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Analyzing Country Risk: Estimating the Probability of External Debt Repudiation in the Post-Oil-Embargo Decade

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ANALYZING COUNTRY RISK:

Estimating the Probability of External Debt Repudiation in the Post-Oil-Embargo Decade

by

Thomas J. Webster

A dissertation submitted to the Graduate Faculty in Economics in partial fulfillment of the requirements for the degree of Doctor of Philosophy, The City University of New York.

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ABSTRACT

ANALYZING COUNTRY RISK:

Estimating the Probability of External Debt Repudiation
in the Post-Oil-Embargo Decade

by

Thomas J. Webster

Advisor: Professor Michael Edelstein

This dissertation examines the use of logit analysis as a tool for assessing the likelihood that a sovereign risk cannot, or will not, adhere to the terms of its foreign debt obligations as a result of adverse political, social, economic, or financial disruptions. The discussion is divided into two parts. Part one is devoted to a review of the topic of assessing the likelihood of debt servicing difficulties by borrower nations by first tracing the growth of international bank lending activities by U.S. commercial banks, followed by a general discussion of the international debt crisis and a brief survey of some of the conventional approaches employed by many international institutions to assess overseas lending risk. Part one continues with a survey of a variety of social, economic, and political considerations incorporated into the risk evaluation process and concludes with a discussion of how these factors are integrated into the microeconomics of international bank lending.

Part two of this study discusses specifically the use of logit analysis as a tool for evaluating country risk under alternative sub-set data specifications. It begins with a review of the major empirical studies on the use of econometric techniques for predicting the incidence of foreign debt repudiations followed by an investigation of the rescheduling process subsequent to the first oil price "shock" in 1973-74. The analysis attempts to improve and expand upon the work of others by specifically addressing a variety of empirical and theoretical deficiencies present in earlier studies. The paper concludes with a discussion of the possible presence of dynamic elements in the rescheduling process which may ultimately help to improve upon the predictive performance of the logit model.

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PREFACE

Between 1974 and 1981 I had the opportunity of working for two of the largest money center banks in the United States. The first of these banks is located in Chicago where I was a loan officer in the International Division. A few years later I held the position of an international economist with one of the largest New York based commercial banks. Coincidentally, the period since 1974 has been one of monumental change in the U.S. banking industry. Starting with the OPEC oil embargo in late 1973 and the subsequent quadrupling of oil prices the commercial banking system assumed ever increasing importance in the international financial community. This has also been a learning period for the major western banks, and has not been without its share of growing pains.

Today the international financial community stands at a crossroad. Massive overseas exposure in the form of outstanding loans and repayment problems are prompting a fundamental reevaluation of the basic tenets of free enterprise in international lending. Not the least of these concerns, and one which has haunted commercial bankers since the late 1970's, is the evaluation of country risk as it relates to present and future lending decisions. This paper is an attempt to focus on this issue and hopefully to provide

a clearer understanding of the issues involved and the dilemma currently facing economic policy makers.

This paper will examine a few of the multitude of considerations facing analysts when examining the liklihood that a particular sovereign risk cannot, or will not, honor its overseas obligations. In particular, this paper will focus on the use of logit analysis as a tool for assessing default risk, in spite of the fact that this technique has been shown to suffer from a combination of theoretical and practical shortcomings. Part one of this paper is devoted primarily to a review of the general topic of assessing the liklihood of debt servicing difficulties of borrower nations. Chapter one discusses the growth of international lending activities by U.S. commercial banks as well as its present involvement in the international debt crisis. In addition, this chapter will examine the genesis of the prevailing international debt crisis as well as its potential impact not only on the commercial banking system in the United States but its macroeconomic implications as well. Chapter two takes a closer look at the subject of international bank lending per se. In particular, this chapter will provide a working definition of what is commonly referred to as "country risk" and provides a theoretical paradigm of the rescheduling process. The chapter will close with a brief discussion of some of the conventional approaches employed by many commercial banks to assess country risk thereby developing a framework within which to ascertain the

likelihood of a debt repudiation. Chapter three will then lay the foundation for the actual process of country risk evaluation by first discussing a variety of social, economic, and political considerations, and then to integrate these considerations into the microeconomics of commercial bank overseas lending. The discussion is by no means comprehensive but is intended to provide a flavor for the actual considerations employed in the lending process.

Part two of this study discusses the use of logit analysis as a tool in the evaluation of country risk. Specifically, logit analysis is an econometric technique which is used for predicting the probability of a binary valued event; in this case the incidence of "default" or "no default." Chapter four reviews some of the principal studies in the use of econometric techniques for predicting the incidence of foreign debt reschedulings that have been employed since the early 1970's. Chapter five constitutes an empirical investigation of debt reschedulings which have occurred since the OPEC oil embargo and subsequent oil price "shocks." This analysis will utilize the logit analysis framework under alternative data specifications. The purpose of this procedure is to investigate the predictive performance of the logit model in the light of the major international structural shifts which have occurred in the advent of the developments of the early 1970's. After this a number of innovations will be introduced in an attempt to improve upon the model's descriptive and predictive accuracy. Chapter six will summarize the results of the empirical

investigations presented in chapter five followed by a brief discussion of the possible presence of dynamic elements in the rescheduling process which may improve upon the model's predictive performance. Chapter six will close with some brief concluding remarks.

PART I: AN OVERVIEW

Chapter 1

Introduction

During the course of the last two decades the banking industry in the United States has undergone many changes. Of these the most significant has been the broadening participation of large money center and regional U.S. banks in overseas activities. In 1965, for example, the U.S. foreign banking presence was represented by 13 large banks operating 211 overseas branches with assets of only $9.1 billion. By 1971, there were 91 U.S. banks operating 583 overseas branches with combined assets totalling $67.1 billion. Six years later the number of banks stood at 130, with 738 overseas branches and assets of $259.0 billion, almost four times the total overseas assets of 1971. This figure equalled 22 percent of domestic bank assets and over three times the total equity capital of U.S. banks. By December 31, 1983, total assets of U.S. money center and regional commercial banks ballooned to a phenominal $376.3 billion, more than 400 percent of the figure recorded just eighteen years earlier.(1) Several factors contributed to this expansion. The tremendous growth of international trade, full convertibility of most major currencies, and the rapid overseas expansion of major U.S. corporations in the 1960's which generated the need for a U.S. banking presence

abroad. Moreover, during this period a new financial institution developed in the form of the Euromarket which enabled foreign branches of commercial banks to raise needed funds outside the U.S. without being subject to domestic reserve requirements and interest rate ceilings. Additionally, in the period 1965 to 1974 U.S. banks were affected by the Voluntary Credit Restraint Program that restricted the making of foreign loans directly from their domestic offices. As a result, banks were encouraged to fund their overseas lending from external sources. This meant that banks without foreign branches, or at least what was called "a window on the Eurodollar market," were at a disadvantage in competing for international business.

Beginning in 1974, international banking took on a new character with new dimensions. The quadrupling of oil prices at the end of 1973 and early 1974 resulted in massive trade and payments surplusses for oil-exporting countries while the major oil-importing countries suffered severe reversals in their international payments accounts. Commercial banks played a key role in the process of financial intermediation between the surplus and the deficit nations. As a result, international lending expanded by an impressive 44 percent in the short period between year-end 1974 and 1976.

With the explosion of international banking activities in the past two decades and consequent large scale overseas lending, however, the international financial system has become vulnerable to the potential impact of outright default or serious disruption of external debt servicing obligations

by, especially, East European and non-oil-producing less developed countries (NOLDC's). This vulnerability stems not only from the fact that a large proportion of this outstanding debt is owed to private commercial banks, but also because the amounts owed are rather substantial relative to bank capital. Because of the pivotal role which commercial banks play in national economies, especially as regards to the domestic monetization process, and because outstanding loans are highly leveraged against a relatively small capital base, significant debt repudiations could jeopardize international economic stability.(2)

Table 1 illustrates the trend in U.S. bank lending in the period 1977-82. Since 1977 the ratio of bank exposure to capital has risen from 131.6 percent to 155.0 percent in 1982. Of the nine largest U.S. commercial banks this figure has grown from 188.2 percent to 221.2 percent, although it ought to be kept in mind that in spite of these figures this represents only a modest portion of total bank loans. For example, in spite of the fact that outstanding loans accounted for 282.8 percent of capital of the nine largest U.S. commercial banks in 1982, this was only 14 percent of total bank assets.(3)

As a further illustration of the severity of the present situation consider table 2 which highlights the exposure of the eighteen largest U.S. banks to five Latin American countries, all of which experienced debt servicing problems since 1982. For Citibank, BankAmerica, Chase

Manhattan, Manufacturers Hanover Trust, Chemical, and Crocker National exposure to these five countries alone was in excess of 150 percent of total bank capital.

What are the implications of these developments to the U.S. banking system? As of mid-1982 the ten largest debtor nations[4] owed U.S. commercial banks a total of $221 billion. The top five (Mexico, Brazil, Argintina, Chile, and Venezuela) alone owed $56 billion to the sixteen largest U.S. commercial banks (with capital in excess of $1 billion) leveraged against total bank capital of $36 billion (including shareholder's equity, subordinated notes, and reserves against possible loan loses). On this basis these banks generated total net profits of roughly $4 billion ($7 billion pretax). In a worst case scenario a unilateral repudiation of just a single year's interest and principal repayments could amount to some $17 billion. After wiping out profits this would mean that $10 billion would have to be absorbed from bank capital, i.e. a 28 percent reduction. This loss of capital would force banks to reduce their outstanding loans by roughly $200 billion in order to conform to the 5 percent ratio of capital to loans adopted for large banks in mid-1983 by bank regulators. This, of course, would translate into a severe contraction of the domestic money supply necessitating massive federal intervention. As Michas and Wojtyla have noted:

> "In a crisis the Fed could pump in reserves, but reserves aren't bank capital, so the Fed or the Congress would have to inject government capital into the banks. Would all the banks be saved or would there be mass mergers, such as are going on in the oil industry with the top 16 (30?) banks reduced to just three or four?"(5)

Even under the worst of circumstances this body of debt would unlikely become worthless overnight. Nevertheless, in light of recent overseas lending activity can there be any doubt as to why the Federal Reserve, indeed the entire international financial community is deeply worried about the prevailing external debt situation? Can there be any doubt, for instance, why Federal Reserve Chairman Paul Volcker has repeatedly urged Congress to lessen the size of the federal deficit in order to relieve the pressure on the overall interest rate structure there by reducing the burden of debt servicing by the non-oil producing less developed countries?

Historical Background

On October 19-20, the Organization of Petroleum Exporting Countries (OPEC)(6) imposed an embargo on exports of oil to the United States and the Netherlands following the onset of the third Arab-Israeli war earlier in the month. This was followed shortly thereafter by a rise in the posted price of petroleum from $3.011 to $5.119 per barrel, an increase of almost 70 percent. In subsequent years the spot market price of Saudi Arabian light crude rose from roughly $2.70 per barrel in 1973 to around 11.50 per barrel in 1976. By year-end 1983 the price of crude oil had risen to approximately $30 per barrel. These price hikes, or "shocks"

as they were popularly dubbed by the press, were to have profound social, political, and economic consequences.

For many Americans the embargo and subsequent oil price increases are remembered for the irritations of long lines at gasoline stations and for relatively minor reductions in real living standards. For the rest of the world, however, particularly the non-oil-producing less developed countries, these events were to foreshadow a profound change in those countries economic and political fortunes. The events of the early and mid-1970's represented a transfer of current economic resources from one sector of the global economy to another unparalleled in history. A cursory examination of sectoral current account balances (7) serves to illustrate the magnitude of the transfer. In 1973 the Organization for Economic Cooperation and Development (OECD), a consortium of the world's most economically advanced nations, ran a combined current account surplus totalling $9.9 billion, while the NOLDC's exhibited a deficit of $6.2 billion. OPEC, on the other hand, ran a combined current account surplus of $7.7 billion. One year later the OECD countries were sporting a combined deficit of $27.5 billion (a turnaround of $37.4 billion), while the NOLDC's deficit increased to $23.3 billion (or a worsening of $17.1 billion). On the other side, the current account surplus of OPEC expanded to $59.5 billion (or an increase of nearly $52 billion).

The first major concern of the petroleum importing countries during the initial stages of the oil price increase was how to ameliorate the impact of these developments on

economic growth. Virtually all parties involved in the formulation of policy at this time feared a severe downturn in world economic growth. For the most developed countries (MDC's) the increased petroleum bill could be financed in large measure by reduced consumption of non-essential imports and the promulgation of commercial policies designed to promote exports, notably manufactures. In the case of the United States, by virtue of the fact that petroleum sales were denominated in U.S. dollars, the increase in prices eventually manifested itself as a growing federal budgetary deficit, an accelerated inflation rate, and domestic economic recession. For the NOLDC's the problem was even more vexatious. The NOLDC's did not possess the import compressibility of the MDC's and the prospects of a severe economic depression were imminent. To make matters worse, NOLDC exports (typically agricultural and primary products) were demand inelastic.(8) For these countries the consequences of widespread unemployment and higher prices for essential imports threatened political instability and social chaos.

Within international economic circles the quintessential question was how to channel the considerable petroleum revenues of OPEC back to the NOLDC's to enable them to pay for higher priced oil imports. This was the so-called "petrodollar" recycling problem. In retrospect the short-run solution to the initial problem appears to have been relatively painless. Most of the oil revenues earned by OPEC

during this period made its way back to the OECD countries through the system of international financial intermediation. Flush with oil dollars the petroleum exporting countries enthusiastically pumped these funds back into North America, Europe, and Japan by purchasing real and financial assets, including real estate, corporate and government securities, precious metals, bank deposits, etc. In no time at all the coffers of the major western banks were overflowing with petrodollars. Given the worsening state of the world economy and the magnitude of the dollars involved there was only one place for these funds to go -- right back to the NOLDC's. As John Makin poignantly observed:

> "The huge transfer of resources from oil importers to oil exporters was a banker's dream. Overnight it (the first oil price shock) created a whole new category of borrowers and lenders: the oil buyer and the oil seller. The sellers were not very sophisticated in financial matters - they wanted to put their money in the bank. At first the bank's biggest problem was to recycle the money fast enough - to get it into the hands of borrowers in huge chunks while collecting their fees, which shot up simply as a reflection of the delightful fact that 1 percent of $100 million is ten times larger than 1 percent of $10 million. Jumbo loans are just as easy to make as large loans and yet much more profitable."(9)

By 1977 the process of recycling petrodollars back to the NOLDC's following the initial oil price shock was complete and the major commercial banks were patting themselves on the back for having resolved a major international financial crisis.

