2 lists the additional 217 nondefault cases included in the sample for the years 1965-1972. The sample

TABLE 1

Rescheduling, 1965-1972

Country	Year	Country	Year
1. Argentina	1965	12. Uruguay	1968
2. Chile	1965	13. Ghana	1969
3. Turkey	1965	14. India	1969-70
4. Uruguay	1965	15. Peru	1969-70
5. Indonesia	1966	16. Indonesia	1970
6. Yugoslavia	1966	17. Ghana	1970
7. Egypt	1966-67	18. Turkey	1970
8. Ghana	1966-68	19. Pakistan	1971
9. India	1968	20. Chile	1972
10. Peru	1968	21. Ghana	1972
11. Turkey	1968		

TABLE 2

Nondefault Country
Years Included in the Logit Analysis

Country	Years	Country	Years
1. Bolivia	1966-1972	18. Iran	1965-1972
2. Brazil	1968-1972	19. Iraq	1965-1971
3. Burma	1966-1968	20. Israel	1971-1972
4. Chile	1969-1970	21. Jamaica	1965-1972
5. China (Nationalist)	1965-1972	22. Jordan	1965-1966
6. Colombia	1965-1972	23. Korea	1965-1972
7. Costa Rica	1970-1972	24. Malaysia	1965-1972
8. Cyprus	1968-1972	25. Mexico	1965-1972
9. Dominican Republic	1965-1972	26. Morocco	1965-1972
10. Ecuador	1965-1972	27. Nicaragua	1965-1972
11. El Salvador	1965-1972	28. Nigeria	1965-1969
12. Ethiopia	1965-1972	29. Pakistan	1965-1969
13. Greece	1965-1972	30. Paraguay	1965-1972
14. Guatemala	1965-1972	31. Peru	1965-1967
15. Guyana	1965-1972	32. Spain	1966-1972
16. Honduras	1965-1972	33. Thailand	1965-1972
17. India	1965-1966	34. Venezuela	1965-1972

thus consists of 238 observations from 41 countries and is rather comprehensive. For example, in 1972, the countries included account for 85 percent of the total outstanding debt for all developing countries.

Data for the independent variables were compiled from various International Monetary Fund (IMF), World Bank (IBRD), and United Nations publications. Exports fluctuations, per capita income, the amortization/debt ratio, the imports/GNP ratio, and the imports/reserves ratio were measured in the same way as suggested by Frank and Cline.[10] The debt-service ratio for nondefault observations was taken directly from figures reported by IBRD. However, the debt service due was used for countries that defaulted. Since the actual debt service paid by countries that defaulted is less than that which was due, the service burden that prompted a rescheduling request is precisely the debt service due. Therefore, in cases where data were available on debt service due, the hypothetical debt service rather than actual debt service was calculated. In several other cases, Bittermann's information on the debt-service ratio projected by the government was used. In the few cases where no data were available, it was assumed that rescheduling involved 25 percent of the debt service due (which is quite a reasonable figure according to Bittermann's data). Thus, in these cases, the actual debt-service ratio (as reported by IBRD) was scaled by 1.25. The measure of export growth was calculated as the simple average growth rate in the eight-year period preceding the observation. The two additional variables which are used here are Gross Domestic Product (GDP) growth (calculated as a five-year average of GDP growth rate) and the ratio of capital inflows to debt service due (lagged one year).[11] These matters are discussed further in the Appendix.

Two approaches were used in estimating the logit model. The first included all the variables, and the second excluded the amortization/debt ratio for the following reasons. First, there may be doubts as to whether the relation between average debt maturity and the probability of default is indeed a causal relation. It may well be that the loan maturity allowed by the lender depends on the country's debt servicing capacity; hence, the amortization/debt ratio may be highly correlated with default without actually explaining any causal relationship. Secondly, measurement of the amortization/debt ratio for some of the default observations was extremely difficult (the hypothetical ratio is needed rather than the actual one). While hypothetical debt service figures were easy to estimate, their composition in terms of interest and amortization was not known and ad hoc methods had been used, thus rendering some amortization/debt estimates less reliable.

