ISSN 0316-5078

INSTITUTE FOR ECONOMIC RESEARCH

QUEEN'S UNIVERSITY

Kingston, Ontario, Canada K7L 3N6

DEBT CAPACITY AND LDCs' BORROWING: A CRITICAL REVIEW

by Paul Lanoie*

QUEEN'S DISCUSSION PAPER NO. 659

September 1986

Table of Contents

Introduction 1

I. Indicator Approaches to Debt Capacity 2

I.A. Literature Survey 2

I.B. Summary and Discussion 3

I.B.1. Summary of the results 3

I.B.2. Discussion 6

I.B.2.1. Lack of theoretical underpinnings 6

I.B.2.2. Statistical techniques 7

I.B.2.3. Choice of the dependent and independent variables 8

I.B.2.4. Stability of the coefficients 11

I.B.2.5. Ability to forecast 12

II. Risk Premium Approach 13

II.A. Literature Survey 13

II.B. Summary and Conclusions 18

Conclusion 21

Footnotes 22

Bibliography 26

Abstract

This paper will review an important part of the literature on debt capacity and LDCs' borrowing. The pioneer theoretical work on the evolution of debt through time has provided principles of limited practical applicability for judging the sustainability of a particular debt situation. Having this limitation in mind, many researchers have tried, using an indicator approach, to identify empirically the circumstances under which countries have experienced debt-servicing problems. Building upon this work, some studies investigated the way in which a nation's probability of defaulting affects the funds suppliers' perception of the country's risk that is translated into a demand for a risk premium. These last two trends in the literature will be examined critically and further extensions will be suggested.

Introduction

The literature on developing nations' debt has shown a considerable expansion in recent years. A large part of this work seems rather descriptive and tends to concentrate on case studies, on LDCs' questionable macroeconomic policies, and on some elements of a solution to the debt crisis.[1] More analytical and more likely to inform about the real dangers of the situation is the literature on the determination of the developing countries' debt capacity.

One can divide this literature into three main sections. The first one investigates the sustainability and the optimality of different debt policies, the evolution of debt through time and its relation to economic growth. Unfortunately, this wide range of considerations eliminates the possibility of any clear-cut derived formula for judging the sustainability of a particular debt situation. As a result, the second body of literature, on which we will place more emphasis, deals with the empirical identification of the circumstances under which countries have experienced debt problems. In this context, many external debt ratios and a series of economic indicators are used as explanatory variables of the debt-servicing difficulties. The last section stops focusing on the debtor's perspective and underlines the importance of paying attention to the supply of credit and thus, to the complete market environment. The creditors' demand for a risk premium on LDCs' loans (a trend in the literature that present many links with the second section) and credit rationing due to potential debt repudiation constitute the principal building blocks of this third approach.[2] This paper will examine consecutively the indicator approach to debt capacity and the related contributions on the lenders' demand for a risk premium on LDCs' borrowing. The criticisms that are made to these two parts of the literature lead to a major reconsideration of their appropriateness.

I. Indicator Approaches to Debt Capacity

I.A. Literature Survey

Before proceeding, it seems relevant to quickly survey the first section of literature on the evolution of debt through time to see why this indicator approach has emerged. The first theoretical attempts use the "rather rigid" Harrod-Domar growth model where output is produced with fixed coefficients technology. A growth rate objective (along with this technology) determines the investment requirements so that foreign borrowings come into the picture to fill the resource gap between the level of desired investment and national savings.[3] So far, the authors examine situations where sustainability problems could occur, but they do not pay attention to the normative concern of how much a country "should" borrow. Therefore, certain models developed in an intertemporal optimizing framework are considered.[4] Apart from investment, other borrowing motives are taken into account such as the smoothing of consumption in response to different external shocks (eg. those due to a change in the price of an intermediate input, or due to the volatility of the world interest rates).

Nevertheless, one should recognize that, at this level, the analysis becomes quite complex even if one adopts, as was done, a very simplistic representation of the supply side of external credits. In order to judge the "actual" optimality of borrowing policies, detailed knowledge about the parameters of the intertemporal utility function, about the production technology of the economy and about the nature of the shocks (temporary or permanent) would be necessary. Obviously, there are a lot of obstacles in getting all this information. Having this limitation in mind, many researchers have tried to identify empirically the significant circumstances under which countries have experienced debt-servicing problems. Attention will now be paid to such efforts.

In this section of literature very few attempts are made to provide rigorous theoretical underpinnings for the models used. Instead, links are established according to traditional perceptions between debt-servicing difficulties[5] (X_t: typically debt rescheduling versus non-rescheduling) and two categories of independent variables, the "financial indicators" (Y_t) and the "debtor's economic performance indicators" (Z_t). The different authors use statistical techniques, typically discriminant or logit analysis, to estimate an equation such as (1):

$$X_t = f(Y_t, Z_t, \varepsilon_t) \qquad (1)$$ where ε_t: error term.

Fifteen studies applying this kind of analysis are recorded. They differ particularly in terms of the sample used, the dependent variables, the explanatory variables -- "successful" and "non-successful" -- and the statistical performance of the investigation (these elements are provided respectively by Tables 1-2-3 at the end of this section). We present here a summary of the results and a discussion on the appropriateness of the different methodologies.

I.B. Summary and Discussion

I.B.1. Summary of the Results

In comparing the outcomes of these papers, one has to keep in mind the somewhat misleading nature of the exercise since the studies vary considerably from one another. Table 2 summarizes the main results, it contains fifty independent variables (apart from country and time dummies) that are tested in at least one study and regrouped under the two principal categories mentioned above. Forty-two of these variables are significant in at least one study from which ten appear significant, with the same sign, in at least two papers while only seven variables are significant three times or more. Four of them (DSR, Debt/GDP,

Debt/Exports, Debt amortization/Debt) belong to the first class of indicators while the three others (Imports/Reserves, Rate of Inflation, Investments/GDP) are present in the second category. At this stage, it seems useful to examine these seven variables and provide the economic justification for their influence on the possibility of debt-servicing problems.

The debt-service ratio (DSR: debt-service payments/exports) appears significant and positive in six papers. It is one of the most common rules of thumb for creditworthiness evaluation. Indeed, a high ratio, indicating a heavy burden on the country's resources, is related to a higher risk of debt problem. Moreover, since debt service is a fixed obligation, it indicates the vulnerability of the country to foreign exchange crises. For instance, any shortfall in foreign exchange earnings must be offset by exchange reserves or import reductions.

The Debt/GDP ratio measures the claims of the rest of the world on the resources of the country. However, the traditional practice is often to compare external debt to exports (Debt/Exports is also one of the significant variables) on the grounds that only exports generate the foreign exchange revenues needed to service the debt (actually, on this basis, net exports would be more relevant). But, it can be argued that there are two different issues that are better dealt with separately: the productive capacity of the economy and the ease or flexibility with which the corresponding resources can be used to generate the necessary foreign exchange. Thus, these two ratios (Debt/GDP, Debt/Exports) are expected to take a positive sign as reported in Table 2.