The LDC Debt Crisis

The recycling of petrodollars has continued to the present day, however, the crisis is far from over. The solution to the short-run problem is having serious long-run side effects. In 1973 total outstanding and disbursed medium- and long-term foreign debt of the less developed countries (LDC's), both oil and non-oil producing, was approximately $135 billion. Four years later this figure had risen to $211 billion. By some estimates total outstanding debt of the LDC's in 1984 will have reached as high as $790 billion. For a more detailed profile of the total debt picture consider tables 3 and 4. (10)

The single most important cause for the phenominal growth in total external debt, particularly of the NOLDC's, was the sharp increases in oil prices in 1973-74 and again in 1979-80. Consider, for example, table 5 which illustrates a variety of external debt indicators for NOLDC's in the period 1973-82. As a percentage of total, oil imports rose from roughly 6 percent in 1973 to around 20 percent in 1980-82. Table 6 illustrates the hypothetical impact of higher oil prices on these countries in terms of the cumulative additional costs over and above what would have occured had the price of oil risen by no more than the U.S. wholesale price index. As indicated by the table the cumulative total of additional costs incurred amounted to nearly $260 billion in the decade 1974-84. This figure does not, of course, refer to the actual rise in foreign debt since there are a variety

of mitigating and debilitating factors to consider, such as export trends, policy measures to reduce oil imports, interest rate movements, etc., nevertheless it does provide an overall sense of the pressures which must have been felt by local authorities to increase the inflow of foreign capital.

It is clear, therefore, that the surges in oil prices set the stage for the phenominal increase in external debt over the last decade. Yet, this burden might have ameliorated over time with no untoward consequences had it not been for the global recession and skyrocketing interest rates of 1980-82.

In addition to the dramatic growth in LDC debt outstanding there was also a hardening of financing terms. Prior to 1976 the bulk of developing country financing was done at the official level at relatively soft terms, i.e. below market interest rates with liberal repayment schedules. After 1976, however, not only did the terms of official borrowings begin to harden somewhat but debtor nations had begun to turn towards private financial institutions with increasing regularity. The bulk of private financing came from the large western commercial banks at interest rates which were, more often than not, based upon eitner the London Inter-Bank Offer (LIBOR) or U.S. prime rate, with much shorter payout periods.[11] Cline has estimated,[12] for example, that in the period 1961-70 average real interest rates[13] on NOLDC external debt averaged 4.1 percent. This

rate dropped to an incredible -.8 percent in the period 1971-80. In 1979 and 1980 although nominal rates were very high (LIBOR averaged 13.2 percent) so too was the U.S. inflation rate. By 1981-82, however, real interest rates had begun to explode as declines in inflation were not similarly matched by drops in nominal interest rates. In fact, LIBOR in 1981-82 rose to an average 14.8 percent, resulting in real interest rates of 7.5 and 11.0 percent, respectively. It has also been estimated by Cline[14] that this surge in interest rates, caused by expansionary fiscal and tight monetary policies in the U.S., accounted for approximately $41 billion in total excess interest payments in the period 1981-82 beyond what would have been anticipated on the basis of real interest rates over the previous two decades.[15]

As a consequence of these developments many debtor nations found it increasingly more difficult to service its external obligations. To make matters worse, a worldwide recession in 1980-82 caused commodity prices to fall thereby squeezing export earnings of many developing nations. Export unit values fell from 100 in 1980 to 94 in 1981 and to 90 in 1982 for non-oil producing developing countries,[16] while import unit values rose from 100 in 1980 to 103 in 1981 before falling back to 100 the following year. The total loss to NOLDC's in the period 1981-82 as a result of these changes applied on a trade basis has been estimated by Cline at $79 billion.[17] Unfortunately, these developments were not offset by growth in volume as real exports of non-oil developing countries, which averaged 8.1 percent in 1971-80

and 9.9 percent in 1981 before falling to 1.2 percent in 1982.

As a result of these developments Cline has established that the ex ante impact of these exogenous shocks was to increase external debt of NOLDC's by $401 billion. These figures are summarized in table 7 which also shows that the actual increase in debt amounted to $482 billion. Although these figures are not adjusted for policy measures promulgated by some countries to reduce the deficits they do, nonetheless, suggest that the huge increase in developing country debt may be attributed to developments largely outside the control of the countries themselves.

In addition to these exogenous shocks the borrowing nations themselves share some of the responsibility for their deteriorated debt situation. In some instances, notably in Brazil, short-term policies of rapid debt accumulation for the purpose of high rates of ecoonomic growth backfired when the resulting legacy of huge external debts became an oppresive burden in the face of a weakened international economy. In other cases, Argentina for example, faulty exchange rate policies resulted in overvalued currencies which culminated in high imports and poor export performance. In Venezuela and Mexico attempts to maintain an overvalued currency on a fully convertible basis, coupled with domestic interest rate policies, resulted in capital flight. In Argentina and Venezuela this outflow of capital is estimated to have accounted for roughly one-third of total debt, and

approximately one-fifth in Mexico.

In addition to short-term policy errors, long-term development strategies have been myopic. Over pricing of labor, excessive protection of industrialization programs based upon import substitution, ill-conceived and inefficient government enterprise activities, and other distortions have hindered growth.[18]

By 1982-83 the situation had deteriorated so badly that debt servicing problems had become epidemic. International debt problems were further aggravated by what Cline terms "psychological shifts" in the credit markets. Debt servicing breakdowns by a major country, according to Cline, has resulted in severely restricting capital flows to most of the rest of the region, to wit Poland's quasi-default in 1981 which pushed Romania into a debt rescheduling and other East European countries into severe debt servicing problems; Mexico's debt crisis in August 1982 causing a credit supply shock to Latin America resulting in reschedulings by Brazil, Chile, Peru, and Venezuela, along with debt-servicing difficulties by Costa Rica, Nicaragua, Bolivia, and Ecuador. The sharp curtailment of credit to Latin America is evidenced by data on U.S. bank loans outstanding which grew from $68.1 billion in June 1982 to $69.3 billion in December, an increase of only $1.2 billion, compared with $7.3 billion during the same period in 1981.[19]

Debt servicing disruptions during 1982-83, including formal reschedulings, reached approximately two-thirds of commercial bank debt owed by East European and developing

countries, while by year-end 1982 no less than 34 countries were in arrears on their debt. The amounts of debt formally rescheduled rose from $2.6 billion in 1981 to $5.5 billion in 1982, and again to roughly $90 billion in 1983.

In short, the international financial crisis which reached a peak in 1982-83 can be traced to five fundamental causes: higher oil prices in 1973-74 and 1979-80, high interest rates and global recession in 1980-82, local economic mismanagement, and the psychological shift in the international credit market which, as a result of debt servicing breakdowns, severely restricted the flow of new credit.

Recent Concern About the Risk of Overseas Lending

With the rapid rise in international lending and with an unstable international economic environment, lending risk has become the subject of much discussion in recent years. Much of the increased attention has focused on the growth of loans to LDC's. The magnitude of U.S. bank overseas lending, cases of debt reschedulings, and the greater possibility of outright default have contributed much to the fervor ot these discussions.

Between 1956 and 1975 eleven countries[20] underwent a total of 32 multilateral debt rescheduling exercises which provided about $7.5 billion in debt relief.[21] From 1976 until 1981, a mere half-dozen years later, there were an additional 23 major debt reschedulings involving fourteen

countries,[22] and providing $9.7 billion in debt relief.[23] In 1982 alone there were four major financial rescue operations undertaken involving the world's largest debtor nations - Brazil, Mexico, and, Argentina, along with Yugoslavia. Principal rescheduling was the essential element in each of these four cases, and typically involved restructuring on a five-to-eight year basis. Excluding Yugoslavia,[24] $30 billion in external debt was rescheduled, coupled with an additional $39 billion in additional financial support (including Yugoslavia), $14.7 billion of which was in the form of new loans from U.S. commercial banks. These rescue packages also typically carried rescheduling fees ranging from .5 to 1.5 percentage points, with relatively wide spreads above either LIBOR or the U.S. prime rate, usually around 2 percentage points.[25]

In 1977, hearings on overseas lending were conducted by the Senate Committee of Banking, Housing, and Urban Development. Concern over the impact of overseas lending activities upon the stability of the U.S. banking system was voiced by the three regulatory authorities charged with the responsibility of regulating the banking industry: The Federal Reserve, the Comptroller of the Currency, and the Federal Deposit Insurance Corporation. Together these agencies conducted a joint survey of foreign lending by U.S. commercial banks covering claims on foreign residents held at all domestic and foreign offices of 119 banks with assets of $1 billion or more. The findings of the survey led to a proposal by the Comptroller of the Currency to impose a legal

lending limit on national banks to foreign governments. The proposal expanded and clarified the federal regulation which prohibited any federally chartered bank from lending more than 10 percent of capital to any single forign government.

Under the ruling, national banks were no longer able to view government and state-controlled agencies as seperate and independent from the central government unless the borrower was able to demonstrate, first, that it had independent resources and income to pay back the loan, and second, that the proceeds of the loan would be used for the specific purpose intended. More recently, the regulatory authorities have explicitly considered the notion of "transfer risk" in sovereign lending which results from the inability of a country to generate sufficient foreign exchange to service its external debt.[26] In the past, commercial bankers have contended that sovereign lending was without risk due to the fact that there is no dissolution of the borrower as might otherwise occur under commercial bankruptcy. Together, these three agencies promulgated a five point program of bank regulation including: (a) a stricter examination of country exposure, (b) greater public disclosure of a bank's overseas portfolio, (c) new loan classifications[27] for writting-off or provisioning into reserves "bad" loans, (d) a stretch-out of reported income from loan fees, and (e) increased cooperation with foreign bank regulators including a greater sharing of International Monetary Fund (IMF) information on external debt. This program supplements the system developed

in 1978 to measure and monitor country risk as it is reflected in a bank's exposure and exposure management systems. This approach focuses on the degree of country concentration and diversification of foreign loans in individual bank portfolios and on the quality of information possessed by a bank in assessing the degree of risk attached to that portfolio. Authorities have, however, shied away from ratings of risk on a country by country basis since this would be tantamount to directing or influencing the flow of bank credit.

At the international level, a number of agencies are now attempting to improve international statistical information on capital movements. For example, the Bank for International Settlements (BIS), through the cooperation of major central banks, has developed a reporting system on external private borrowing and lending. Similar data on Eurodollar credits and loans from public sources have been on stream for quite a few years.

Chapter 2

Distinguishing Aspects of International Bank Lending

As in domestic lending, international lending involves risk as is subject to the same basic credit principles -- namely the definition of that risk, adequate knowledge and understanding of the borrower, including a thorough financial history, position and prospects, and a clear indication that the loan will be repaid.

The element that most distinguishes overseas lending from domestic lending, however, is the concept of country risk (with all that is involved) and the presence of sovereign risk. Even if the foreign customer is financially able to repay a loan, i.e. there is an acceptable banking risk in the sense of prospects of commercial bankruptcy, that customer's government may prevent the appropriate conversion of local currency into foreign exchange to repay the bank loan. This may result in default on the national level rather than the local private level.

The most widely accepted definition of sovereign risk is that it is the risk involved when claims are either against a foreign government itself or is backed by the full faith and credit of that government. Such risk is usually regarded as superior to non-sovereign risk because the government has management, good or ill, over its existing foreign assets as well as the flows of receipts and payments, stimulation or dampening, over goods and services exports and imports. On the other hand, the sovereign entity usually cannot be sued

due to its immunity to foreign prosecution, unless it waives that immunity. The principle of sovereign immunity recognizes the independent integrity of each sovereign state, asserting that no one state is superior to any other, and reflects general acceptance in international law that a sovereign cannot, without consent, be made a respondent in the courts of another sovereign.

In this connection, the U.S. passed the Foreign Sovereign Immunities Act in 1976 which set the standards by which questions of immunity are to be resolved as far as this country is concerned. The Act contains a general grant of immunity from the jurisdiction of the courts of the United States to each foreign state. An immunity from attachment, arrest, and execution is also granted with respect to a foreign state's property in the United States. Among the exceptions to such immunity are cases in which a foreign state engages in a commercial activity. In large degree this Act represents a codification of court-created law over the years rather than the breaking of any new ground.

The Nature of Country Risk

Country risk is the risk that a particular country cannot or will not adhere to the terms of its external obligations as a result of adverse political, social, economic, and financial developments. The term "default" is widely used in the literature to describe such debt servicing disruptions although this is a somewhat of a misnomer. Eaton and Gersovitz[29] point out, for example, that a loan is not

legally in default until the lender has declared that the borrower has failed to meet the terms of its obligations, a situation which has rarely been taken with respect to sovereign debt. When arrears have occurred, reschedulings have usually ensued. Such circumstances have, nonetheless, been referred to in the literature as "defaults." In what is to follow the terms defaults, reschedulings, and repudiations have been used interchangeably, unless where otherwise obvious from the text.