In both cases it appeared that the model was misspecified when export fluctuations and the import/GNP ratio were included since implausible (negative) coefficient estimates were obtained.[12] Hence, the empirical results presented in Table 3 exclude those two variables. All other variables, however, behave as one would expect; furthermore, most estimates are highly significant. In (a), which includes all other variables, all variables except GDP growth are significant at the 5 percent level (for a one-sided test). If GDP growth is deleted, then all six remaining variables are still significant at the 5 percent level. The likelihood ratio index (analogous to R^2 in linear regression) is above .92 in each case, and the likelihood ratio statistic (which has an asymptotic chi-square distribution) implies strong significance of the logit model regression [see McFadden for a discussion of these statistics].

TABLE 3

Logit Estimates of Default Probability

Variable	Case (a)	(b)	(c)	(d)
Debt-Service Ratio	53.6619 (2.5731)[a]	59.2085 (3.2864)	35.9826 (3.3768)	38.0096 (3.6181)
Imports/Reserves	.3946 (1.8323)	.3867 (1.7877)	.3614 (1.8622)	.3535 (1.7895)
Amortization/Debt	- 34.6172 (1.6535)	- 39.6368 (2.1808)		
Income/Capita	- .0116 (2.4708)	- .0124 (2.8337)	- .0113 (3.0333)	- .0142 (3.5523)
Capital Inflow/ Debt Service	- 2.6685 (2.9576)	- 2.8591 (3.3930)	- 2.1301 (3.4862)	- 2.2730 (3.6666)
GDP Growth	- 18.1495 (.4011)		- 50.3238 (1.4274)	
Export Growth	- 44.8634 (1.7120)	- 52.6046 (2.7077)	- 30.5812 (1.6159)	- 47.3640 (2.8498)
Likelihood Ratio Index	.9222	.9217	.9086	.9019
Likelihood Ratio Statistic	304.2605	304.0954	299.7940	297.5613

[a]Figures in parentheses denote 't' values.

On the basis of (b), there are six economic indicators for which coefficients of the probability of default are significantly nonzero: the imports/reserves ratio; the amortization/debt ratio; the debt-service ratio (all of which have been pointed out in the Frank and Cline study); and, in addition, the growth of exports; the per capita income; and the ratio of capital inflows to debt service payments.

Because of reservations associated with loan maturity discussed above, additional estimates were also obtained excluding the amortization/debt ratio. In this case, all remaining coefficient estimates in (c) are significant at the 7.5 percent level (again in a one-sided sense). Although the t-ratio for GDP growth is perhaps a little low by usual standards, it should be noted that the distribution theory is only asymptotically applicable. Nevertheless, (d) was also estimated by further excluding GDP growth. In either case, the likelihood ratio index remains above .90, and the likelihood ratio statistic is not changed appreciably.

In comparing the results, it may be noted that the significance of the export growth coefficient increases appreciably when GDP growth is deleted--whether or not amortization is considered. This apparently happens because export growth is relatively highly correlated with GDP growth in most developing countries (where the export sector is the leading sector).[13] Hence, one should perhaps interpret predictive results based on the model excluding GDP growth with caution for countries where GDP growth is not closely related to export growth. For this reason, it appears advantageous to retain GDP growth--particularly with the significance levels obtained in (c).

Comparing the results with and without the amortization/debt ratio, it is interesting to note that the remaining variables behave relatively the same way in either case. Estimates of other coefficients are approximately of the same magnitude (except for those two variables involved in the multicollinearity or high correlation problem) while the significances are generally improved when amortization is not included. This is exactly what one would expect to happen when the amortization/debt ratio (loan maturity) is affected by debt servicing capacity rather than vice versa. That is, the amortization/debt ratio would be closely related to the linear combination of variables specified by the estimated equation and would thus detract from the significance of other variables. But it would appear significant because it would falsely explain some of the disturbances in the logit model. Additionally, considering the small decline in the overall fit (likelihood ratio index), it thus seems that the causal relationship may well be incorrect for retaining the amortization/debt ratio in final results.

In either case, however, it is observed that both short- and long-run indicators should be included. The probability of default thus appears to depend not only on the circumstances prevailing immediately before the year on which a forecast is being made but also on trends that are based on a relatively long period of time preceding the forecast. But it is not necessarily correct to consider the resulting probability predictions as valid for a long-run period unless it is assumed that the economic situation (as reflected by the indicators) will remain unchanged.