The next indicator is the ratio of debt amortization to total outstanding debt (the inverse of the "average" maturity loans) which is significant three times. A low value for this variable indicates that a country has predominantly

long term liabilities. When this is the case, a nation does not enjoy much short-run flexibility in lowering its debt service commitments by a temporary reduction of borrowings. Thus, ceteris paribus, such a country has more likelihood of rescheduling. Furthermore, Cline (1984) suggests that a country with a greater amortization rate will appear to have a more healthy balance sheet to a lender. Effectively, a larger rate shows that a higher component of debt service constitutes a liquidation of the liability than another country with the same DSR, but a lower amortization rate. These reasons indicate that the coefficient of this variable (Debt amortization/Debt) will be expected to take a negative sign.

The reserves/imports ratio is also quite popular, being significant in six papers. As a balance against fluctuations caused by factors beyond the control of the economy, one should consider the presence of flexible elements within the balance of payments that are controlled by the government, such as exchange reserves. In order to have comparable measures among countries, it is common to consider a reserves/imports ratio (or imports/reserves). Therefore, one would anticipate more frequent debt-servicing problems with a higher imports/reserves ratio.

The inflation rate appears significant four times and, in some sense, reflects the ability of the macroeconomic management of the country. Moreover, inflation usually leads to an increased demand for imports and to a stagnation of exports, which in turn are associated with a rapid build-up of external debt. Therefore, the inflation rate will be expected to affect positively the possibility of debt-servicing problems.

Lastly, the share of investment to GDP is present and significant in three studies. This variable represents the portion of production allocated to the

accumulation of real assets as opposed to consumption. The coefficient of this variable is expected to be negative as the accumulation of real assets, by raising the productive capacity of the economy, increases the amount of real resources available to service the debt in the future.

I.B.2. Discussion

I.B.2.1. Lack of theoretical underpinnings

This amalgam of more or less heterogeneous variables that is tested does not inspire confidence and clearly reflects the faltering way in which this strand of literature has been developed. The "ad hoc" manner, in which these explanatory variables are introduced in the different papers, demonstrates a flagrant lack of theoretical structure. In fact, these studies are basically "searching for statistical relationship".

One of the key elements to overcome this deficiency is a model of behavior. To fall into arrears and to seek renegotiation of a loan is a decision taken as a result of severe debt-servicing difficulties that may arise from external shocks. Supposedly, it is taken in light of the costs of possible alternatives, such as complete repudiation. Furthermore, attention should be paid to the role of the suppliers of funds and their perception of a country's creditworthiness. As a last element, one would argue that social and political factors should be taken into account as it is often done in creditworthiness analysis performed by banks.[6] So, what is needed is a framework that considers these factors. Without underlying theory, the studies presented do not tell whether or not the countries follow the scheme of actions described above. Finally, it would be unfair here to neglect the work of Kharas (1984) that constitutes an interesting endeavor to cope with this problem.[7] However, his analysis is based on the Harrod-Domar model that is, as we have already underlined, very limitating and rigid.

I.B.2.2. Statistical techniques

More specifically, criticisms should also be addressed to the different statistical methods that were used. Dhonte (1975) is the only one to employ the principal component analysis[8] where a set of composite indicators (or components) is substituted for the original group of variables, and each component is a linear combination of some initial indicators. A component's relative importance is measured by the proportion of the total sample information it contains. However, as a major shortcoming of his work, reducing the dimensions of the data in this manner is useful as long as some meaning can be given to the constructed variables, but such is not always the case. This explains why this technique was quickly abandoned.

Discriminant analysis[9] is used in six papers (Frank-Cline (1971), Grinols (1976), Sargen (1977), Saini-Bates (1978), Abassi-Taffler (1984) and Schmidt (1984)). The hypothesis underlying this type of analysis is that the total population is separated into two distinct subpopulations. The objective of the exercise is to design from sample information a rule that will permit one to distinguish between these two groups (in our case: rescheduling and non-rescheduling nations). The rule is chosen so as to minimize the expected costs of misclassification, i.e. to minimize the sum of "Type I" and "Type II" errors (see Table 3 for the definition of these terms). The determination of the significance of individual explanatory variables constitutes one of the most important flaws in this technique.[10]

This problem is not encountered in the logit analysis[11] introduced by Feder and Just (1977a) and utilized by all the subsequent authors.[12] This technique embodies desirable statistical properties for empirical work involving a binary-valued dependent variable (where the variable takes the value of "1" when

a rescheduling occurred and "0" otherwise). These authors also point out the lack of theoretical underpinnings of the discriminant analysis that assumes the existence of two different categories of countries implying that a nation suddenly becomes a member of another species when it reschedules its debt. This pitfall is also avoided by logit analysis.[13] Two studies -- Saini and Bates (1978), Schmidt (1984) -- have compared the logit and discriminant analysis on the same sample. In the first trial, the statistical performance[14] of the two analyses was not significantly different[15], while the logit analysis was declared "champion" in Schmidt's attempt.

In any case, the logit analysis beats the competition because of its theoretical superiority and the very apparent weaknesses of the other methods. However, the results of the logit analysis are still hard to interpret since there is no definite procedure for selecting the "cut-off" probability (the value that discriminates between rescheduling and non-rescheduling cases). The authors usually choose the critical value so as to minimize the sum of Type I and Type II errors. This criterion works efficiently when it is time to classify past debt reschedulings, but nothing ensures it will be as "skillful" in forecasting a country's debt-servicing difficulties. Moreover, as will be seen below, nothing excludes other statistical methods from being helpful.

I.B.2.3. Choice of the dependent and independent variables

Typically, (in 9 studies out of 15, see Table 1) the researchers employ a binary valued dependent variable related to instances of rescheduling and non-rescheduling. As a first problem, most econometricians would agree that the low relative frequency of reschedulings is likely to lower the power of the estimation methods used. Indeed, referring to Table 1, one can notice that the

number of observations of an actual rescheduling represents only around 5% of the total number of observations for most of the studies.

Next, one should be concerned with how reschedulings are effectively related to debt capacity. There exists no theoretical structure indicating that debt rescheduling is the variable to focus on. In fact, a rescheduling may arise because of the coexistence of many adverse factors outside a country's control, and such debt-servicing difficulties do not necessarily reflect the debt capacity of a nation. So, one could argue that factors more deeply associated with the economic management of the country, such as the productivity of investments, are more appropriate indicators of the debt capacity.

This lack of theoretical underpinnings explains that many studies utilize different dependent variables without a proper justification. An interesting exercise is accomplished by Saini and Bates (1978) who use reschedulings as a dependent variable (correctly excluding the "voluntary" reschedulings[16]) in conjunction with recourses to balance of payment support loans. Then, they show the superior statistical performance of their model over one that only considers reschedulings as a dependent variable, suggesting the appropriateness of their extension. Other authors, such as McFadden et al.(1985) include the presence of IMF support loans as a sign of debt-servicing difficulties while Cline (1984) argues that these loans are far too common to constitute an appropriate threshold of severity for analysis.

In this sense, a binary 0-1 dependent variable appears "too dichotomous". A variable that would incorporate intermediate values could probably resolve this issue. Eigrechen and Portes (1985) employ such a variable in the context of a Tobit model[17]. Indeed, this procedure seems clearly justified because of the various degrees of debt-servicing problems that can occur, going from a simple

fall into arrears to a complete rescheduling. Arbitrary judgments would presumably be needed to assign intermediate values between "0" and "1" to different levels of debt-servicing difficulties, but the exercise would still be worthwhile.