Whether the borrower is a government, a quasi-public company or a private entity, an appraisal of economic, social, and political conditions in the country becomes a vital element in evaluating the desirability of lending to the prospective borrower. Adverse political developments include such actions as expropriations, crippling legal restrictions, freezing of assets and nationalization; financial risks include devaluation, inconvertability of currency and rescheduling of external debt. They can occur singly or in combination and are usually the result of adverse economic or political changes. Thus, it is of crucial importance to the overseas lending operations of commercial banks to carefully assess the political, social, and economic environment of those countries in which they have outstanding committments.

The fundamental concern of every international lender is that sufficient foreign exchange will be available to countries in order to facilitate the orderly servicing of

their external debt. It is essential, therefore, to consider those factors which bear on a country's ability to meet its external obligations. Such factors are essentially those related to the availability of foreign exchange or the possible reduction in foreign exchange expenditure. The most important factors to be considered include:

- Revenues derived from exports of goods and services;
- Net factor remittances;
- Net inflow of capital through direct investment;
- External borrowings and foreign aid;
- International reserve holdings;
- Maneuverability for reduction of imports of goods and services.

These factors will be developed more fully in subsequent discussions regarding the choice of economic indicators used in flagging potential servicing disruptions.

When extending credit facilities to a foreign country, the question frequently arises as to the extent to which a bank ought to expose itself in any given country, not only in absolute terms but also in proportion to other countries. In this, concern is not over the countries with a high credit standing, nor with those countries where excessive political and commercial risks are so obvious that they are not regarded as creditworthy by private lenders. The international bank lender is rather concerned with the "in-between" cases. Who are they? How do they measure up in relation to each other? Where does the lender desire to place his finite resources in order to optimize his

international portfolio within the context of maximum return, liquidity, and security. In other words, the international lender is concerned, first, with the degree of exposure within each country individually, and then, more importantly, the net placed at risk in that country in relation to other countries as influenced by the size of his total portfolio commitment to foreign credit operations.

What then is exposure? Exposure in a foreign country consists of short-term credit lines and individual transactions with banks, individuals, private and government corporations, and governments for letters of credit, stand-by letters of credit, acceptances and advances, including temporary overdrafts. It also includes layoffs and foreign exchange positions and lines. Also included are firm unused commitments and term loans.

A commercial bank's exposure in any given country is the result of its cumulative credit decisions, possibly over many years, and represents the total commitment in any given country. A bank's first concern is how to determine limits to country exposure, while its basic preoccupation is with how much is at risk and the likelihood that a particular country will experience problems which might jeopardize the viability of its commitments.

The International Credit Market and Credit Rationing

We have thus far considered the possibility of a debt repudiation at the purely microeconomic level, i.e. from the

point of view of the individual lender. In other words, the discussion has thus far been centered exclusively on the topic of some sort of breakdown in the international credit market without having first given form and substance to the underlying nature of this market.

We know that a country's decision to default on its foreign debt is very often the result of that country's inability to earn, attract through investment, or borrow an amount of foreign exchange consistent with its perceived or actual requirements. As and when such conditions arise then a sovereign nation must make certain policy decisions. Either that country must implement domestic measures, such as import reductions, which may have adverse economic or political consequences, or it must reduce its outflow of foreign exchange through, say, a restructuring of its external debt obligations. In other words, a country is capable of reducing the drain in its financial resources through either internal measures, external measures, or a combination of the two.

In order to obtain a clearer understanding of the determinants of the international credit market consider the following simplistic short-run model of a global economy which is characterized by two countries, a net borrower and a net lender, and a financial intermediary. It will be assumed that exchange rates are fully flexible.[30] A flexible-exchange-rate system is a convertible-currency system in which the exchange rate is market determined after which no "deficit" in the balance of payments is possible. In other

words, the current account (defined as exports less imports plus net tourist expenditures, dividends, interest payments, insurance and shipping receipts, etc.) must be identically equal to the sign reversed capital account (defined as net borrowings from abroad, net purchases of foreign securities, and draw-downs of foreign bank accounts) with no change in international reserve holdings. A flexible-exchange-rate system stands in contrast to a fixed-exchange-rate system in which the government buys and sells foreign exchange in order to maintain the exchange rate at some fixed value. As a result international reserve holdings are likely to fluctuate. Consider, therefore, equations (2.1) and (2.2) which illustrate a simplified version of the balance of payments accounting identity for the borrower and the lender, respectively.

$$dR = [X(Y^*) - M(Y) - iD] + [B + I^F(i - i^*) - Q] = 0 \tag{2.1}$$

$$dR^* = [X^*(Y) - M^*(Y^*) - iD] + [B^* + I^F(i - i^*) - Q] = 0 \tag{2.2}$$

where

dR = the change in international reserves;

X = exports of goods and services as a function of foreign income;

M = imports of goods and services as a function of home income;

i = the real interest rate paid by the borrowing country;

D = total outstanding external debt;

iD = total interest payments;

Q = principal repayments on borrowings from foreign banks;

iD+Q = total debt service payments to foreign banks;

B = total new public and private borrowings from foreign banks;

L (=B-Q) = new net lending;

$I^{F}(i-i^*)$ = new net non-bank borrowings as a function of the difference between interest rates prevailing in the borrower country and the lender country, respectively. (31)

For the sake of simplicity it will be assumed that there exists no net dividend payouts to foreigners. This assumption is at least partially supported by the fact that many developing countries have imposed prohibitive restrictions on capital outflows. The inclusion of net foreign purchases of interest bearing securities into the analysis is justified on the grounds that the period since the late 1960's and early 1970's witnessed an unparalleled integration of the global economy as capital flows became increasingly sensitive to interest rate differentials. Both i^* and Y^* are assumed to be exogenously determined. Following from equations (2.1) and (2.2) it can be seen, therefore, that

$$[X(Y^*)-M(Y)-iD] = -[X^*(Y)-M^*(Y^*)+iD] \tag{2.3}$$

$$[B+I^{F}(i-i^*)-Q] = -[B^*+I^{F*}(i-i^*)-Q^*] \tag{2.4}$$

Define total investment demand of the borrowing country

as

$$I = I^{D}(i,Y) + I^{F}(i-i^{*}) \tag{2.5}$$

where $I^{D}(i,Y)$ is domestic investment as a function of the domestic interest rate and national income. The hypothesized first partials are

$$I^{D}_{i} < 0,\ I^{D}_{y} > 0,\ I^{F}_{i} > 0 \tag{2.6}$$

Attempting to model the behavior of diverse sovereign nations simultaneously as regards to their attitudes towards foreign capital inflows is problematical. Some countries, for example, seek to attract foreign capital in order to sustain or to increase present consumption levels as was certainly the case for many NOLDC's following the first and second oil price shocks. Increased consumption may take the form of greater military outlays (Argentina) or increased borrowing for the purpose of fixing the exchange rate to keep down the price of imported commodities (Egypt and Turkey). Some countries since the early 1970's, notably such oil-producing LDC's like Mexico and Indonesia or non-oil-producing LDC's with seemingly tremendous latent potential for rapid economic gorwth such as Brazil, sought to attract foreign capital in order to encourage total investment expenditures. In other words, it is quite difficult to formulate a single unified theory of policy objectives of the state given the

variegation of nations considered in the present study.

One reasonable, albeit limited, hypothesis is that developing countries attempt in any given period to maximize total investment subject to the constraints imposed upon it by the availability of domestic savings and/or its ability to generate foreign exchange. To the extent that other considerations such as the level and composition of household and government consumption expenditures are concerned, it will merely be assumed that such considerations are policy variables which have been built into the "programmed" balance of payments (see footnote 45) and as such are exogenously determined and reflected in the trade balance. This admittedly feeble argument is endorsed by the fact that a large proportion of LDC internal investment is intended as a foreign exchange saver through import substitution. It can easily be demonstrated from the standard national income accounting identities that,

$$(2.7) \qquad (S_{HH} + S_B - I^D) = (X-M-iD) + (G-T)$$

where S_{HH} represents household savings, S_B business savings, and $G-T$ the federal budgetary surplus (or deficit). If we define government savings as $-S_G = G-T$, then (2.7) becomes

$$(2.8) \qquad (S-I^D) = (X-M-iD)$$

where $S=S_{HH}+S_B+S_G$. Equation (2.1) may, therefore, be rewritten as

$$(2.1)' \qquad dR = (S-I^{D}) + (B+I^{F}(i-i^*)-Q) = 0$$

We can rearrange (2.1)' to provide a basic description of the so-called "two-gap" model of foreign lending,[32] i.e. that net foreign lending is required to bridge the gap between domestic savings and foreign exchange availability to finance domestic investment;

$$(2.9) \qquad L = I^{D} - I^{F} - S = B-Q$$

The problem, therefore, is to mazimize (2.5) subject to (2.1);

$$(2.10) \qquad \max I = I^{D}(i,Y)+I^{F}(i-i^*)$$
$$\text{s.t.} \quad X(Y^*)-M(Y)-iD+B+I^{F}(i-i^*)-Q = 0$$

Forming the expression

$$(2.11) \qquad G = I^{D}(i,Y)+I^{F}(i-i^*)+g[X(Y^*)-M(Y)-iD+B+I^{F}(i-i^*)-Q]$$

where g is the lagrangian multiplier, and taking the partial derivatives with respect to i and Y, the following first order (necessary) conditions are obtained:

$$(2.12) \qquad G_i = I^{D}_i + I^{F}_i + g[-D+I^{F}_i] = 0$$

$$G_y = I^D_y + g[-M^D_y] = 0 \tag{2.13}$$

$$G_g = X(Y^*) - M(Y) - iD + B + I^F(i-i^*) - Q = 0 \tag{2.14}$$

where $M_y > 0$. The second order (sufficient) conditions for a global maximum are:

$$\begin{vmatrix} I^D_{ii} + I^F_{ii} - I^F_{ii} I^D_y / M_y & I^D_{iy} & -M_y \\ I^D_{yi} & I^D_{yy} & I^F_{ii} \\ -M_y & I^F_{ii} & 0 \end{vmatrix} > 0 \tag{2.15}$$

Solving equations (2.12) through (2.14) and rearranging yields the demand for net foreign credit as

$$L^D = M(Y) - X(Y^*) - I^F(i-i^*) + i\{([I^D_i + I^F_i]/I^D_y)M_y + I^F_i\} \tag{2.16}$$

Turning to the supply side of the international credit market, although the supply of credit is essentially the current account surplus of the creditor nation, these surplusses are channeled through financial intermediaries. It is assumed that these financial institutions are private profit maximizing firms. The profit function may be generalized as

(2.17) $H = (i+k)L[r(i+k)]-i*A$

where H is profit, k is the bank's spread above the prevailing interest rate i, and A is the availability of foreign credit defined as

(2.18) $A = -X(Y^*)+M(Y)+iD$

In equation (2.16) the extension of net credit by the private bank is functionally related to perceived risk, r. It is assumed that the extension of credit is negatively related to risk, and that risk is positively associated with the spread, i.e.

(2.19) $L_r < 0,\ r_k > 0$

Maximizing profit with respect to the spread above the market interest rate yields the supply of credit equation

(2.20) $L^S = -kL_{r\,r_k} - iL_{r\,r_k}$

Although the coefficient of i in equation (2.17) is sign indeterminant, if we assume that $I^D_{iy} > 0$ and that $I^D_i > I^F_i$ and utilizing the condition in (2.16) from which it might be inferred that $I^D_{ii}, I^D_{yy}, I^F_{ii} < 0$, then

$$(2.21)\qquad L_i^D = [(I_i^D + I_i^F)/I_y^D]M_y + i\{M_y[I_y^D(I_{ii}^D + I_{ii}^F) + (I_i^D + I_i^F)]/I_y^D + I_{ii}^{D2}\} < 0$$

Furthermore, if it is assumed that $r_{ki} > 0$, i.e. that the compensation for perceived risk must rise at an increasing rate, then from equation (2.21)

$$(2.22)\qquad L_i^S = -(i+k)L_{r_{ki}} - r_k L_r > 0$$

From these results, equations (2.16) and (2.20) are depicted diagramatically in figure 1, panel A.

One way to interpret the incidence of a temporary repudiation of debt servicing obligations is to view the event as the consequence of a failure of the international credit market to clear, i.e. a situation in which there is a failure to reach an equilibrium. External debt reschedulings or repudiations may occur when the demand for international credit exceeds the amount which foreign banks are willing or able to supply, possibly even after an array of domestic austerity measures, devaluations, etc. have been implemented. To clarify this sort of market failure it is useful to consider the theory of credit rationing.[33] In order to illustrate this concept consider panel A in diagram 1. Unlike most commodity markets where prices rise continuously until equilibrium between supply and demand is established,

in credit markets there is an interest ceiling beyond which lenders are unwilling to supply additional credit. The reason for this is usually attributed to the paucity of information about borrowers, particularly developing countries where up-to-date and accurate data is notoriously suspect. As a result, lenders use the interest rate which borrowers are willing to pay as a proxy for the desperateness of the borrower's situation. If the interest rate which the potential borrower is willing to pay rises above some conventional norm[34] then this would be viewed as evidence of the borrower's desperate situation in which case additional funding might, in fact, dry up altogether thereby hastening a financial crisis. Such circumstances might be viewed by foreign creditors as constituting an unacceptable level of risk. Note also in the diagram that below some interest rate, say i', the supply of new credit (SS) is zero, where i' represents the cost of loanable funds to the lender (say LIBOR plus a minimum spread representing transaction costs).[35] At the ceiling rate, i", the supply of new credit, L, becomes totally inelastic.

The demand for foreign credit (DD) can be viewed conventionally as being inversely related to the interest rate, which in turn reflects the scarcity of domestic capital and foreign exchange.[36] In the diagram equilibrium occurs at i(t) at an amount L(t) of new lending.