4. Additional implications of the results

Using the coefficients of (b) and (c), the implied probabilities of default have been calculated. As expected, most of the actual default

observations have a high probability of default while most of the no-default observations have a low probability. To gain further insights into the performance of the model, one can consider the following hypothetical situation: suppose that for each of the 238 observations the predicted probability of default is known a priori while it is not known whether a default will indeed happen. Suppose further that the following rule of thumb is adopted: given a critical probability value P*, all countries with probability greater than P* are denied credit while all others are granted loans.[14] Then, for any given P*, there are two possible types of error: (1) Type I error--the case where a country has a probability lower than P* but actually defaults, and (2) Type II error--the case where a country has a predicted probability higher than P* but does not default. Table 4 reports the frequency of the two types of errors in the two models for various values of P*. In no case of P* are more than 11 errors made in a total of 238 observations; and, with P* = .4, only 6 errors are made with (b) while 9 errors are made with (c).

To obtain a further check on the validity of these results, an auxiliary set of data pertaining to countries borrowing in the Eurodollar market has also been used. For 102 observations on public or publicly guaranteed loans granted to 27 developing countries during the 1973-74 period, default probability predictions were computed on the basis of (b) and (c).[15] Although the results are too lengthy to discuss here, they may be summarized as follows. In the case of only eight loans to three countries was the predicted probability of default higher than .12. But according to knowledge which is now available, none of the countries with low probability predictions have

TABLE 4

Type I and Type II Errors Based on the Logit Estimates

p*	Case (b)		Case (c)	
	Number of Type I errors	Number of Type II errors	Number of Type I errors	Number of Type II errors
.10	0	10	0	11
.20	0	6	1	8
.30	1	6	2	7
.40	1	5	3	6
.50	2	4	4	6
.60	3	4	4	2
.70	5	1	5	1
.80	5	1	6	1
.90	7	1	8	1

actually defaulted or rescheduled.[16] Of the higher probability predictions, three (ranging from .82 to .89) were associated with a country that has been recently reported in the press to be seeking a rescheduling agreement with one of its major creditors--thus confirming the prediction. Of the remaining five cases, (b) predicted default probabilities less than .18 for two observations while (c) predicted default probabilities higher than .5 for all five. Hence, if one takes P* anywhere in the range from .18 to .50, it appears that only three Type II errors (or about 3 percent) are made with (b) while five (or about 4.9 percent) are made with (c). Thus, the error rates are quite consistent with those obtained for the sample actually used in estimation of the logit model and confirm the overall good predictive performance of the estimates in this paper.

5. Conclusions

In summary, on the basis of statistical tests, the logit model estimates indicate that six economic variables are significantly related to debt servicing capacity. In addition to the imports/reserve ratio, the amortization/debt ratio, and the debt-service ratio suggested by the Frank and Cline results, the results in Table 3 also indicate that export growth, per capita income, and the capital inflows/debt-service ratio are important indicators of debt servicing capacity. With the addition of the latter three, the list of indicators which appear to be important includes long-term as well as short-term factors and thus becomes consistent with arguments advanced by Avramovic et al. and Mikesell. In addition, it may be noted that the capital inflows coefficient estimate is significant in every regression thus confirming earlier arguments advanced by Irvine et al. Finally, it appears

that exports are important in both a static sense (the debt-service ratio) and a dynamic sense (export growth) as suggested by Avramovic et al.

The results of this study are obviously useful for debt servicing capacity analysis by potential lenders (see Appendix). But the results also hold some useful possibilities for borrowing countries. Increasingly, developing countries are entering commercial capital markets for funds; and, of course, the availability of these funds depends on their debt servicing capacity. The controlled regulation of important debt servicing capacity indicators can thus become an important part of government policy in reaching many other national objectives. In formulating national policies, it may also be particularly important to carefully control the probability of default since a reputation for default may seriously limit future credit possibilities. A study of these policy-related issues is reported in Feder and Just (1976).

Appendix

In order to facilitate application of the results reported in Table 3, the units of measurement and exact specifications of the seven variables are described below. It should be emphasized that these variables are only approximations for the values at year t which are usually not known at t - 1 when prediction is made. If, however, the analyst believes he has a better projection for some of the relevant indicators, he may choose to use the latter. Note that decimal fractions are used in all cases (except income per capita).