Concerning independent variables, a theoretical apparatus would prove useful in elucidating the three following issues. First, the use of debt statistics as explanatory factors, even if they perform well empirically, is condemned by some authors for two kinds of reasons. Saini-Bates (1978) and Callier (1985) argue that debt indicators are incomplete, (for instance, the general shortage of data on short term debt) inconsistent across countries and they lack of "freshness".[18] Moreover, researchers such as Sargen (1977) and Eigrechen-Portes (1985) reasonably claim that deficient economic management is responsible for debt crises and in fact, a debt indicator such as the debt-service ratio has no direct link with the allocative efficiency of the economy.[19] These comments make one suspicious about the validity of the results where debt statistics appear as significant explanatory variables.

Secondly, apart from the variables themselves, there are difficulties related to whether they should be lagged and if so, by how many years. Callier (1985) and Mayo-Barrett (1978) use independent variables that are lagged five years, the latter arguing that five years was chosen to reflect the normal maximum term of commercial bank lending. However, McFadden et al. (1985) and Cline (1984) (only for some variables) utilize explanatory factors that are lagged one year. It is assumed that because of time lags in data, decisions of rescheduling taken in a given year are broadly determined by data pertaining to the end of the previous year.[20]

Finally, a model would allow one to assess the argument of Feder, Just and Ross (1981) that the impact of certain independent variables might be nonlinear. They account for this by the use of quadratic terms which provide more insight on the proper influence of each factor.[21]

I.B.2.4. Stability of the coefficients

The next point to underline about these models is that they are estimated across diverse groups of countries and over time periods of varying length. In such circumstances, the existence of stable parameters is to be doubted. A large number of factors could explain instability. For instance, recent history shows there is a much more important role played by commercial lenders. Therefore, it is not obvious that the debt-service ratio has the same implications as before since commercial lending is usually of shorter maturity, implying higher debt-service payments. It is not clear that, in itself, this makes the country a higher risk. Until recently, very little attention was paid to this issue of stability through time. Saini and Bates (1978) estimate their logit and discriminant functions up to 1970 and for the period 1971-77, but they present no statistical tests of structural stability. However, McFadden et al. (1985) and Schmidt (1984) tackle this question. The formers demonstrate that their coefficients are, as expected, unstable between 1971-75 and 1976-1982, while the latter shows a remarkable stability of his coefficients but for a different time interval.

The stability of the parameters across countries is also questionable. Indeed, structural models are likely to vary across countries because of, among other factors, political and social differences. McFadden et al. (1985) and Kharas (1984) introduce dummies to test for the differences across countries that show a strong "country effect" in the first case and a mitigated effect in the

second one. Feder, Just and Ross (1981) use dummies reflecting the geographical location of a country, namely its continent. They find little improvement in the explanatory power of equation, but clearly one can think of other more satisfactory kinds of grouping (e.g., by some economic criteria). One possible reason for the little emphasis that was put on the stability of the parameters was the relatively low number of reschedulings in the sample. With longer periods now available and with a greater number of instances of rescheduling, it is probable that the necessary efforts will be made to consider the problems of instability.

I.B.2.5. Ability to forecast

Table 3 indicates the statistical performance of these different models (see footnote 14) in classifying past reschedulings. In this regard, it should be mentioned that some studies show remarkable results (such as Feder-Just) while others seem suspect (McFadden et al.). However, a number of reasons have been outlined for exercising caution about the out-of-sample applicability of these studies, i.e. their use for predictions. The major problem in predicting reschedulings is that one must forecast the value of the explanatory variables. This projection is particularly difficult when the model includes volatile financial variables (Feder, Just and Ross are aware of this limitation in their predicting exercise). By using explanatory factors lagged five years, Mayo-Barrett, Abassi-Taffler and Callier claim to avoid this problem. Indeed, this procedure permits them to predict a rescheduling occurring in 1980, on which actual information is available, from the data of 1975;[22] but it still cannot forecast debt-servicing difficulties in 1991 according to data from 1986 and this is what bankers need.

Furthermore, the present exercises enable one to identify which variables significantly affect the possibility of debt-servicing problems, but surprisingly enough nobody is asking the following (and relevant!) question: at which level are these explanatory factors starting to cause a danger of rescheduling? With this practical information a bank would know, for instance, that if the debt-service ratio in one of its debtor countries crosses a certain threshold, debt-servicing problems are likely to arise. A relatively straightforward application of the Tobit analysis would enable one to determine such critical levels as was done elsewhere.[23] If one does not have the courage of building a new theoretical framework, this use of a Tobit model would be considered as a fruitful extension to the available empirical work.

II. Risk Premium Approach

II.A. Literature Survey

The first section was mostly devoted to debt from the borrower's perspective. However, when one makes a judgment about the sustainability of a nation's debt policy, it is not satisfactory to only know that the debtor's plans are consistent with its intertemporal budget constraint. Supply conditions must also be taken into account, especially the creditor's perception of the economic feasibility of the borrower's projects. Moreover, understanding the behavior of credit suppliers is particularly important in the present context where banks are accused of having over-extended their lendings to the LDCs.[24] In fact, many authors are asking whether banks did pay enough attention to risk in their lending decisions. The first point in an eventual answer is to investigate the relationship between the conditions of credit and the nation's risk.

Table 1

Description of the Sample and of the Dependent Variables Used in the Different Studies

	Description of the Sample of the Different Studies	Dependent Variables Used in the Different Studies
1. Dhonte (1975)	Data from 1969, - 69 countries - 13 renegotiation cases	Rescheduling vs. non-rescheduling countries[a]
2. Frank-Cline (1971)	Period 1960-68, - 145 observations on 26 countries - 13 reschedulings in 8 countries	Rescheduling vs. non-rescheduling countries
3. Grinols (1976)	Period 1960-74, - 64 countries	Rescheduling vs. non-rescheduling countries
4. Sargen (1977)	Period 1960-75	Rescheduling vs. non-rescheduling countries
5. Feder-Just (1977)	Period 1965-72, - 238 observations on 30 countries - 21 reschedulings in 11 countries	Rescheduling vs. non-rescheduling countries
6. Saini-Bates (1978)	Period 1960-77, - 298 observations on 25 countries - 13 countries have experienced debt problems	- Rescheduling vs. non-rescheduling countries, excludes voluntary rescheduling, includes countries that asked for balance of payment support loans
7. Mayo-Barrett (1978)	Period 1960-75, - 571 observations on 48 countries - 28 reschedulings in 11 countries	- Rescheduling vs. non-rescheduling countries, but here, in order to design an early-warning model the independent variables are lagged 5 years. Includes Exim-Bank Reschedulings and Claims.
8. Feder-Just-Ross (1981)	Period 1965-76, - 580 observations on 56 countries - 40 observations on rescheduling	- Same as Saini-Bates (1978).
9. Abassi-Taffler (1984)	Period 1967-78, - 1140 observations on 95 countries - 55 reschedulings in 14 countries	- Rescheduling vs. non-rescheduling countries
10. Schmidt (1984)	Period 1973-79, - data on 52 countries - reschedulings in 9 countries	- Rescheduling vs. non-rescheduling countries
11. Cline (1984)	Period 1968-82, - 670 observations on 60 countries - 22 cases of rescheduling	- Rescheduling vs. non-rescheduling countries
12. McFadden and all (1985)	Period 1970-82, - data on 93 countries - 82% of them had debt repayment problems at least one year	- Reschedulings(excluding voluntary ones) - Presence of IMF support - Net new loans/exports, Arrears
13. Eigrechen and Portes (1985)	Period 1934-38, - 90 observations on 22 countries	- Dependent variables = 0 for countries which did not default = 1 for countries in default on all their obligations = intermediate values for countries partially in default
14. Callier (1985)	Period 1971-82, - data on 62 countries - 17 have experienced debt problems	- Reschedulings - Moratorium on servicing debt - Arrears on payments. Independent variables cover 1977-82. Dependent cover 1971-75.
15. Kharas (1984)	Period 1965-76, - 441 observations on 43 countries - 30 reschedulings involving 11 countries	- Rescheduling vs. non-reschedulings countries