Consider now the disequilibrium case depicted in panel B of the same diagram. In this case we have a contraction in

the supply of credit as depicted by a left-shift in the supply curve (S'S'), an expansion in the demand for foreign credit as depicted by a right-shift in the demand curve (D'D'), or both.[37] Under these circumstances at i", L(d)>L(s), with the resulting gap, G, representing a disequilibrium in the foreign credit market. The manner in which the borrowing country is able to rectify this situation is of paramount importance from the point of view of the international lender. As Cline has pointed out:

> "Under normal circumstances the country can take adjustment measures to shift the demand curve for foreign borrowing backward to the left, often with IMF guidance. Indeed, the announcement of an adjustment package (especially one with IMF participation) may serve to shift the supply curve of international loans outward to the right because, other things being equal, it will give foreign lenders more confidence."(38)

Under more extreme circumstances, however, it may be infeasible to shift either the demand curve to the left through the imposition of domestic austerity measures due to the possibility of political paroxysms, or to shift the supply curve to the right due to a jittery international lending climate. Under these circumstances external debt rescheduling becomes an incipient possibility. The relative degree to which either the DD curve will be left shifted or the SS curve right-shifted will depend upon the bargaining position of the parties involved.

Conventional Approaches to Assessing Country Risk (39)

Even before recent efforts by U.S. bank regulatory authorities to more closely monitor overseas lending activities, large U.S. commercial banks were acting more systematically and formally to protect themselves against overseas risk. They developed their own individual systems for evaluating economic conditions in foreign countries. Moreover, smaller banks which used to rely on the larger banks' decisions when participating in loan syndications began to develop their own risk evaluation systems as well.

A survey conducted by Eximbank (40) of 37 U.S. banks revealed the variety of different types of systems utilized when assessing country risk, i.e. debt rescheduling or repudiation, and for determining the extent of country exposure. Eximbank found that the analytical approaches used by banks in evaluating country risk varied significantly in nature and scope. Banks with small international portfolios had no system, and evaluated country risk only when a loan application necessitated it. Most banks, however, employed a systematic procedure for assessing the creditworthiness of countries. The analytical approaches used range from the strictly qualitative -- involving little or no numerical or statistical analysis appearing in the final country review -- to those that are fundamentally quantitative in character. Some banks used more than one system.

In general, four types of country evaluation systems

can be distinguished: fully qualitative, structured qualitative, checklist, and quantitative econometric. A fully qualitative system is structured around a country evaluation report whose format, detail, and scope may vary from country to country. Banks which used this system tended to be those which were just beginning to do systematic country reviews and are therefore using this system while seeking to develop a more structured system more suitable to their particular needs. This approach is an entirely subjective approach.

In contrast, the structured qualitative system has a standardized format and a well defined scope, with some statistical analysis generally included. Nearly 75 percent of the banks surveyed used a structured qualitative system. An example of this type of country evaluation report from a major New York commercial bank is presented in Appendix I.[41]

The checklist system is both quantitative and subjective in nature, using a scoring technique to scale a country's strengths with respect to a set of chosen indicators and predetermined criteria. variables. The indicators are often quantitative and to that extent the scoring requires no judgement or first-hand knowledge of the country. On the other hand, subjective judgements, especially with respect to political and social features or likely trends may require intimate familiarity with specific countries. The score for each indicator may be aggregated into a summary rating for each country using a common set of subjectively determined

weights — the weighted checklist approach. Some banks use both a weighted checklist and a structured qualitative system. Other banks combine the weighted checklist with an experimental quantitative technique. The indicators are subjectively selected and any built-in bias will affect the quality of the result, although these short-comings will apply accross the board to all countries evaluated.

The quantitative econometric approach involves statistically more sophisticated evaluation techniques. Such methods include discriminant analysis, principal components, linear probability models, logit and probit transforms. These approaches attempt to overcome the shortcomings of the checklist system which lie in the subjectivity involved in selecting the most significant variables to be used in the evaluation process. Standard econometric and statistical tests of predictive accuracy are used to select the most relevant explanatory variables and to predict potential debt servicing difficulties.

It was found that of the 37 banks surveyed by Eximbank 26 used the results of country evaluation reports to set maximum exposure limits for countries and, in some cases, to set sub-limits for specific loan maturities and categories. Country exposure ceilings, however, were not determined solely by the evaluation results. Other factors such as a bank's marketing strategy and competitive position also played important roles in the setting of country exposure limits.

Chapter 3

Assessing Country Risk

Traditionally, the assessment of country risk has involved two important technical steps: The selection of risk indicators (together with an implicit or explicit weighting scheme) and the choice of a formula to grade or rank potential country exposure. This chapter discusses the quantitative and qualitative ingredients generally considered to be essential for making relative, albeit limited, comparisons across countries.

Economic conditions alone cannot accurately mirror a country's ability to service its external debt obligations. Furthermore, even if this were possible an analysis of such conditions would not reveal local policy makers' willingness to meet is foreign committments. A truly thorough evaluation must therefore also consider those social and political realities which may impinge upon a country's capacity to service its external debt. The necessary approach, therefore, is to consider risk evaluation within the context not only of economic developments, but of prevailing commercial, political, and social circumstances as well.

A carefully conceived risk appraisal framework, especially if performed on a repetitive basis, can provide the analyst with a time series of evaluations against which to make a considered appraisal of an individual country's strenghts and weaknesses. By pointing out improvement, deterioration, or turning points in a country's overall

position, this process can help to focus attention early on incipient economic, social, or political developments which may serve as a basis for taking early corrective measures in order to reduce exposure risks or for moving promptly to capitalize on new opportunities.

Economic Indicators

While taking into account every conceivable economic indicator is neither feasible nor necessary from a practical point of view, it is possible to select a few of the most significant and use them as analytical tools. Key data and ratios are then scored in order to provide the analyst with a basis of comparison in order to measure relative economic stability, strength, and growth.

The main concern is, of course, with the borrowing country's capacity to service its debts. The most directly relevant economic indicators, therefore, relate to the balance of payments, the debt structure, and the international liquidity of the country.

Most country risk analysts start with the appraisal of the elements of the country's balance of payments. As a general rule, balance of payments (especially current account) surplusses are healthy in as much as they provide an indication of a country's ability to generate the foreign exchange with which to service outstanding debt. If a country experiences a persistent balance of payments deficit and adverse trends in, say, its trade account, then the

possibility of an underlying fundamental disequilibrium exists, often accompanied by an overvalued currency and capital flight caused by speculation that the country's currency will weaken. The most common risks are that severe balance of payments deficits may lead to either a short-fall in available foreign-exchange or inconvertibility of local currency into hard currency.

Exports and imports of goods and services and transfer payments make up the current account. A current account surplus is a good indicator since a stagnant economy or poor country management does not easily attract capital from abroad whereas a growing economy that is sound would be more likely to receive private capital as a result of foreign direct investment and lending, as well as official capital inflows resulting from active development efforts.

The next point of focus is the debt structure of a country. Unfortunately, data on foreign debt and debt structure have historically been unavailable or only partially available and, therefore, analysts often look to a truncated version of the debt service ratio (42) as a convenient yardstick for assessing country risk.

Finally, it is advisable to observe changes in the net foreign asset position of a country. International liquid assets consists of gold, special drawing rights (SDR's), foreign currencies — preferably convertible currencies (43)

-- and the country's position with the IMF. Any drawdown of that international liquidity is an indication that the country is running a balance of payments "deficit."[44]

Most careful country risk analysts advocate the observation of past performance over a period of, say, five years in order to ferret out momentary blips from more or less stable trends. Projections should also be taken into consideration in order to obtain a notion of future trends as perceived by country officials, i.e. the official "programmed" balance of payments.[45] Wherever long-term plans exist they ought to be looked at as an indication of the direction in which the government intends to lead the economy, but the observer should attempt to distinguish between real plans and aggregations of project proposals.

Selection of actual key data and ratios included in a formal country assessment is one of the most cricital elements in the preparation of the model. Avramovic et al[46] have examined several factors pertaining to a country's ability to service its short- and long-term external obligations. Their approach suggested the use of several economic indicators for evaluating country risk. The most commonly used indicators include: the ratio of debt service payments to exports (the debt service ratio), the ratio of external debt (public and private) to exports, the ratio of external debt to gross national product (GNP), the ratio of international reserves to imports (the liquidity ratio), the growth rate of exports (usually a moving average over a number of years), the ratio of imports to GNP, and per

capita income. Frank and Cline[47] in their important study on the measurement of debt servicing capacity examined such indicators as an index of export fluctuation, the ratio of "non-compressible imports" to total imports, and the ratio of debt amortization to total outstanding debt. In addition, recognizing the impact of inflation on debt relief some authors, notable Saini and Bates[48] and Smith[49] have argued either for the inclusion of an additional indicator, say, the consumer price index, or to deflate debt service payments by an index of dollar export prices.[50] Unfortunately, despite their widespread use, the fact that there exists no conceptual framework for selecting specific indicators and for assigning them the appropriate weights renders them of limited usefulness. Most of the research conducted in recent years, particularly by various U.S. government and international agencies, has focused on identifying statistically significant explanatory variables for use in evaluating country risk and, more specifically, flagging potential debt servicing problems.

Commercial Indicators

The second important category of conditions to be analyzed in country risk is the commercial.[51] Commercial indicators are best derived from first-hand experience and in-depth knowledge of a country. Commercial indicators may be divided into four basic types, all of which are necessarily somewhat subjective and dynamic. These types of

indicators include: Business confidence and activity, purpose of financing, climatic conditions, and access to energy resources.

Countries with liberal attitudes towards private investment (domestic and foreign) tend to be lower risk areas from the viewpoint of the extension of credit. In some countries not only private but overall commercial activity is adversely affected due to pervasive government intervention of various forms and to various degrees in basic and other industries, burdensome and changing regulations and taxes, and official discrimination. On the other hand, in centrally planned economies where private investment, either foreign or domestic, may or may not be sanctioned, this factor, in the narrow sense, has to be removed from the broad risk assessment rather than regarding it as being heavily negative. Judgements are affected by the official, and actual, attitude toward foreign business, the climate for conducting negotiations and operations, and the stability of economic, commercial, and political policies. Other barometers of business confidence normally include stability of the indiginous labor supply, the tax structure, the cost of capital, government incentives to promote commerce and industry, and government organizations or agencies established to assist foreign business and finance.

Loan purpose is most important, not only from the microeconomic point of view of judicious lending practices, but as an explicit element not only in the future economic growth of the country, but also as it relates (especially in

the U.S.) to the regulatory procedures covering bank lending to governments and government-owned entities. Credit risk is considered minimized if the loan involves an efficient export-oriented industry (a foreign exchange earner) or, secondarily, and import-substitution industry (a foreign exchange saver). They may have the tacit or formal support of the government and, more fundamentally, tends to have a direct impact upon the country's capacity to service its foreign debt.

Many less developed countries suffer from periodic geophysical catastrophies: tornadoes, earthquakes, floods, drought, etc. Such natural calamities may affect agricultural exports particularly, either generally or specific crops, or products from specific areas of the country. Ability to meet debt obligations may become erratic. The reason why such considerations are placed under the rubric "commercial" rather than "economic" is that they are judged only as a likelihood of occurrence. As and when such incipient dangers become reality and their impact courses through the societal structure are they then reclassified as economic.

Many less developed countries lack domestic energy resources to sustain growing industrial and agricultural production. Again, this fact is not explicitly obvious in national income data, but is reflective of indiginous attempts to overcome such deficiencies. The importance of energy resources has become abundantly clear since the first

OPEC price hikes in 1974. Oil is a prime, non-diginous, source of energy in many LDC's and fluctuations in oil prices have had a major impact on a number of these countries. Whatever the form, energy resources, their adequacy, conservation, development, and financing have assumed increasing importance in recent years, both from the point of view of the domestic economy but also with respect to the country's balance of payments.

Political and Social Indicators

When assessing country risk the analyst must be concerned not only with a country's ability to service its external obligations (this is the primary function of the use of economic indicators), but also whether that country has the willingness to do so. The scope of political analysis for purposes of country risk assessment is necessarily limited. The basic aim is to determine whether drastic changes in policy or political stability is likely to jeopardize a country's continued ability or willingness to service in an undisturbed manner its foreign obligations. More fundamentally, the analyst must be concerned not only with the financial integrity and political longevity of an existing political regime but also, in the event of a change in the ruling clique, the degree of stability in the transition process. Such changes may lead not only to disruptions of existing economic conditions which themselves may lead to an inability to service external obligations but may also cause governments to reevaluate its position with

regards to that debt or with whatever priorities that repayment may carry. As Donaldson has stated:

> "In the case of government lending political risk covers conscious refusal to pay for whatever reason. It may involve a new government repudiating external debts 'improperly' incurred or 'not in the national interest.' Alternatively, an existing government may repudiate some or all of its debts. This is harder to justify psychologically and even more damaging to the country's credit standing, but can happen."(52)

As a rule, a less developed country is more vulnerable to political disruptions since its political institutions are usually relatively new, its capable leaders few, and its tier of middle management thin. Furthermore, a restless and dissatisfied populace seeking profound change will likely lead to political upheavels. As Makin has quipped: "Bankers are impressed by an aura of control, particularly where disarray has gone before."(53)

The assessment of political stability is highly judgemental. It does not readily lend itself to statistical comparison. Nevertheless, focus on a few key considerations, measured against standards, can provide a framework for interpreting political information about a particular country. The objective is to identify significant trends which, within the historical context of that country, can provide for an understanding of the political dynamics of its society. This permits some judgement about the vulnerability of the political system to disruptive change and gives a basis for comparison with other countries.

Political stability depends closely on the nature of the government (not necessarily its form), the extent of power of

the political leadership, the availability of capable leaders, the level of institutionalization of the political system (most importantly, arrangements for an orderly transition and succession of governments), and the ability of the administration to quickly respond to critical economic and social problems so as to defuse potentially explosive confrontations.

The degree of the leader's power is most important because it determines the government's decision-making capacity and options. Government measures can deeply affect the business and investment climate of the country. Such areas of focus, therefore, should begin with the leadership's capacity to maintain itself in power and carry out its policies. From this the probability of nationalization, restrictions on capital movements, desire for foreign investment, limits on foreign ownership, government intervention in business and similar factors affecting business efficiency and climate can be assessed.