Debt-service ratio: debt-service payment on public or publicly guaranteed debt in year t - 1 divided by export earnings (of both merchandise sales and nonfactor services).

Imports: in dollars as reported in IMF trade statistics for year t - 1 divided by year-end reserves [in special drawing right (SDR) equivalents]. Reserves include gold holdings, SDR's, and other convertible currency holdings.

Amortization/debt ratio: debt outstanding (including undisbursed) at the end of t - 1 divided by debt service in t - 1.

Income per capita: in current U. S. dollars as reported in the U. N. Statistical Yearbook for year t - 1.

Capital inflow/(debt service): net capital inflows (short and long term), including direct investments and grants, as reported in IMF financial statistics for year t - 1. Debt service is on public or publicly guaranteed debt in year t - 1.

GDP (per capita) growth: average of the annual rates of growth between year t - 5 and t - 1 for GDP per capita in constant prices.

Export growth: average of the eight-year annual rates of growth between year t - 8 and t - 1. Exports are in current U. S. dollars as reported in the IMF International Financial Statistics Tables on world trade.

Footnotes

*Giannini Foundation Paper No. 424. The views expressed in this paper are those of the authors alone and do not necessarily reflect those of the University of California.

[1]It should be noted, however, that the testing procedure used in the Frank and Cline study may not be valid for two reasons. First, "t" and "F" tests are not quite legitimate in the case of discriminant analysis because of normality assumptions. Second, even if these tests are legitimate, an F test should be used for testing that several variables are unimportant simultaneously.

[2]By comparison, the Frank and Cline results gave 12 to 26 errors with 145 observations.

[3]It may also be noted that this variable was not found significant by Frank and Cline.

[4]Actually, they have used the inverse ratio. Although there is no particular reason for their choice, it was also adopted in this study for comparability.

[5]In fact, however, the inverse relation should be used since capital flows may be positive, negative, or zero.

[6]For instance, Avramovic et al. (1964, p. 69) conclude: "The only important factor from the long run point of view is the rate of growth of production." Alter (1961, p. 146) also states: "A minimum condition

for developing even a small sustainable margin for debt service over the long term would appear to be some increase in per capita income." For related comments, see Kindleberger (1958, pp. 265 and 266) and Faarland (1967, pp. 263 and 264).

[7]Information on rescheduling arrangements for the cases included in the present study was obtained from Bittermann (1973).

[8]Of course, such arrangements are only reluctantly agreed upon by the creditor.

[9]For instance, in 1965, Yugoslavia negotiated a rescheduling of payments due in 1966; thus, 1966 was considered a year of default.

[10]Regarding the export fluctuations index, there is a slight difference since Frank and Cline use a weighted average of deviations around an eight-year trend in such a way that the fourth and fifth years are given highest weight. In this study, equal weights were assigned to all years (see Appendix).

[11]Capital inflows as reported by IMF include both long- and short-run flows. But the use of short-run flows may lead to bias because the direction of causality is unclear, and there may be correlation with the error term. That is, short-term loans are highly sensitive to debt servicing capacity; long-term flows, on the other hand, are usually committed some time in advance of loan disbursement. Thus, in this study, transfers and other sources of foreign currency inflows that are not considered as export earnings were added. Since only net inflows were included, most short-term flows were thus eliminated.

[12]These results were consistent with the Frank and Cline findings. They also obtained a negative coefficient for export fluctuations. Their estimates for the import/GNP ratio were positive when export fluctuations were included, but a similar result was obtained in our case also. The export fluctuations coefficient became negative only when the import/GNP ratio was deleted (a case not reported in the earlier study). In none of these cases were the coefficients (asymptotically) significant at the 10 percent level for a two-sided test.

[13]The sample correlation is .53 which is the highest correlation between any two variables in the sample.

[14]Such a rule of thumb would not fit a lender with some degree of monopolistic power since he can change the terms of credit so as to account for risk.

[15]These data were obtained from Feder (1976).

[16]One should note that we can expect <u>a priori</u> that the perceived default probabilities were rather low since all the lenders are commercial institutions which would not grant a loan to an excessively risky country.

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