[a] There is no dependent variables in a principal component analysis, but in this study the groups of countries that are compared are the ones that have experienced rescheduling and the ones that have not.

Table 2

"Successful" and "Non-successful" independent variables

	1. Dhonte (1975)[a]	2. Frank-Cline (1971)	3. Grinols (1976)[b]	4. Sargen (1977)[b]	5. Feder-Just (1977a)	6. Saini-Bates (1978)[b]	7. Mayo-Barrett[c] (1978)	8. Feder-Just-Ross[d] (1981)	9. Abassi-Taffler[c] (1984)	10. Schmidt (1984)[c,e]	11. Cline (1984)[f]	12. McFadden and al[g] (1985)	13. Elgrechen-Portes[h] (1985)	14. Calitler (1985)	15. Kharas (1984)[i]
1. Debt-Service Indicators															
DSR = Debt service payments/exports[j]		+		+	+			+			+	0			
Debt/GDP	0		+										+	+	
Debt/Exports	+		+						+			+			
Debt service payment/Debt disbursem.	+		+												
" " " /Imports			+	.											
" " " /Reserves			+												
" " " /Capital inflows					+										
" " " /GDP			-												+
Non-commer. foreign exch. inflows/Debt Payments[k]															
Commercial inflows								-							
Debt Amortizat./Debt								0							
Interest payments/Debt		-			-						-				
Disbursed debt outstanding/Exports											-				
New loans commitments per capita						-									
Cumulative payments problems[L]									+						
Debt from suppliers/Debt												+			
Annual growth of outstanding debt										+					
										+					
2. Debtor's Economic Performance Indicators															
(A) Current account related indicators															
Growth rate of exports		0		0	-	0									
Export fluctuations		0			0										
Current account/GDP														-	
Imports/GDP		0			0	0	+								
Exports/GDP								-				+			
Net foreign assets/GDP								-							
Net foreign assets/Money Supply														-	
Openness index[M]						0								-	
Net Transfers/Imports	-														
Adjusted Cumulative Curr. Acc./Exports						-					-				
Non-compressible Imports[N]		0										0			
Real Exchange Rate Change (deviation from P.P.P.)[O]				0										+	
Percent deterioration of T.O.T. in 1929-31															
(B) Reserves Related Indicators															
Imports/Reserves		+			+	0	+	+			+				
Reserves Growth Rate						-									
Reserves/GDP												-		+	
Reserves/Money Supply							-							+	
Reserves IMF/Imports															
Percent increase in reserve ratio 1929-31															
(C) Indicators Reflecting Macroeconomic Management															
Inflation Rate			+		+	+			+		0				
Money Supply Growth Rate			0		+										
Domestic Credit/GDP									+						
Percent Increase in Budget Deficit 1929-30														+	
Total Borrowing made by LDCs in the Year											-				
(D) Indicators Reflecting Growth of GNP and Investments															
Per capita income		0		-	0						0	0			
Growth of per capita income				0							-	0			
GNP/U.S. GNP								-						-	
Diff. in growth rate of GNP and GDP														-	
Population variable[P]														-	
Investment/GDP							-							-	+
Saving Rate											0				
Productivity of capital indicator														0	
Dualism[Q]														-	

Notes to Table 2:

+: indicates that this variable has a positive and significant influence on debt-servicing problems.
-: indicates that this variable has a negative and significant influence on debt-servicing problems.
0: this variable was tested but was not significant.

a These are the indicators that Dhonte uses in one-at-a-time comparison (correlation analysis) between rescheduling and non-rescheduling countries.

b The original copy of these studies was not available so we cannot know which variables are not significant.

c Mayo-Barrett tested over 50 variables and they listed only the significant ones. Schmidt tested 21 variables, we only kept the significant ones, similarly for Abassi-Taffler that tested 42 variables.

d These results refer to their model 3, within sample, with the cut-off probability of .1. DSR^2 and $Imports/Reserves^2$ were also significant.

e These results refer to his logit analysis for the year 1978.

f This corresponds to Table A-3, model A.

g These results refer to their model no. 9, the one with the best statistical performance.

h This corresponds to Table 3, model (i).

i This corresponds to Model 2, Table I, p. 430.

j DSR corresponds to debt-service ratio.
Debt in the following indicators corresponds to total outstanding debt.

k Noncommercial foreign exchange inflows: net medium and long term loans from governments and international organizations, capital grants, workers' remittances, and net current transfers.

L As an indicator of previous debt problems, they constructed an index of the number of years since 1970 in which a rescheduling occurred.

M Half the sum of imports and exports divided by the sum of GDP and imports.

N Non-compressible imports were essentially intermediate goods, capital goods, and basic food-stuffs.

O As an indicator of real exchange rate movements, they compute the difference between the rate of domestic consumer price inflation and the sum of exchange rate depreciation and the growth rate of the U.S. GNP deflator. This variable was interacted with a dummy variable indicating a fixed exchange rate regime.

P Natural logarithm of the population measured in millions. See the justification for this variable in Callier (1985), p. 110.

q Callier defines the concept of dualism according to which the developing economies are divided in two sectors (a modern sector and a traditional sector) between which resources do not flow freely to maintain the marginal conditions usually associated with efficiency in resources allocation. Those rigidities constrain greatly the ability to adjust the economy in cases of balance of payment problems. An indicator of the degree of dualism in the economy is an index (varying between 0 and 1) based on the comparison of the relative productivity of labor in each country with that prevailing in industrial countries.

Note that these studies differ in countries, time periods considered and in details in definitions of both dependent and independent variables.