In matters of analysis, financial and judicial institutions are of utmost importance. If a country's financial establishment is strong, it usually reflects a regard for financial responsibility with an awareness of international implications and suggests that foreign debt problems, if they arise, will receive the attention they deserve.

An efficient central bank and a well established network of financial institutions is capable of surviving the fall of

a political regime (although the top government political personalities change) at least in terms of routine adminsitration if not always in terms of policy direction. In some instances where the central bank is strong and influential there may be continuity in economic and financial policy (Italy has provided good examples of this). In many countries, regimes have been toppled and government structures changed, yet the central banks and their international bank relations have remained relatively untouched. The analyst must also look for a high attention to debt management and planning capacity on the part of the country's financial authorities.

Judicial institutions are a major factor in the recognition and the enforcement of claims. Judicial institutions are often, but not always, able to surive political changes, even drastic ones, and to resolve debtor-creditor disputes in an even-handed manner. Where the judicial system is not sufficiently established and stable to outlive a change in regime, the reliability of any type of claim is significantly weakened.

Social factors such as homogeneity of population, religious beliefs, destribution of wealth and income, unemployment, level of urbanization, educational opportunities, rate of illiteracy, will significantly affect the political stability of the country. Major dissatisfaction and discontent in any of these areas may lead to political, and therefore economic, disruptions.

External factors have an important impact on the

country's political and economic stability. Obviously a country threatened by foreign invasion is likely to concentrate its resources on military defense and have little left for economic development (as was the case in Thailand and its bellicose neighbor Vietnam in the late-1970's). It is also essential to assess the impact of international economic and political events. Such phenomena as world recession, inflation, oil price increases, or political affiliations certainly have profound repercussions on the economies of the underdeveloped countries, and the industrially advanced as well.

The political component of country risk involves primarily the question of probable political stability and continuity. This is important from the point of view of external debt management because it provides some insights into a country's willingness to meet its foreign obligations which, in the final analysis, is the key element in understanding the default process. This is so because in times of crisis, when local administrators are confronted with the hard decision of whether to tighten belts domestically in order to continue servicing its foreign debt or whether to default so as to avoid instituting politically unpopular corrective economic measures, such considerations provide an insight into which way a county will choose to go.

Illustrative Methods for Comparing Country Exposure

One application of country risk analysis is to make or review decisions regarding the extension of credit or an increased involvement within a geographical area. Another application, perhaps the broadest, is in connection with an overall review of a bank's international asset portfolio as an aid to strategic planning for development and diversification.

The basic idea behind the use of risk analysis for this purpose is to "rank" or "grade" countries through the use of a summary measure or "score" in order to make overall relative comparisons of the strengths and weaknesses of the countries under review. The scoring system is based upon a variety of weighted risk indicators (economic, social, political, etc.) which are then scored in order to arrive at individual country ratings. The indicators themselves might be comprised of absolute data, such as per capita GDP, relative grade rankings, as for example the degree of political stability, or some combination of the two.

One method is to arrange the countries concerned along with the selected indicators in matrix form.(54) This technique has been referred to as the matrix approach. As an illustration consider table 9. In the table the countries to be ranked are listed in the stub, while the next three columns include sample indicator values. For simplicity only three indicators have been selected: GNP (X1), exports (X2),

and the debt service ratio (X3).

The next step in the matrix approach is to rank the data in each indicator column. For example, in this case Venezuela is shown to have a gross national product of $8.7 billion, which out of a total sample of, say, 80 countries is number 26 from the top. In exports Venezuela ranks 73, and so on, for a total score of 109 which ranks the country twenty fifth out of 80 cases. It will be noted that while either actual data (GNP) or ratings (debt service ratio, in which case the "rank" must be assigned a weight) may be used.

In this particular example it is assumed that as the overall numerical rank increases so too does risk, i.e. a country with rank 1 being less risky than a country with rank 2, and so forth. As the country risk increases it is presumed that exposure will decrease, on the assumption that reward and other relevant factors such as an established marketing strategy are not also being considered. Although the present example is fraught with difficulties, not the least of which being that it automatically relegates economically small countries (in absolute terms) to the bottom of the heap,(55) it is nonetheless useful in that it serves to highlight the simplicity, as well as economy, of the technique.

A variant of the matrix approach, and one more commonly used, is that of the checklist. Once designed, it offers relatively rapid, and sometimes more importantly, an economical means of rating a country. Its principal defect,

and one which it shares with the matrix approach, lies in the large degree of subjectivity involved, not only in the selection of the key indicators but in establishing conformance or performance gradations, assigning weights, and finally in completing the risk questionaire itself. More importantly, both the matrix and the checklist systems are incapable of providing the analyst with the single most important piece of statistical information -- the probability of a rescheduling crisis. In general, when using either the matrix or checklist approach more, rather than less, familiarity with a country is required for the best assessment lest the analyst take the output of either approach as the last word.(56) In a somewhat similar vein, even if it were possible to design a ranking system which was able to objectively assign appropriate weights to the chosen variables, once the countries are ranked there is no rule to guide the analyst as to where the line(s) whould be drawn to denote the various degrees of credit worthiness.

For the purpose of illustrating the checklist approach, and the ease with which it is possible to obtain an overall country ranking consider the checklist designed by Business International(57) in Appendix III. In the BI checklist the country risk index consists of three main types of risk categories, each of which includes ten selected indicators.

The first category or subindex includes ten selected political, legal, and social factors. The second category consists of ten so-called commercial criteria reflecting the

size and development of a given market. The final category is comprised of ten monetary and financial elements. Each subindex of ten factors has a maximum score of 100, or a possible 300 for any given country. Any downward departure from a perfect score of 300 suggests increased risk (political, economic, and financial) which lenders may face in a specific country. The scores within each of the sub-categories suggests wherein specific risks lie.

In order to quantify political, financial, legal, and economic risk each factor carries with it a pre-established schedule of scores which attribute a maximum of points to the most favorable of conditions, downward to a minimum of points for the least desireable of circumstances. Note that the point gradations are not the same for each of the ten factors assessed in each category. The points attributed to each of the ten factors within each risk category carries with it the built-in assumption that an informed, careful assessment has assigned the most appropriate weight to each factor within the sub-group and that the analyst is qualified to judge situational gradations. Of course, the subjective nature of such weighting schemes is, in fact, the Achilles heel of the checklist approach. As Saini and Bates have noted:

> "Although most commercial banks continue to rely upon these relatively simple risk evaluation techniques, the usefulness of these techniques has been limited by the lack of a conceptual framework for selecting individual indicators and for assigning them appropriate weights."(58)

A second illustration of the checklist approach can be found in Appendix IV which was prepared for use by a major

U.S. commercial bank. In this illustration the checklist is composed of fourteen domestic economic factors, eleven external economic factors, and nine political-legal factors. Scored with a maximum of ten points for each factor, the maximum total for the three categories are 140, 110, and 90, respectively. Again, as in the BI index, any downward deviation from the maximum total of 340 indicates an increasing degree of lending risk.

Again, the subjectivity involved in the selection of risk indicators and the method of weighting each of the factors considered lies at the heart of the weakness of both the matrix and the checklist approaches. Nevertheless, both techniques, especially the checklist, are widely used. As will be seen in greater detail in subsequent pages there do exist more rigorous econometric techniques which bypass many of the inherent deficiencies in these types of approaches.

The Linkage Between Risk Assessment and a Bank's Loan Portfolio

Within the microeconomic context of international bank lending it is necessary that management develop some linkage between the country risk assessments and country exposure limits. In other words, to develop rough guidelines to relate country risk to the dynamic aspects of international bank lending. To be effective, risk assessment must be linked to one or more specific growth elements of the bank's balance sheet, for example, total foreign earning assets, foreign deposits, a bank's internal lending limits allocated

to foreign operations, or its total capital funds, in effect, pro-rated to foreign operations. Such formula permits exposure guidelines to increase and change as the bank's international operations grow. However, since the procedure involves rather mechanistic features which cannot reflect such aspects as market limitations or marketing goals, it cannot be regarded as a substitute for managerial "hands on" judgement.

It ought to be noted that any such linkage does not answer two basic bank policy considerations: The division between foreign and domestic business and the specific allocation of exposure among broad risk categories. i.e. from high to low risk countries. Furthermore, as the study of the particular formats in Appendices III and IV reveals, the selection of risk factors requires extreme care while the weighting of these factors is extremely subjective. Thus neither the risk evaluation format nor the consequent exposure guidelines should be regarded as having been cast in bronze. Once country exposure limits or guidelines and country inter-relationships are established on the basis of the format, they should be reviewed periodically, as should the format itself.

Long-Term Risk Assessment

The evaluation of long-term country risk, along with international or interregional comparisons, presents even more formidable problems and furnishes considerably less

trustworthy results. After all, consider even the difficulties of long-range forecasting for a country like the United States with the plethora of data and resources available to the economist. Even twelve month forecasts are operous in the presence of economic turning points or major structural changes. What is more, an experienced international banker is very likely to be modest about the solidity of his perceptions when considering, say, a ten-year term loan. Consider, for example, how a banker's attitudes will likely be tempered by an experience in which a country enduring economic or political problems suddenly and unexpectedly has a turn for the better. Suppose that in the depths of the crisis the banker had undertaken vigorous measures designed to convert long-term (risky) assets into relatively safe self-liquidating short-term credit. When, in fact, the turn-around occurs the banker discovers that he has acted precipitously to the chagrin of the borrower as well as upper management. Consequently, even greater caution is expected to prevail when long-term credit decisions are under consideration.

When examining possible methods for assessing longer term country risk, there seems to be a tendency to project current trends with misleading precision excessively far into the future. It goes without saying that for countries in which the direction of the major economic and political elements appear to be linear then the chances are that such projections may have some validity so long as the planning horizon is not so distant that structural change has an

impact. On the other hand, predictive reliability becomes even more obtuse as one moves from countries with fairly regular cycles of economic stability and instability to those experiencing generally unsettled conditions with occasional bright periods, and where the toss of a coin is almost as good a forecasting tool as any. A major difficulty in long-term, and sometimes short-term, forecasts is the prediction of turning points,[59] and then the strength of the new direction.

A further difficulty, especially with model-building, is that because of their simplicity application is sometimes limited and while the test elements may prove accurate they are far from conclusive, or else the elements are so complex that the assessment process is virtually unmanageable, the results uncertain, and the costs uneconomic.

It is beyond the scope of this paper to explore the problems of, and possible approaches to, long-term country risk evaluation. It has merely been raised as a related topic along with a few observations which have methodological implications.

Minimizing Country Risk

Risks underlying the country exposure profile can be reduced by certain common practices developed through experience in lending activities. As in domestic lending, international lending involves the making of credit decisions through the study of performance indicators coupled with an

element of subjectivity and intuition. In international lending, however, the variables are more complex. A banker can reduce the risk in international lending in a number of ways. This section is devoted to a brief discussion of the means by which a banker might reduce the risk associated with international lending.

Regardless of the maturity of the loan, risk can be significantly reduced if the financing is directly related to self-liquidating transactions. This type of financing is characteristic of trade transactions such as short-term export and import financing. In fact, prior to the twentieth century this was the stuff of international banking. As Makin observes in connection with the rise of the Bank of England (which from 1694 until after World War II operated as a private bank:

> "... like those of most other banks of the time, the international operations of the Bank of England was largely centered on very short-term lending to finance the day-to-day turnover of trade; manufacturing investment was still the business of individual speculators."(60)

Since risk increases with the length of the obligation, conscious maturity scheduling is of utmost importance. The majority of overseas commercial bank credits to less than good credit risks are short-term, i.e. mature in less than one year. Longer maturities should be closely controlled and limited to strong borrowers and countries of borrowing. Shorter maturities permit relatively rapid reductions in exposure as conditions change.

Where loans are guaranteed, the risk is reduced;

external guarantees reduce both the credit risk and the risk involved in country exposure. Such loans may be loans to subsidiaries of multinational corporations guaranteed by the parent company. Loans to quasi-public entities, or to private ones, guaranteed by the government or by the central bank of the country may reduce the credit risk but do not basically reduce country risk. Another protection against country risk, though not a guarantee, can be provided in the form of readily marketable foreign collateral.

The lender can also request an assignment of receipts. This can take several forms which have effects ranging from generating additional bank income and reducing risk to making viable what would otherwise be an excessively high risk transaction. An example of the former would be a relatively common export financing transaction in which the bank possesses the documents, makes the collection, and pays itself from the assigned receipts. An example of the latter would be a balance of payments loan to a high risk country which had agreed to process through bank collections relating to a principal export, allocating a portion of the receipts for maturing interest and amortization obligations. This kind of an arrangement has an interesting historical parallel. When the Italian city-states of the fourteenth century borrowed they often did so from syndicates of moneylenders from within their citizenry known as <u>monti</u> ("piles" [of money]). In exchange, local authorities typically pledged the city's future tax revenues and empowered the <u>monti</u> to collect such taxes in order to retire

the loan.

Governments of developing countries which have made their names familiar in international private credit markets tend to have a lesser risk because they have demonstrated that they give a high priority to their international creditworthiness and normally will make every effort to meet their obligations. They generally realize more profoundly that this is particularly important for them since they require repeated access to these credit markets in order to obtain financing for internal growth and improvement in the standard of living of their people. Thus they often possess greater opportunity to refinance their debt, fulfilling their obligations and maintaining their creditworthiness. It is less likely that loss will occur when the borrower is a foreign government, but experience has also shown that this certainly does not preclude the occurrence of problem loans.

PART II: THE APPLICATION OF LOGIT ANALYSIS TO THE ASSESSMENT OF COUNTRY RISK

Chapter 4

Introduction

Part I of the present discussion had essentially two objectives: a) to outline the seriousness of the international debt situation as viewed from a western perspective, and b) to review in rather general terms the techniques commonly employed by, especially, commercial banks in attempting to assess the risk involved in overseas lending. In as much as the dramatic rise in LDC debt over the past two decades has progressed to the point where the fragile nature of the international financial system has become a major economic policy issue, it would appear that recent attempts to evaluate country risk have not met with much success. An alternative, more cynical explanation, is that country risk analysis has been sound but that their message has been misinterpreted at best, ignored at worst. The LDC debt crisis is, unfortunately, a fact of life, yet its genesis has both micro- and macro-economic origins. The dilemma of the LDC debt crisis was spawned in part by individual commercial banks seeking to maximize their separate utility (read profit) functions in the face of a glut of petrodollars. It is a matter of some debate, however, just how significant a role was the risk element in these functions as typified in the present discussion by

equation (2.17).

At this juncture there are a number of paths which the debt analyst might choose to take. The analyst might decide, for example, that the LDC crisis should be taken as a fait accompli and to cast his analytical prowess into the resolution of the larger macro-issue of economic salvation in the face of possible widespread financial collapse. In making the decision to go this route the analyst must believe that the present systems for evaluating country risk are sound, that the output of these systems are properly interpreted and implemented, but that the lending decisions made at the micro-level have somehow created unstable economic conditions in the aggregate.

The analyst may, on the other hand, take the position that country risk analysis still has something to say about the dynamics of debt repudiations and that further investigation and research is in order. To choose this path still leaves open the possibility that even with refinements in assessment techniques that there may still exist inherent flaws which will still lead to instability at the macro-level.

In choosing to take the latter path, i.e. a closer examination into the evaluation of country risk, it ought to be emphasized that apart from its usefulness in future lending situations, given the tenuous state of the existing global situation that any clarification of the elements associated with the servicing of international loans already

on the books will also contirbute to a resolution of the larger macro-issues. With this in mind, Part II of the present discussion has opted to go in the direction of country risk evaluation and the forecasting of potential debt sevicing problems.

As was noted much earlier in Part I, the primary criticism directed toward most of the techniques employed by commercial banks to assess country risk is the rather arbitrary manner in which various indicators purporting to capture the essential elements of potential debt servicing problems are selected and weighted. Although there have been tremendous strides made in the application of statistical techniques for identifying which of the most commonly used indicators are, indeed, statistically significant in evaluating the propability of debt rescheduling or debt repudiation, until recently the selection of these indicators has been largely trial and error. Furthermore, in spite of the obvious superiority of these techniques in evaluating the significance of economic indicators, i.e. of a country's ability to service its external debt, they have been unable to cope with the larger, and perhaps more important, issue of a country's willingness to meet its international obligations. This, as was seen, is the rationale behind the use of political-social and commercial indicators employed in the so-called "checklist" systems. Furthermore, while these statistical techniques have many advantages over the more subjective methods currently used, they are themselves not without criticism.

Review of Principal Studies

Concern over the economic problems of less developed economies and the role of external finance in alleviating some of those problems has its origins well before the events of the early 1970's. The theoretical nature of these analyses tended to concentrate on a country's lack of both physical and human capital, with economic progress being largely impeded by a scarcity of domestic savings and foreign exchange to finance internal investment; the so-called "two gap" model. Within this context, external finance has been viewed as a partial remedy. Perhaps the most famous of these analyses is embodied in the Harrod-Domar model (61) (62) which describes how debt situations evolve over time. The basic elements of such models include a production function with fixed input coefficient technology, a target growth rate, a fixed capital/output ratio, and a fixed marginal propensity to save out of output. To the extent that foreign borrowing is required it is to bridge the "gap" between domestic savings and the required level of investment.

The growth-cum-debt literature suffers from a variety of deficiencies, not the least of which is their narrow perspective. For example, while these models do provide insights into the investment motive for external borrowing, they tend to ignore alternative uses for foreign finance, such as smoothing out domestic consumption over time, or attempts to postpone domestic economic adjustments in

response to exogenous shocks. In other words, such models are silent on the topic of what constitutes decisions rules for optimal borrowing. Because of limitations in applying such rigid theoretical models, interest has turned towards trying to identify the circumstances under which nations are likely to encounter debt servicing difficulties. The present discussion is a review of the principal studies in this area.

The seminal article on the use of statistical techniques to derive an index summarizing the likelihood that a country will experience debt servicing difficulties was that written by Charles R. Frank and William R. Cline[63] just a little more than a decade ago.[64] Utilizing discriminant analysis Frank and Cline examined eight commonly used economic indicators[65] as to their ability to identify potential debt servicing difficulties. These explanatory variables were tested against a binary-valued dependent variable of rescheduling and non-rescheduling, i.e. if a country reschedules then the dependent variable is assigned a value of unity for that year, otherwise it is given a zero value. Frank and Cline's data set covered 26 countries for the period 1960 to 1968, inclusive. According to the authors the resulting indicator should satisfy two criteria. First, the indicator should be simple, i.e. easily interpretable. Second, the indicator should also have a high degree of predictability. The purpose of the Frank and Cline study was to determine the predictive performance of some widely used debt servicing debt indicators.

Although the usual assumptions underlying regression

analysis are not appropriate in discriminant analysis, Frank and Cline nevertheless utilized generated t-values to exclude some of the explanatory variables. They found that of the eight economic indicators tested only three were statistically significant at the 5 percent level: the debt service ratio, the ratio of debt amortization of total external debt, and the ratio of total imports to international reserves. In the first stage of their analysis (see table 10)[66] Frank and Cline assumed a linear discriminant function with equal covariance matrices. They found that in the three variable case that the model through the first iteration commited a type I error (when a rescheduling country is predicted as non-rescheduling) in 23 percent of the cases examined, and a type II error (when a non-rescheduling country is predicted as rescheduling) 11 percent. Through the tenth iteration these percentages became 8 and 20 percent, respectively. Frank and Cline then proceeded to reestimate the linear discriminant function excluding the variable imports/international reserves, and to repeat the entire process using a quadratic form. Their best results came from the two variable quadratic case in which there were zero type I and only 9 percent type II errors.

Apart from the problem of discarding independent variables which may have some importance in explaining the incidence of debt rescheduling, another important problem concerns the selection of the critical discriminant function value which distinguishes between rescheduling and non-

rescheduling cases. In the first experiment of the three variable linear discriminant function, for example, Frank and Cline chose zero as their critical value.[67] For the quadratic function, however, they found that the best critical value was -.600 in the three-variable case and .302 in the two-variable case. In this, as well as other, studies, there appears to be no explicit rationale for the selection of the critical value other than to minimize the total number of errors in the sample period. The basic drawback with this approach is that while it is useful in correctly classifying past reschedulings, it has not had much success in predicting future debt servicing difficulties.

Pierre Dhonte in his examination of countries which were unable to service their external debt[68] utilized the principal component technique.[69] In his study Dhonte analyzed 13 debt rescheduling cases between 1959 and 1971 and compared these to 69 non-rescheduling cases in the year 1969. Upon examining ten economic indicators[70] Dhonte found four (net transfers/imports, debt disbursements/imports, external debt/exports, external debt/GNP) to be the most significant for the first principal component accounting for 38 percent of the variation in the sample. The second principal component (of which the indicators debt service payments/debt disbursements and debt service payments/external debt were the most significant) accounted for an additional 18 percent of the sample variation. In all, Dhonte was able to summarize a total of 79 percent of the variation in the sample data.

On the basis of his study Dhonte hypothesized the existence of two equilibria conditions. The first of these conditions being the existence of a trade-off between a country's "involvement"[71] in external debt and the terms of that debt.[72] More specifically, a country which has a heavy external debt burden (say, total external debt two to three times average yearly exports) suddenly faced with a rapid increase in interest rates, or a sudden decline in export earnings, is likely to experience a debt management crisis. In other words, countries with large external debt burdens that still rely heavily on foreign capital inflows can only do so on easy terms which allow for a reasonably painless roll-over of its maturing obligations. The second of Dhonte's equilibria conditions is that the increase in external debt should be more or less in line with the growth of exports.

In his study, Dhonte used the first two principal components as co-ordinates on which to plot his sample rescheduling observations. In the graph quadrant I represented the critical region in which a heavy involvement in external debt is aggravated by unfavorable borrowing terms, i.e. the double condition in which a debt rescheduling would be expected to occur. In predicting the incidence of debt rescheduling on the basis of his sample data Dhonte's results are less convincing than those of Frank and Cline in which discriminant analysis was used. On this basis Dhonte committed type I errors in 37 percent of the rescheduling

cases, and type II errors in 13 percent of the non-rescheduling cases. Compare these results with those of Frank and Cline whose type I and type II errors ranged from Ø.Ø percent to 23.1 percent and from 9.Ø percent to 19.9 percent, respectively.

After the important work of Frank and Cline the next most significant advance in the analysis of debt servicing difficulties is the application of logit analysis[73] pioneered by Gershon Feder and Richard E. Just.[74] Analyzed were 21 instances of debt reschedulings (in 11 countries) and 217 non-rescheduling cases for a total of 238 observations from 41 countries spanning the years 1965 to 1972. Feder and Just examined nine economic indicators of debt servicing capacity: seven being the same as in the Frank and Cline study, along with the additional economic indicators capital inflows/debt service payments and growth of per capita domestic product.[75]

The argument put forward by Feder and Just for the use of logit analysis instead of discriminant analysis was that this method was "specifically developed to deal with the binary-valued, dependent-variable case."[76] One advantage which the use of a logistic distribution function has over the use of a discriminant function is that the maximum likelihood estimators are consistent and asymptotically unbiased and efficient[77] and, therefore, more appropriate statistical tests are available to determine the relevance of various economic indicators of debt servicing capicity. Of

the nine economic indicators examined, Feder and Just found six which were significantly related to debt servicing capicity: the ratio of total imports to international reserves, the ratio of amortization to total external debt, the debt service ratio, export growth, per capita income, and the ratio of capital inflows to debt service. These results confirmed and expanded upon the conclusions put forward by Frank and Cline. What is more, the study provided the best results of any of the previous attempts to to assess country risk. The results of the Feder and Just analysis for all six economic variables tested are replicated in table 11.(78) In the table for any critical probability value P* there are two possible types of errors: Type I errors in which for some P<P* a no default is predicted but where one actually occurs, and a type II error where P>P* and a default is predicted but none occurs. In no case of P* are more than 11 errors made out of a total of 238 observations, while at P*=.4 only 6 errors are made in case (b) and 9 in case (c). In case (b) this translates into type I error of about 5 percent and a type II error of 2.5 percent, compared with the Frank and Cline study of 23 percent and 11 percent, respectively.

Unfortunately, these results are subject to many of the same criticisms which have been leveled at the use of discriminant analysis. There is still no explicit rationale behind the selection of the critical probability value beyond minimizing the total of type I and type II errors so while it

efficiently characterizes past debt servicing problems it was of limited usefulness in forecasting such crises. As will be discussed later, this may be the result of two factors: a) that such crises are, under certain cconditions, the result of stochastic shocks or, b) that such crises are the result of a highly explosive Markov process. Financial conditions may, in fact, deteriorate within a matter of weeks and a country which may have tested quite capable of servicing its debt just a few months earlier may experience severe financial spasms almost overnight. The use of annual data, therefore, often makes accurate predictions impossible. Be that as it may, logit analysis remains the best statistical technique available for testing debt servicing crises as a binary-valued dependent variable event.

In their study of statistical techniques used for determining the debt servicing capacity of developing countrues, Krishan Saini and Philip Bates (79) addressed a variety of weaknesses present in earlier studies and then compared the results of discriminant analysis and logit analysis in order to observe the relative merits of each technique in explaining the incidence of past debt servicing difficulties. More specifically, Saini and Bates employed a modified version of the dependent variable, in addition to the traditional binary-valued dependent variable, for rescheduling and non-rescheduling cases, in recognition of the fact that there may exist options other then a formal rescheduling in the face of severe debt servicing problems. These options may include debt refinancing and restructuring,

balance of payments support loans, etc. In other words, the authors have emphasized that the distinction ought to be made between voluntary and involuntary rescheduling of its external debt. Furthermore, Saini and Bates argue for the use of non-debt variables to serve as proxies for the debt related indicators of earlier studies. The argument here is that because of the poor quality and paucity of reliable data on external debt service payments that the use of estimated data seriously bias the estimates.[80] Lastly, the authors divide their sample data into two intervals in order to test for structural shifts in the functional parameters.[81] Saini and Bates rightly point out that this problem is particularly vexing when developing countries are examined.

Saini and Bates performed tests on two types of binary-valued dependent variables for the period 1960-1977. In the first instance, the dependent variable consisted of the usual official debt rescheduling and non-rescheduling cases and contained 22 rescheduling observations for 12 countries. In the second instance, the dependent variable included both involuntary debt reschedulings and balance of payments support loans,[82] while it excluded voluntary debt reschedulings.[83] These were tested against 11 explanatory variables[84] which were selected either because they had been found to be statistically significant in earlier studies or as proxies for data on external debt.[85]

Performing discriminant and logit analysis for a variety of time intervals, dependent and explanatory variables, Saini

and Bates concluded: a) that there were no significant differences observed in error rates and coefficient values generated by either technique; b) that the modified dependent variable was more useful in identifying potential debt servicing problems; c) that the indicator with the greatest explanatory power of those indicators tested were the consumer price index, money supply growth, cumulative current account balance to export ratio, and the growth of international reserves (this last indicator was also found to be an effective and stable proxy for selected debt ratios found in earlier studies); d) that the debt service ratio was virtually useless in isolating debt servicing problems;[86] e) that the explanatory variables performed better in explaining the period 1971-77 than for the period 1960-70;[87] f) and that although the error rates obtained in this study were higher than those of the other studies examined that this was attributable to methodological differences in the selection of data entries. The results of the Saini and Bates study are summarized in table 12.[88] For example, the error rates calculated for the period 1960-77 using discriminant and logit techniques were 15.5 and 19.0 percent, respectively, compared with 11.5 percent in Frank and Cline and 2.5 percent in Feder and Just. For the period 1971-77, however, these errors were reduced to 9.5 percent for both functions estimated.