Table 3

A comparison of error rates

	Type I error[a]	Type II error[a]	Total errors
Dhonte (principal components analysis)			
Number of errors	4	9	13
Number of observations	12	69	81
Error rate	33%	13%	16%
Frank and Cline (discriminant analysis)			
Number of errors	3	14	7
Number of observations	13	132	145
Error rate	23%	10.5%	11.5%
Grinols (discriminant analysis)			
Number of errors	3	19	22
Number of observations	24	319	343
Error rate	12.5%	6%	6.5%
Sargen (discriminant analysis)			
Number of errors	8	35	43
Number of observations	24	442	466
Error rate	33%	8%	9%
Feder and Just (logit analysis)			
Number of errors	1	5	6
Number of observations	21	217	238
Error rate	5%	2.5%	2.5%
Saini and Bates[b]			
Discriminant analysis			
Number of errors	4	42	46
Number of observations	23	275	298
Error rate	17%	15%	15.5%
Logit analysis			
Number of errors	4	53	57
Number of observations	23	275	298
Error rate	17%	19%	19%
Mayo and Barrett (logit analysis)			
Number of errors	7	71	78
Number of observations	28	543	571
Error rate	25%	13%	14%
*Feder-Just-Ross (logit analysis)[d]			
Error rate	10%	6%	
Abassi and Taffler[c] (discriminant analysis)			
Number of errors	5	56	61
Number of observations	50	631	681
Error rate	10.0%	8.9%	9.0%
*Schmidt[e]			
Discriminant analysis	44%	7%	
Logit analysis	11%	7%	
*Cline (logit analysis)			
Error rate	9.1%	13%	
*McFadden and all[f] (logit analysis)			
Error rate	14.49%	23.53%	
*Eigrechen and Portes[g] (probit analysis)			
*Callier (logit analysis)			
Number of errors	4	3	
Number of observations	46	16	
Error rate	9%	18%	
*Kharas (probit analysis)			
Error rate	17%	7%	

[a] Type I error = prediction of non-rescheduling for rescheduling country/year. Type II error = prediction of rescheduling for non-rescheduling country/year.

[b] These results are for the modified dependent variable which excludes voluntary reschedulings and includes balance of payments support loans or bridge loans and involuntary debt. For additional results, see Saini and Bates (1978).

[c] These error rates are for a smaller sample than the author's original sample size.

[d] These error rates refer to their model 3 within sample with the cut-off probability of .1.

[e] Schmidt proceeds to one regression every year from 1974 to 1978. The numbers reported here correspond to the year 1978.

[f] This refers to model 9.

[g] No such results are presented in the study.

Source: Saini, K.G. and Bates, P.S. "A Survey of Quantitative Approaches to Country Risk Analysis" in Journal of Banking and Finance, 8, 1984, p. 319.

* Studies added by the author.

Eleven papers[25] proceed to this exercise by studying the relation between the interest rate differential asked on LDCs' loans (i.e. the spread over LIBOR[26]) and the country's risk. The authors usually model the Eurocurrency market in a monopolistic competition framework where the spread (S_t)[27] is affected by two categories of factors: the terms of loans variables (L_t: amount, duration) and the probability of debt-servicing difficulties.[28] This probability is a function of Y_t and Z_t (see equation (1)) as in the rescheduling functions presented in the preceding section. So, basically, the following equation is estimated in most studies:[29]

$$S_t = f(L_t, Y_t, Z_t, \alpha_t) \qquad (2) \qquad \text{where } \alpha_t\text{: error term.}$$

This is done for the bank loans' interest spread, but also for the risk premium on the bond market (Edwards (1985)).

II.B. Summary and Discussion

A quick glance at Table 4 reveals that 25 variables (apart from country and time dummies) are tested. These factors are divided into the two categories identified above. Twenty-one factors prove to be significant in at least one study out of which ten are significant twice. Only five variables appear significant more than two times (Loan duration, DSR, Debt/GNP, Imports/Reserves and the Inflation Rate), recalling that these last four were good "performers" in the rescheduling functions. As a noticeable feature of these investigations, one should mention that periods covered (see footnotes of Table 4) are shorter than in the studies of Section I. This is usually justified since variations in market liquidity and changes in expectations regarding cost of capital could distort the results if longer periods were considered.

A first criticism concerns the probability of debt-servicing difficulties that is often used as an explanatory variable. This probability emerges from models such as those described in Section I and reservations have already been expressed about their validity. Moreover, the relative frequencies that are computed reflect the current probability of problems, but what should really influence the risk premium is the future probability of debt-servicing difficulties. Furthermore, it can be argued that the probability of rescheduling is not responsible for the interest spread; instead, bankers worry about the expected value of any ensuing loss from a rescheduling, which would clearly depend on the time of rescheduling and the terms of renegotiation.

Another point is related to the sample construction and the currency composition of the loans. Spreads vary across Eurocurrencies depending on the perceived currency risk. This would argue in favor of examining samples denominated in the same currency, but only Feder-Ross have proceeded in such a manner.

As with the literature on rescheduling functions, one should be suspicious about the assumption of structural stability. Only Brittain, Burton-Inoue and Feder-Uy verify the stability of their coefficients over time. While the first two studies signal the lack of stability of their coefficients through time, Feder-Uy's coefficients seem immutable. Similarly, Angeloni-Short, Sargen and Haegele incorporate separate dummy variables for different types of economies (centrally planned economies, developed countries, LDCs and oil producing countries) and obtain significant coefficients for these dummies. This suggests that it might be profitable to continue to explore these intercountry and intertemporal differences.

Table 4

Risk Premium Analysis

"Successful and Unsuccessful Explanatory Variables"

	1. Sargen (1976)[a]	2. Feder and Just (1977b)[b]	3. Brittain (1977)[c]	4. Angeloni and Short (1980)[d]	5. Feder and Just (1980)[e]	6. Haegele (1980)[f]	7. Edwards (1984)[g]	8. Burton and Inoue (1985)[h]	9. Edwards (1985)[i]	10. Feder and Uy (1985)[j]
1. Terms of Loans Variables										
Loan duration (maturity)	-	+			+		0	0	0	
Amount of the loan						-	0	+	0	
Basic rate[k]								0		
World liquidity						-				
2. Variables Related to the Probability of Debt-Servicing Problems										
(A) Debt Statistics										
DSR	+	+			+		+		+	
Debt/GNP		0	+				+		+	-
Debt amortization/Debt		0		+						
Debt/Exports								-		
IMFQT[L]								0		
(B) Debtor's Economic Performance										
(B.1) Current Account Related Indicators										
Import/GDP		+			+				0	
Current account/Exports								-		
Export fluctuations		+								
Current account/GNP						-	+		0	
Real effective exchange rate[M]									0	
Average export growth										+
Export vulnerability index[N]										+
(B.2) Reserves Related Indicators										
Imports/Reserves		+		+				+		-
Reserves/GNP							-		0	
(B.3) Indicators Reflecting the Macroeconomic Management										
Inflation rate	+					+		+		
Political variable[O]								0		-
(B.4) Indicators Reflecting Gorwth of GNP and Investments										
GNP per capita		0				-			0	+
Projected GDP growth		-								
Ranking of countries creditowrthiness from Institutional Investor									0	
Investments/GDP				+						
							-	0	-	

+: indicates that this variable has a positive and significant influence on the interest spread.

-: indicates that this variable has a negative and significant influence on the interest spread.

0: this variable is tested but is not significant.

The dependent variable of all these studies is the risk premium spread over the ordinary interest rate except for Feder-Uy (1985), see footnote 27, that is why signs are different for this study.

[a] Sample covering loans made to 14 developing countries during 1974-75.

[b] 102 observations on public and publicly guaranteed loans involving 27 countries during the years 1973-74. The reported regression corresponds to case 2.

[c] Sample covering loans made to 10 developing countries from 1965 to 1974.