Each of the studies thus far examined had one thing in common; they all related to characteristics of the borrower and their impact on debt servicing capacity. However, in

attempting to justify the sustainability of economic policies of debtor countries it is not enough to consider only the demand for foreign credit; supply side factors must also be taken into consideration. In other words, in order to obtain a more complete understanding of the rescheduling process it is essential to consider such factors as the general availability of credit, the terms of financing, and the existance of credit rationing.(89)

In recent years there has been a rise in interest concerning supply conditions in international credit markets. One such study appeared in an article written by Gershon Feder and Knud Ross.(90) While their study did not attempt to deal directly with the probability of an external debt rescheduling, Feder and Ross did attempt to ascertain whether there existed a systematic relationship between how creditors perceive the risks associated with debt rescheduling and interest rates charged. In the authors words:

> "One subject which has been debated in the last few years is whether risk assessments are reflected (as they theoretically should) in the pricing of Euro-loans...
>
> "Such assertions would normally be subjected to a formal empirical test. One serious problem, however, prevented such a test: in order to relate observed market prices (i.e., terms of credit) to banker's risk assessments, one needs data on default probabilities as perceived by banker's."(91)

According to Feder and Ross this proxy for perceived default probabilities did exist in the form of country credit risk ratings which were just then being published by Institutional Investor. The Institutional Investor credit ratings constituted a survey of major international

commercial banks in which bankers are asked to rank a country between zero and ten[92] according to their "perception of the country's chances of default." In the study, the authors began with "the conviction that these weighted scores are a reasonable measure of the market's perceived default probabilities... a crude hypothesis since the price of credit in general reflects other factors besides risk, such as supply and demand forces."[93] In the jargon of the present discussion, these rankings supposedly eschewed a country's ability to service its external obligations, concentrating instead upon their willingness to do so.

Maximizing the likelihood function over the unknown parameters in their model (the expected loss in the grace period, the expected loss in the rest of the loan period, and the time horizon of the banks), Feder and Ross conclude that for the year 1979 that a relationship did indeed exist between banker's subjective probability and credit terms in the Euromarket. What is more, the authors found that expected loss rates were quite low; an observation consistent with the observation that financial losses following debt repudiations have been low.[94]

In another study, utilizing the idea of a disequilibrium in the market for international credit, William Cline in a forthcoming study[95] makes use of the theory of credit rationing in order to explain the incidence of external debt rescheduling. As Cline puts it:

> "It is useful to interpret debt reschedulings... as the consequence of a disequilibrium that occurs in the international credit market when the amount the country

> seeks to borrow... exceeds the amount that foreign banks are prepared to supply at the upper ceiling interest rate. The international credit market thus fails to clear. A nonmarket solution must be established, and is arrived at in a bargaining process: debt rescheduling."

He goes on to say:

> "... in the bargaining context of rescheduling the borrowers will reach an agreement... if the borrower's leverage is high the full amount... will tend to be covered by the extension of new, involuntary lending and postponement of maturities otherwise due. If the lender's leverage is stronger, a smaller portion... will be covered and the country will be forced to take additional painful (domestic austerity) measures...(96)

Cline specifies his model in probabilistic terms; that is, associated with each argument in the supply and demand functions is the probability that there will occur either a right-shift or a left shift in the supply and/or demand curves for international credit. Formally, Cline specifies the probability of demand for debt rescheduling as:

$$(4.1) \qquad P^{d} = f(DSR, RSM, g, y, hCAX^{2})$$

where DSR is the debt service ratio, RSM the ratio of international reserves to imports, g the rate of per capita economic growth (GRO), y per capita income (GDP), and $hCAX^{2}$ a quadratic specification of the ratio of the current account balance to exports (CAX).(97) The hypothesized first partial derivatives of the above function are all negative, with the exception of the debt service and the current account ratios which are assumed to be positively related to the probability of a debt rescheduling.

On the supply side Cline distinguishes between two

forces affecting the "non-supply" of foreign credit. On the one hand, there are those variables that serve as screening devices whereby the suppliers of credit assess the strength of a country's borrowing capacity. These variables are country specific over which potential borrowers have some measure of control. On the other hand, there are those variables which reflect the general international economic environment. These variables are beyond the borrower's control. Formally, the probability of supply of debt rescheduling may be written as:

$$P^{s} = g(DSR, \dot{p}D/X, a, y, s, gx, A) \qquad (4.2)$$

where DSR is, again, the debt service ratio, $\dot{p}D/X$ the "inflationary errosion of outstanding debt (INX),"[98,99][100] a the amortization rate on outstanding external debt (AMZ), y per capita income,[101] s the savings rate (SAV),[102] gx the rate of export growth (XGR), and A the global supply of credit (EXBOR).[103] The corresponding first partials[104] are all assumed negative with the exception of the debt service ratio. Cline also suggested that the ratio of net external debt[105] to exports be used as an alternative to the debt service ratio as a measure of a country's debt burden on the grounds that "it is a longer term measure, examining the 'stock' concept of the country's balance sheet rather than the 'flow' concept of the current rate of debt service -- which may be distorted by differences caused by bunching of maturities..."[106]

Cline's reduced form equation thus provides an overall probability of debt rescheduling from the supply and demand sides.[107] The initial results of this model of external debt rescheduling employing a population of 58 countries appear in table 13.[108] The five models represent alternative specifications of the explanatory variables. In order to measure the overall predictive performance of the resultant models Cline employs the standard criteria of selecting the critical value which minimize the total number of type I and type II errors. The best overall results are achieved by "model C" for which only 9.1 percent of the actual reschedulings are unpredicted (type II error) and 13.0 percent of nonrescheduling cases are falsely predicted as rescheduling (type I error). These results compare quite favorably with earlier studies reviewed here. The model finds that the most important variables in explaining the incidence of past reschedulings include the debt service ratio (contrary to the results of Saini and Bates), the ratio of imports to reserves, the amortization rate, the current account deficit, the growth of output, and the availability of global financing.

Next, recognizing the possibility of a systematic difference between countries with large debt and small debt, Cline examines 31 countries out of his sample of 58 which had the heaviest debt burden. Using "model C" the average value of the predicted probability of rescheduling (P_c) was .32, as against .20 for countries with lighter debt burdens.

According to Cline:

> "...the results appear to indicate that the smaller debtors reach rescheduling situations at lower levels of underlying debt burden than for larger debtors. This conclusion is not surprising when the actual counties in question are reviewed... Most of the countries in the first group... would be judged on an informal basis by international creditors to be able to sustain relatively higher levels of debt than in the second group because of past debt performance and level of development..."(109)

The results of the Cline analysis ("model L") of the 31 largest debtor countries is reproduced in table 14. Overall, the results of his investigation are comparable to "model C" above. In general, those variables found to be statistically significant in the earlier run were also found to be statistically significant here, although the critical probability threshold had risen from .041 to .240. In this instance type I and type II errors are 21.4 and 2.6 percent, respectively.

Although Cline's model does appear to overcome some of the conceptual difficulties of earlier models some problems remain. For one thing, there still remains a measure of arbitrariness in the selection of the arguments for the supply and demand functions, i.e. in classifying an influence as being on the demand or supply side. For example, the international reserve/import ratio could arguably be called a credit supply determinant because it may be viewed as a screening device by international creditors. What is more, there is the problem of the selection of the critical value. This was made especially clear in the above "model L" case in which there appears to be a strong correlation between a country's level of development and the tolerated size of its

foreign debt by the international financial community. The problem of structural changes on parameter values is, once again, of considerable importance.

Chapter 5

A Logit Model of Debt Rescheduling: An Empirical Investigation

There would appear to exist at least five fundamental deficiencies associated, at least in part, with each of the studies considered above. First among these deficiencies is the absence of an adequate conceptual framework necessary for the selection of the most appropriate risk indicators to flag potential debt servicing difficulties. Most of the early work focused upon statistically testing the most commonly used economic indicators in use by, especially, commercial banks. Later, much of this work concentrated upon an ad hoc search for additional, more significant, risk indicators. A second deficiency relates to the paucity of a comprehensive and reliable data set on both public and private external debt, as well as information concerning debt servicing requirements. In some cases, most notably African and Middle Eastern countries, even balance of payments and national income data are unavailable, or only so after a considerable delay, sometimes three and four years. In other cases, statistical compilation and reporting procedures are so erratic as to cast serious doubt on the validity of the data which is available. Fortunately, in recent years, there has been considerable improvement in the collection and presentation of data on external debt which has ameliorated many of the problems heretofore present. A third problem has

been the failure to distinguish between a country's ability versus its willingness to meet its external debt obligations. This failure has been due, in part, to the difficulties involved in quantifying the subjective character of the "willingness to pay" component in econometric terms. It has been argued, quite rightly, that the main advantage of restricting statistical analyses to economic indicators is that it purges the evaluation of country risk of its problematical subjective element, however, the exclusion of the willingness factor may account for the poor predictive performance of these models. A fourth, and closely related, difficulty is the failure to adequately cope with parametric structural changes. These changes may be the result of international events (as was undoubtedly the case following the oil price shocks of 1973-74 and 1979-80 or the global recessions of 1976-77 and 1980-82), intra-regional characteristics (as was demonstrated, for example, by the spate of South American repudiations in 1982-83), or country specific difficulties. What is more, parametric differences across countries or regions might be of a categorical nature, as for instance between NOLDC's and oil producing LDC's, heavily indebted versus moderately indebted countries, etc. A fifth deficiency relates to the failure of these models to predict future rescheduling episodes. As Saini and Bates have conjectured:

> "In the final analysis the major drawback of existing statistical debt monitoring systems is their inability to adequately predict reschedulings... Perhaps the major weakness affecting the predictive ability of these statistical techniques is their heavy reliance on

out-of-date economic information."(110)

The Model

Chapter two presented a simple short-run model of the international credit market with a discussion of the determinants of market failure and consequent credit rationing. Following from that discussion it is inferred that the demand for foreign bank credit may be characterized as,

$$L^D = L^D (T, iD+Q, y, s) \tag{5.1}$$

where $T=X(Y^*)-M(Y)$ is the trade balance, $iD+Q$ current servicing requirements on external debt, y real economic growth, and s the domestic savings rate. Likewise, the supply of foreign bank credit may be summarized as,

$$L^S = L^S (D, r(i+k), A) \tag{5.2}$$

where D is total external debt, r perceived risk associated with the timely servicing of external bank debt as a function of the interest rate (i) and the spread (k). Equilibrium in this market is characterized by

$$L^D = L^S \tag{5.3}$$

Where (5.3) is not satisfied then a disequilibrium condition in the international credit market exists which gives rise to a financial crisis and subsequent debt rescheduling episode.

It is possible, therefore, to characterize the probability of a breakdown in this market as

(5.4) $$P = P(T, iD+Q, y, s, D, r(i+k), A)$$

Expression (5.4) might be considered deficient on two counts. In the first place it is predicated on the assumption that exchange rates are fully flexible. A flexible-exchange rate system is one in which the exchange rate is market-determined and in which there can be no "deficit" in the balance of payments. In the second place, it was assumed that the purchasing-power-parity theorem was operative. Purchasing-power-parity essentially asserts that prices in one country must equal those in another when expressed in a common currency. In reality fully flexible exchange rate and purchasing-power-parity is unlikely to hold. In order to correct for this expression (5.4) will be modified by explicitly considering international reserve holdings and include, following from the work of Cline, an explanatory variable to measure the inflationary erosion of external debt. This latter variable will be discussed at greater length in subsequent pages. Suffice for the moment to say that the inflationary erosion of debt variable is included to measure the direct impact of global price changes on a country's overall debt burden. Expression (5.4) may, therefore, be rewritten as

(5.4)' $P = P(T, iD+Q, y, s, R, \dot{p}D, D, r(i+k), A)$

where R is international reserve holdings and $\dot{p}D$ the inflationary erosion of external debt.

Expression (5.4)' differs from the Cline formulation in three noteworthy respects. First, although the reduced form expression has essentially all of the explanatory variables imployed by Cline, it is the result of decidedly different supply side and demand side considerations. Second, unlike the Cline model expression (5.4)' explicitly considers the risks assumed by banks in the financial intermediation process. Finally, since the intermediation process is viewed as being the consequence of decisions made with respect to current financing requirements emanating from developments in the external accounts no a priori allowance has been made for lagging selected explanatory variables nor was it deemed appropriate to eliminate observations in the year following a rescheduling exercise as was done by Cline, Feder and Just, and others. The possibility that a Markov process exists in the rescheduling process for prediction purposes is, however, considered separately in chapter six. Be that as it may, the explanatory variables utilized by Cline to explain the rescheduling process are, by and large, the same variables identified by the model developed in chapter two.

The analysis presented in this chapter will proceed in three stages. In the first stage, a version of the Cline model will be tested on data restricted to the period 1976-82 under various data sub-set specifications. The purpose of

this initial analytical phase is to attempt to identify any structural changes which might have occurred in the advent of the first oil price shock. That is to say, the question will be raised as to whether the regressor variables found to be statistically significant by Cline and hypothesized as significant in the above model hold up when the data set is more narrowly defined. Furthermore, is it possible to improve upon these results when selected sub-categories of countries are chosen for analysis? The models tested in this study include: All debtors, large debtors, small debtors, large debtors in Latin America, and small debtors in Latin America. The selection of the different country categories was not meant to be exhaustive; their selection was based primarily upon data restrictions, i.e. either there were not enough observations in general, or very few or no rescheduling episodes. For example, an analysis of the Far East was impossible since for the period under consideration there was only one instance of default out of 38 observations.