[d] Sample covering loans made to 45 industrialized and less developed countries for the year 1978. The regression reported is no. 9.

[e] The sample contains 29 observations corresponding to 23 countries for the year 1975.

[f] Sample covering loans made to 20 countries during the period 1974-78.

[g] Sample covering loans made to 19 countries during the period 1976-80. The reported regression is 4.1.

[h] Sample covering loans made to 58 developing countries during the period 1972-77.

[i] 900 observations on bank loans made to LDCs between 1976 and 1980. The reported regression is 5.2.

[j] 405 observations on bank loans made to 55 LDCs between 1979-1983.

[k] Basic Rate: $B_t = \Delta WMS_t - \Delta WIF_t$, where ΔWMS_t denotes the annual growth rate of world money supply and ΔWIF_t is the annual growth rate of world-wide inflation.

[L] IMFQT: use of IMF credit, measured by a country's use of its quota as a percentage of that quota.

[M] for the exact meaning of this variable, see Edwards, S. and F. Ng., "Trends in Real Exchange Rate Behavior in Selected Developing Countries", Working Paper, the World Bank, 1985.

[N] Measure of export volatility: extent to which export revenues are concentrated in few commodities.

[O] Political Variable: represented by a simple arithmetic combination of unstable events; namely assassinations, general strikes, guerilla warfare, government crises, purges, riots, revolutions, anti-government demonstrations and coup d'état over the three preceding years. It is a dummy variable in Feder-Uy (1985)

Conclusion

This paper allowed us to review an important part of the literature on debt capacity and LDCs' borrowing. Using the indicator approaches, some authors tried to identify empirically the circumstances under which developing countries have experienced debt-servicing problems. Unfortunately, the models presented in this section suffered from a lack of behavioral underpinnings and in fact, were "searching for statistical relationships". Apart from this major reconsideration, some improvements could be reached by using another statistical technique (Tobit) with a non-dichotomous dependent variable, and by monitoring the stability of the coefficients through time and across countries. Building upon these preceding models, those authors considering the risk premium approach basically fell into the same traps and their work should also be re-examined. In sum, some valuable efforts have been made and we have opened the doors to fruitful avenues for pursuing further research.

Footnotes

* Graduate student at Queen's University. I am indebted to Jon Harkness, Barmak Arvin and Ted Horbulyk for helpful comments. The remaining errors are my own.

1. For precious articles in this vein see Dornbusch (1984), (1985a), (1985b), Balassa (1984), Cline (1985), Tremblay (1983), Lelart (1984) and Wiesner (1985).

2. On debt with potential repudiation see Eaton-Gersovitz (1980), (1981a), (1981b), Gersovitz (1985), Eaton-Gersovitz-Stiglitz (1986), Sachs (1982), Sachs-Cohen (1982), (1985), Coopers-Sachs (1985), Grossman-VanHuyck (1985), Kletzer (1984) and Krugman (1985).

3. See Domar (1950), Avramovich et al. (1964), King (1968), Solomon (1977) and Simonsen (1985). For an application, see Feder (1980).

4. For models that examine the evolution of debt through time in the context of an intertemporal optimizing framework see Bardhan (1967), Hanson (1974), McCabe-Silbey (1982), Dornbusch (1983), Martin and Selowsky (1984), Sachs (1984) and Engel-Kletzer (1986).

5. The term "default" is widely used in the literature to designate the typical debt-servicing problem. However, as noted by Eaton and Gersovitz (1981b), in the legal sense a default requires the lender to declare that the borrower has failed to honor the terms of the loan. But usually, arrears associated with a rescheduling of the debt (that involves no change in its present value) are referred to as default; although, legally, no default has occurred. Moreover, the "repudiation" of a loan is the explicit refusal by the borrower to pay interest and/or principal as originally agreed. Unlike repudiation, a default might be temporary.

6. For instance, one can consult Nagy (1978) who describes the system used by the Bank of Montreal where a detailed analysis of political and economic characteristics is made. It involves an evaluation of the likelihood of the different types of debt-servicing difficulties and the probable time of occurrence.

7. Indeed, he tries to synthetize the empirical and growth theory approaches by extending the Harrod-Domar growth model into a formal theory of creditworthiness. Some theoretical efforts are also made in the models with potential debt repudiation and credit rationing (see footnote 2), but at the expense of their empirical testability. Furthermore, these models deal with complete repudiations of debt which are far from common since the 1930's. Theoretical foundations should rather consider different types of debt-servicing problems.

8. For an introduction to this technique, see Amemiya (1985), pp. 58-60.

9. See Amemiya (1985), pp. 281-285, and Saini and Bates (1984), footnote 1, p. 344 to get more details on the technique. Eisenbeis (1977) points out some of the major difficulties encountered with discriminant analysis in economic and finance literature.

10. Eisenbeis (1977; p. 890) indicates this pitfall arguing that the "t" and "F" tests are not justifiable in the case of discriminant analysis. Indeed, contrarily to usual linear regressions, the discriminant function coefficients are not unique due to violations of the normality assumptions. However, the logistic distribution is approximately coincident with the normal distribution except at the extreme ends, appropriate statistical tests are thus available to determine the importance of individual factors.

11. For more details on this technique, see Saini-Bates (1984), footnote 4, or Amemiya (1985), pp. 268-319.

12. - Except Abassi-Taffler (1984).
    - McFadden et al. (1985), Kharas (1984) and Eigrechen-Portes (1985) use a probit instead of a logit, the only difference being the scale of the coefficients.

13. "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 (...)it makes more sense to claim that, in a specific period, the country was pushed beyond a critical level, leading to a rescheduling, than to claim that the country suddenly became a member of another species" [Feder and Just (1977a, p. 26)].

14. The way to compute the statistical performances from a discriminant or a logit analysis is similar. Here, we present how to deal with the logit analysis.

    In the estimation, the logit regression has this form:

$$Z_t = f(x_1, x_2, \ldots, x_i)$$

    where Z_t is the variable indicating the presence of a rescheduling in year t.

    In the logit method, once an equation of this form is statistically estimated (using maximum of likelihood techniques), the resulting dependent variable Z may be transformed into an indicator of the probability of rescheduling, as shown in the following equation:

$$P_C^R = \frac{1}{(1+e^{-Z})}$$

The best indicator of the model's performance is the degree of its success in predicting the occurrence and absence of rescheduling. It is thus necessary to transform the logit measure "estimated Z" into a composite probability of rescheduling using equation (1). Moreover, it is necessary to choose a threshold probability, P_C^{R*}, above which a country is predicted to reschedule and below which no rescheduling is predicted. One possible approach in logit analysis is simply to choose 0.5 as the critical threshold, the implication being that if the composite probability exceeds .5, rescheduling should be predicted. However, this often results in an extremely unbalanced distribution of errors. Therefore, the procedure usually adopted is to minimize the sum of total errors subject to a relatively equal percentage of errors in the two classes of observations.

McFadden (1976) considers the theoretical appropriateness of logit analysis and discriminant analysis under different circumstances.

15. Abassi and Taffler (1984) refer to this result in justifying their use of the discriminant analysis. Moreover, they argue that, generally, there is little evidence in the literature on the superiority of the logit analysis.

16. A voluntary rescheduling happens when there are no balance of payments problems, but rather when such a measure enables the nation to achieve an accelerated pace of development (eg. Turkey and India in the late 1960's). On the other hand, support loans are those which permit the country to avoid rescheduling.

17. Indeed, they use a two-limit probit model that is a generalization of the Tobit model to the case where the data are censored at both tails. See Amemiya (1985), pp. 373-408.

18. Schmidt (1984) also indicates that the lack of timely short term (annual) data may constitute an obstacle to the practical value of rescheduling functions for bankers.

19. As Avramovich points out, it can be shown that, historically, some countries (such as Canada during the early 1930's) have experienced very high debt-service ratios without rescheduling.

20. Also concerning the data, Feder, Just and Ross (1981) use newly available data on private (non-guaranteed) external debt that are included on the grounds that such debt contributes to the pressure on foreign exchange resources and should be accounted for (Cline (1984) also uses these data).

21. For instance, the debt-service ratio (debt-service payments/exports) squared term turns out to be negative indicating that the effect of high debt-service ratios is reduced as the variable increases in value.

22. The word "predicting" is probably misleading in this context. In fact, they "explain" a rescheduling that has actually occurred in 1980 with the data of 1975.

23. For instance, Lanoie (1984), with the Tobit model, tries to identify the critical size of a firm at which the firm will start having R&D activities. Similarly, Hageman (1981) seeks to deduce the level of income at which a household will start travelling during his vacation.

24. For opinions in this sense, see Dornbusch (1984), Wiesner (1985) and Zecher (1983).

25. See Table 4, the study of Feder-Ross (1982) is also surveyed, but because of a different methodology, it is not included in the table.

26. London Interbank Offered Rate.

27. Instead of explaining the creditors' perception of the country's risk by the interest rate differential (or spread), Feder and Uy (1985) use, as dependent variables, a countries' creditworthiness ranking which is published every six months by the Institutional Investor. This ranking probably constitutes a better indicator of the creditors' perception, so its use seems to be an improvement over preceding studies.

28. In Angeloni-Short (1980), the probability of rescheduling is not included in the independent variables. Instead, they model directly the expected loss rate as a function of typical creditworthiness indicators.

29. Feder and Ross (1982) proceed differently. They do not directly verify any hypothesis that relates the risk perception to the interest differential. Instead, using a ranking of countries' creditworthiness (from the "Institutional Investors"), the observed interest rates and other loan terms, they maximize the likelihood function over the unknown paramaters of the model: the expected loss in the grace period, the expected loss in the rest of the borrowing period, and the time horizon of the banks. The results show that bankers expect low conditional loss rates on loans to LDCs governments.

Bibliography

Abassi, B. and R.J. Taffler, "Country Risk: A Model for Predicting Debt Servicing Problems in Developing Countries", in Journal of the Royal Statistical Society, Series A, Vol. 147, part 4, 1984, pp. 541-568.

Amemiya, T., Advanced Econometrics, Cambridge, Harvard University Press, 1985, 521 p.

Angeloni I. and B.K. Short, "The Impact of Country Risk Assessment on Eurocurrency Interest Spreads: A Cross-section Analysis", International Monetary Fund, Document DM/80/35, 1980, 25 p.

Avramovich, Dragoslav, et al., Economic Growth and External Debt, Baltimore, John Hopkins Press, 1964, 207 p.

Balassa, Bela, "The Problem of the Debt in Developing Countries", World Bank Development Research Department, 1984, Report No. DRF88, 39 p.

Bardhan, Pranab K., "Optimum Foreign Borrowing", in Karl Shell (ed.), Essays on the Theory of Optimal Economic Growth, M.I.T. Press, 1967, pp. 117-28.

Brittain, B., "Developing Countries' External Debt and the Private Banks", in Banca Nazionale del Lavoro Quarterly Review, 1977, no. 30, pp. 365-80.

Burton, F.W. and H. Inoue, "The Influence of Country Risk Factors on Interest Rate Differentials on International Bank Lending to Sovereign Borrowers", in Applied Economics, June 1985, 17(3), pp. 491-507.

Callier, Philippe, "Further Results on Countries Debt-Servicing Performance: the Relevance of Structural Factors", in Weltwirtschaftliches Archiv., 1985, 121(1), pp. 105-115.

Cline, William (1984), International Debt: Systemic Risk and Policy Response. Washington, MIT Press, 1984, pp. 205-239.

_____ (1985), "Long-Term Forecasts in International Economics", in American Economic Review, (75), (2), pp. 120-26.

Cooper, R. and J. Sachs, "Borrowing Abroad: The Debtor's Perspective", in G.W. Smith and J.T. Cuddington (eds.), International Debt and the Developing Countries - A World Bank Symposium. Washington, The World Bank, 1985, pp. 21-60.

Dhonte, Pierre, "Describing External Debt Situation: A Roll-Over Approach", in IMF Staff Papers, March 1975, Vol. 22, pp. 159-86.

Domar, Evsey, "The Effect of Foreign Investment in the Balance of Payments", in American Economic Review, December 1950, pp. 805-826.

Dornbusch, Rudiger (1983), "Real Interest Rates, Home Goods, and Optimal Borrowing", in Journal of Political Economy, Vol. 91, No. 1, pp. 141-153.

_____ (1984), "On the Consequences of Muddling Through the Debt Crisis", in World Economy, 7(7), pp. 145-161.

_____ (1985a), "External Debt, Budget Deficits and Disequilibrium Exchange Rates", in G.W. Smith and J.T. Cuddington (eds.), International Debt and the Developing Countries - A World Bank Symposium. Washington, The World Bank, pp. 213-235.

_____ (1985b), "Policy and Performance Links Between LDC Debtors and Industrial Nations", in Brookings Papers on Economic Activity: (2), pp. 303-56.

Eaton, J. and M. Gersovitz (1980), "LDC Participation in International Financial Markets: Debt and Reserves", in Journal of Development Economics, 1980, 7(1), pp. 3-21.

_____ (1981a), "Debt with Potential Repudiation: Theoretical and Empirical Analysis", in Review of Economic Studies, April 1981, Vol. 48, pp. 289-309.

_____ (1981b), "Poor-Country Borrowing in Private Financial Markets and Repudiation Issue", Princeton Studies in International Finance Section, No. 47, Princeton University, June 1981, 44 p.

_____ and J.E. Stiglitz (1986), "The Pure Theory of Country Risk", NBER, Working Paper No. 1894, 58 p.

Edwards, Sebastian (1984), "LDC Foreign Borrowing and Default Risk: An Empirical Investigation", in American Economic Review 74, September 1984, pp. 726-34.

_____ (1985), "The Pricing of Bonds and Bank Loans in International Markets: An Empirical Analysis of Developing Country's Foreign Borrowing", NBER, Working Paper No. 1689, 19 p.

Eigrechen, B. and R. Portes, "Debt and Default in the 1930's: Causes and Consequences", Harvard Institute of Economic Research, Discussion Paper No. 1186, 1985, 61 p.

Eisenbeis, Robert A., "Pitfalls in the Application of the Discriminant Analysis in Business, Finance, and Economics", in Journal of Finance, June 1977, Vol. 32, pp. 875-900.

Engel, C. and K.M. Kletzer, "International Borrowing to Finance Investment", NBER, Working Paper No. 1865, 1986, 38 p.

Feder, G., "Economic Growth, Foreign Loans and Debt Servicing Capacity of Developing Countries", in Journal of Development Studies, 1980, Vol. 16, pp. 352-68.

_____ and R.E. Just (1977a), "A Study of Debt Servicing Capacity Applying Logit Analysis", in Journal of Development Economics, March 1977, Vol. 4, pp. 25-38.

_____ (1977b), "An Analysis of Credit Terms in the Eurodollar Market", in European Economic Review, May 1977, Vol. 9, pp. 221-43.

_____ and K. Ross, "Projecting Debt Servicing Capacity of Developing Countries", in Journal of Financial and Quantitative Analysis, December 1981, Vol. 16, pp. 651-69.

_____ and K. Ross, "Risk Assessments and Risk Premiums in the Eurodollar Market", in Journal of Finance, June 1982, Vol. 37, pp. 679-91.

_____ and L.V. Uy, "Determinants of International Creditworthiness and their Policy Implications", in Journal of Policy Modeling, Spring 1985, Vol. 7, No. 1, pp. 133-156

Frank, C.R. and W.R. Cline, "Measurement of Debt Servicing Capacity: An Application of Discriminant Analysis", in Journal of International Economics, Vol. 1, August 1971, pp. 327-44.

Gersovitz, Mark, "Banks' International Lending Decisions: What we Know and Implications for Further Research", in G.W. Smith and J.T. Cuddington, (eds.), International Debt and the Developing Countries - A World Bank Symposium. Washington, The World Bank, 1985, pp. 61-79.

Grinols, E., "International Debt Rescheduling and Discrimination Using Financial Variables", manuscript, U.S. Treasury Department, Washington, 1976.

Grossman, H.I. and J.B. VanHuyck, "Sovereign Debt as a Contingent Claim: Excusable Default, Repudiation and Reputation", NBER, Working Paper No. 1673, 1985, 19 p.

Haegele,M.J., "The Market Still Knows Best", in Euromoney, May 1980, pp. 121-128.

Hageman, R.P., "The Determinants of Household Vacation Travel: Some Empirical Evidence", in Applied Economics, 1981, 13, pp. 225-234.

Hanson, James A., "Optimal International Borrowing and Lending", in American Economic Review, Vol. 64, September 1974, pp. 616-30.

Kharas, Homi, "The Long Run Creditworthiness of Developing Countries: Theory and Practice", in Quarterly Journal of Economics, August 1984, pp. 415-439.

King, B.B., "Notes on the Mechanics of Growth and Debt", World Bank Staff Occasional Papers, No. 6, Johns Hopkins University Press, Baltimore, 1968.

Kletzer, K.M., "Assymetries of Information and LDC Borrowing with Sovereign Risk", in Economic Journal, 94, June 1984, pp. 287-307.

Krugman, Paul, "International Debt Strategies in an Uncertain World", in G.W. Smith and J.T. Cuddington (eds.), International Debt and the Developing Countries - A World Bank Symposium. Washington, The World Bank, 1985, pp. 79-100.

Lanoie, Paul, "Les déterminants de l'effort inventif dans le secteur canadien des produits électriques: une application du modèle Tobit", M.A. essay completed at l'Ecole des Hautes Etudes Commerciales, February 1984, 88 p.

Lelart, Michel, "Le nord et le sud face à la crise financière internationale", in Economies et Sociétés, june 1984, pp. 59-79.

Martin, R. and M. Selowsky, "Energy Prices, Substitution, and Optimal Borrowing in the Short Run", in Journal of Development Economics, 1984 (14), pp. 331-350.

Mayo, A. and A.G. Barrett, "An Early-Warning Model for Assessing Developing-Country Risk", in S.H. Goodman (ed.), Financing and Risk in Developing Countries. New York, Praeger Publishers, 1978, pp. 81-87.

McCabe, J.L. and D.S. Sibley, "Optimal Foreign Debt Accumulation with Export Revenue Uncertainty", in International Economic Review, Vol. 17, 1982, pp. 675-686.

McDonald, D.C., "Debt Capacity and Developing Country Borrowing: A Survey of the Literature", in IMF Staff Papers, 1982, pp. 603-641.

McFadden, D., "A Comment on Discriminant Analysis "versus" Logit Analysis", in Annals of Economic and Social Measurement, Fall 1976, Vol. 5, pp. 511-23.

McFadden, D. et al., "Is there Life after Debt?: An Econometric Analysis of the Creditworthiness of Developing Countries", in G.W. Smith and J.T. Cuddington, International Debt and the Developing Countries - A World Bank Symposium. Washington, The World Bank, 1985, pp. 179-209.

Nagy, P., "Quantifying Country Risk: A System Developed by Economists of the Bank of Montreal", in Columbia Journal of World Business, Fall 1978, Vol. 13, pp. 135-47.

Sachs, Jeffrey D. (1982), "LDC Debt in the 1980s: Risk and Reforms", in Paul Wachtel (ed.), Crises in the Economic and Financial Structure. Mass.: Lexington, 1982, pp. 197-243.

_____ (1984), "Theoretical Issues in International Borrowing", Princeton Studies in International Finance, No. 54, 41 p.

_____ and D. Cohen (1982), "LDC Borrowing with Default Risk", NBER Working Paper No. 925.

_____ (1985), "Growth and External Debt under Risk of Repudiation", NBER, Working Paper No. 1703, 40 p.

Saini, K. and P. Bates, "Statistical Techniques for Determining Debt-Servicing Capacity for Developing Countries: Analytical Review of the Literature and Further Empirical Results", Federal Reserve Bank of New York, Research Paper No. 7818, September 1978.

_____, "A Survey of the Quantitative Approaches to Country Risk Analysis", in Journal of Banking and Finance, 1984, 8, pp. 341-356.

Sargen, N.P., "Commercial Bank Lending to Developing Countries", in Federal Reserve Bank of San Francisco Economic Review, Winter 1976, pp. 20-31.

_____, "Economic Indicators and Country Risk Appraisal", in Federal Reserve Bank of San Francisco Economic Review, Fall 1977, pp. 19-35.

Schmidt, R., "Early Warning of Rescheduling", in Journal of Banking and Finance, 1984, 8, pp. 357-370.

Simonsen, M.H., "The Developing-Country Debt Problem", in G.W. Smith and J.T. Cuddington (eds.), International Debt and the Developing Countries - A World Bank Symposium. Washington, The World Bank, 1985, pp. 101-128.

Swoboda, A.K., "Debt and the Efficiency and Stability of the International Financial System", in G.W. Smith and J.T. Cuddington (eds.), International Debt and the Developing Countries - A World Bank Symposium. Washington, The World Bank, 1985, pp. 151-175.

Tremblay, R., "L'endettement international et les problèmes d'ajustement: une perspective générale", in L'Actualité Economique, June 1983, 59(2), pp. 283-325.

Wiesner, E., "Latin America Debt: Lessons and Pending Issues", in American Economic Review, May 1985, pp. 191-95.

Zecher, J.R., "The Effects of the Current Turbulent Times on American Multinational Banking: An Overview", in Journal of Banking and Finance, 1983, 7, pp. 625-637.