For each data specification analyzed two versions of the models were tested. The first version utilized the debt service ratio as a measure of debt servicing capacity, while in the second version the net external debt/export ratio was used as a proxy for the debt service ratio. There are two reasons for having proceeded in this manner. On the one hand, the debt service ratio is recognizably the most popular measure of debt servicing burden in use today. It has

traditionally been a pivotal component to the analysis of rescheduling crises. On the other hand, however, and in anticipation of the results of this study, the debt service ratio in all but one case was statistically insignificant. What is more, in every instance where both indicators were used the debt service ratio was subordinated to the net external debt/export ratio, i.e. it was rendered statistically insignificant. The a priori relative merits of both indicators were discussed earlier (see also Appendix II).

In the second stage of the analysis the model modified by the addition of two additional explanatory variables. The first of these regressors is a memory element designed to serve as a proxy for the risk factor, r, which is intended capture the "willingness to pay" aspect of external debt repudiation discussed earlier. The second of these regressors is the ratio of OPEC current account surplusses to imports of NOLDC's as a proxy to measure the availability of international credit. As will be seen in the discussion to follow both additions contribute significantly to an understanding of the rescheduling process.

Finally, in the third stage of the analysis, a second proxy for rescheduling risks, i.e. an index of how lenders percieve particular country risks will be incorporated into the model. The variable which is used for this purpose is the country credit ratings developed by Institutional Investor.(111) The reason why this variable is entered seperately is because these credit ratings were first

published in 1979, thereby resulting in a smaller data set available for analysis.[112] The Institutional Investor index is used to test the validity of the assertion ennunciated in the first chapter that regional debt problems were aggravated by "psychological shifts" in the international credit market.

Before commenting on the reduced form equation to be estimated a few observations are in order regarding the hypothesized influences of some of the regressor variables emunerated by Cline. In the first place, Cline asserted that the first partial of the current account ratio would be positive. This, it is believed, is probably an error since the probability of a debt rescheduling occurring will be diminished as the current account surplus enlargens since it represents a greater inflow of foreign exchange earnings. Secondly, Cline has asserted that the amortization rate is a supply side argument in which "a higher amortization rate means that country A has lower total debt (otherwise its interest payments relative to exports would be the same as those for country B and its total debt service ratio would be higher), giving it a more favorable balance sheet position."[113] For this reason Cline has asserted that a greater supply of credit will be forthcoming and therefore the probability of a debt rescheduling will be lower. This line of reasoning may, of course, be correct, unfortunately this does not follow from the model developed in chapter 2. A high amortization rate is an indication of "bunching" of

maturities which implies a greater strain on a country's current earnings. For this reason the amortization ratio is likely to be a demand side determinant with a positive first partial; this is the line of reasoning which will be adopted here. Finally, the inflationary erosion of debt indicator is also asserted by Cline to be a supply side argument with a negative influence upon the probability of a debt rescheduling. As in the case of the amortization ratio, however, this line of reasoning is far from conclusive. While it is certainly true that the higher the global inflation rate the lower will be a country's real debt burden, it is also true that the higher will be the nominal interest rate and therefore a greater current debt servicing obligation. This additional effect is clearly a demand side argument with an hypothesized positive first partial. In other words, the inflationary errosion of external debt is a priori sign indeterminant; the sign of this regressor will depend upon the net effect of these two competing influences.

With the above reservations accounted for, the reduced form equation providing the overall probability of debt rescheduling to be tested initially may be written as:

$$(5.1) \qquad \ln\{P/(1-P)\} = b_{\emptyset} + b_1 (DSR \text{ or } NDX) + b_2 RSM + b_3 GDP + b_4 GRO + b_5 SQCA + b_6 INX + b_7 AMZ + b_8 SAV + b_9 XGR + b_{10} EXBOR$$

or alternatively as:

$$(5.2) \qquad P = e^{BX}(1-e^{BX-1})$$

where P is the probability of a debt rescheduling, the seperate regressors as earlier defined, and BX the right hand side of equation (5.1). In stage two, the memory element (MEMi) will be added while EXBOR is replaced with OPECM (the ratio of OPEC current account surplusses to imports of NOLDC's). In the final stage, the regressor III (the Institutional Investor index) is added to the reduced form equation of stage two.

Data

The debt service ratio (DSR) is defined as the ratio of total interest payments on all debt and amortization on that debt (short-, medium, and long-term)[114] divided by exports of goods and services. Total amortization payments are derived from the Balance of Payments Yearbook (BOPY),[115] while total interest payments are estimated from the World Debt Tables (WDT),[116] and The Maturity Distribution of International Bank Lending (MDIBL).[117] Exports of goods and services were obtained from the International Financial Statistics (IFS).[118]

The ratio of gross international reserves to imports of goods and services (RSM) is calculated from data available in

the IFS. International reserves exclude gold holdings for two reasons: a) the volitility of gold values on world markets, and b) diverse national practices on gold valuation. Consequently, parameter estimates may be somewhat downward biased. It should also be mentioned that imports of goods and services exclude interest payments on external debt since this has already been accounted for in the DSR.

Until 1977, data on total external debt was largely unavailable. With the publication of MDIBL, however, more precise estimates of total external debt became possible. In this study total external debt was calculated as follows. Data on total public and publicly guaranteed external debt is available from WDT. The WDT also provides information on the amount of this debt which has been provided by private financial institutions. The MDIBL provides information on total outstanding obligations, both public and private, that is provided by member nations of the Bank for International Settlements (BIS). In order to calculate total external debt, therefore, it is a simple matter to deduct from total public and publicly guaranteed external debt the amount provided by private financial institutions, and then to add the resultant figure to total outstanding obligations provided by reporting nations of the BIS. Although these countries do not represent all potential and actual lenders to LDC's, they do represent all of the OECD nations, and therefore the vast bulk of all external private financing. It is worth noting that this is

essentially the same technique used by Cline, however in order to get data going back to 1962 Cline inflated public debt, which was available before 1976, by the average of private debt as a percentage of total debt after 1976. This was clearly a mistake since prior to the first oil price shock private external debt was a lower percentage of the total. As a result, Cline's figures have an inherent upward bias. What is more, by following this procedure Cline glossed over major structural changes which were bound to affect his predicted probabilities.

Having calculated total external debt in the manner described, net debt relative to exports (NDX) is simply total external debt minus international reserves (less gold), with the net result divided by exports of goods and services.

The amortization ratio (AMZ) is calculated as the sum of amortization on medium- and long-term debt divided by total external debt in the previous year. Data on amortization was obtained from BOPY and MDIBL.

Unlike the method employed by Cline in which per capita income (GDP) is calculated on the basis of data in the IFS applied to international purchasing power comparisons conducted by the United Nations, per capita income in the present study is simply 1975 real Gross Domestic Product (GDP) normalized by the population size. Although a broader measure than the one utilized by Cline (119) this statistic, as well as real per capita income growth, has merit on two counts. As a practical matter, these measures of per capita income are not only easier to calculate and rationalize, but

constitute the measures most often used by commercial bank analysts. In addition, in spite of the fact that this procedure results in an understatement of real per capita purchasing power, and therefore serves as a poorer measure of import compressibility, it does have the advantage of more accurately reflecting overall real economic performance.

The ratio of the current account surplus or deficit to exports of goods and services (SQCA) is calculated from data available in the IFS. As described earlier, once this value is squared it is then multiplied by negative unity in the case of deficits in order to maintain sign integrity.

The savings rate (SAV) is also obtained from data available in the IFS and is calculated as follows. From the national accounts, data on private and government consumption are added. This value is then divided by the Gross Domestic Product, and the result is subtracted from unity.

The real growth rate in exports (XGR) is calculated as the ratio of real exports in years t and t-1 divided by real exports in years t-2 and t-3. Real exports are calculated as the ratio of the dollar value of exports to the unit value index of exports for all countries and is found in the IFS. A four year period has been deemed sufficiently long enough to average out extreme fluctuations in export earnings, while short enough to be considered relevant by creditors in evaluating recent export performance. Data for these calculations was obtained from the IFS.

The inflationary erosion of debt (INX) was calculated

using the following expression:

$$INX = (100DW^{-1})X^{-1} \qquad (5.3)$$

where D is total external debt, X exports of goods and services, and W the world consumer price index. External debt is calculated as above, while X was obtained from BOPY, and W from IFS.

Cline measures the availability of global credit (EXBOR) as total net external borrowing from private and official sources by non-oil developing countries divided by total merchandise imports for these countries. Data on total net borrowing was obtained from the World Economic Outlook (120) and exports from the IFS. Although as a first step this same procedure for estimating the availability of the supply of foreign credit is used here (EXBOR being a supply side argument), there are a priori reasons to question its appropriateness. First, and foremost, of these doubts revolves around the recognition that this variable does not represent the availability of lendable funds per se but rather equilibrium in international financial markets. That is to say, the two concepts are equivilent only if borrowers face a perfectly elastic supply of credit. Since lendable funds have alternative uses this is certainly not likely to be the case, consequently there is a potential identification problem.

An alternative specification to EXBOR is the ratio of OPEC current account surplusses to imports of NOLDC's. OPEC

current account surplusses are available in the IFS. The rationale for the use of this variable stems from the petrodollar recycling episode discussed in Chapter 1. More will be said about this variable, as well as the regressor MEMi (the memory element) and the variable III (the Institutional Investor index) later in the discussion.

Debt reschedulings, the dependent variable, assume values of unity in the case of a rescheduling episode, and zero if no rescheduling occurred. Table 15 lists the countries and years in which reschedulings occurred. In some instances,(121) however, reschedulings were recorded as having occurred even though formal agreements had not been concluded until 1983.

The logit model is estimated using data for 33 countries covering the period 1976-82 (see table 16). Although the number of countries examined is smaller than in the Cline study, the sample nonetheless represents over 80 percent of total external debt in 1982.

A Note on the Selection of the "Critical Value."

Before proceeding to the results of the logit analyses on debt rescheduling a few comments are in order regarding the selection of the so-called "critical value" for determining the predictive accuracy of the estimated model. The critical value, it will be recalled, is that a priori selected probability such that if the predicted probability of default is greater, then one would expect a debtor country

to repudiate the terms of its external indebtedness. If the predicted probability is less than the critical value then a continuation of nominal debt servicing (i.e. no default) is expected. Denoting the critical value as P* and the predicted probability value as P, this may be written symbolically as:

$$Y = \begin{cases} 1 \text{ if } P > P^* \\ \emptyset \text{ if } P < P^* \end{cases} \tag{5.4}$$

where Y indicates the incidence of default.

The selection of P* has been subject to some discussion. There are, however, two standard optimal decision rules to be found in the literature on the prediction of external debt rescheduling. The first of these rules, which draws upon the well-established tradition of binary data analysis, is that of selecting a critical value such that the sum of the type I and type II errors be minimized subject to a relatively equal percentage error rate in the two classes of observations. This standard is used principally in descriminant analysis where the expected cost of making type I and type II errors is

$$C = q_1 C(I)P(I) + q_2 C(II)P(II) \tag{5.5}$$

where C(I) and C(II) are the costs associated with committing errors of either type, P(I) and P(II) the probability of making those errors, and q_1 and q_2 the <u>a priori</u> probabilities

that the particular country comes from the population of rescheduling or no rescheduling countries. If q_1 and q_2 are unknown then P=f(x) and P* is selected so as to minimize the maximum of C(I)P(I) and C(II)P(II), i.e. a minimax solution. Welch nas demonstrated[122] that minimizing the total probability of misclassification is equivilent to assuming that C(I)=C(II), i.e. that the costs associated with type I and type II errors are identical. This decision rule is illustrated in figure 2. This particular decision rule, however, presents a number of problems. The first of these problems relates to the reasonableness of assuming that C(I)=C(II). For one thing, the particular cost structure of the decision maker, be he the borrower or be he the lender, ought to be explicitly considered. For another thing, the respective error costs are not likely to remain constant through time. Consequently, while this rule might be adequate for explaining the model's efficiency in describing past reschedulings, it is of limited usefulness in forecasting future events. What is more, even if it could be assumed that costs were equal and constant the problems usually arises as to the precise determination of the critical value from a relatively small data set. In the Feder and Just study,[123] for example, in one instance all that could be said about the critical value when both error types were minimized was that it was somewhere inthe range

of .18 to .50. This imprecision is, in fact, the rule rather than the exception as will be seen in the results of the present study.

An alternative to the error minimization rule is the common practice in logit analysis to arbitrarily select .5 as the critical value. In other words, for P>.5 then an external debt rescheduling would be expected to occur, otherwise not, i.e.

$$(5.6) \qquad P^* = \text{prob}(Y=1;X=X_i) > .5$$

This specification follows from the fact that since the proportion of reschedulings is low, and where Y assumes values of zero or unity for the regressor variables (X), and if that series of binary events is random with independently the same probability of occuring, then the observed events approximate a Poisson distribution.(124) In particular, as P* approaches zero a completely random series tends to Poisson process such that the cumulative distribution function may be written as

$$(5.7) \qquad F(X) = \text{prob}(Y=1;X=X_i) = 1-e^{-BX}$$

where

$$(5.8) \qquad BX = \ln\{P/(1-P)\}$$

This specification of the critical values is, of course, arbitrary since it assumes that the rescheduling process is completely described by the regressor variables included in the model. Nevertheless, the rule is independent of any *a priori* assumptions regarding the costs associated with the errors involved.[125] In the pages to follow both error rules will be presented in the tables.

Results

As mentioned earlier, there are, generally speaking, at least five recognizeable dificiencies that may be associated to some degree with each of the models examined in this study. This first estimation confronts in part three of these dificiencies: a) the absence of a conceptual framework, b) the paucity of reliable economic data on, especially, external debt, and c) the failure to adequately account for parametric structural changes. The first of these inadequacies is addressed by the use of the model developed in chapter two, while the second and third of these problems is partially addressed by restricting the data set to the period 1976-82. As previously mentioned, not only has there been considerable improvement in the availability of data on total external debt during this period, but by restricting the analysis to the period 1976-82 accountability has been made for the historic shock to the international economic system which resulted from the first oil price hike of 1975.

All Debtors

The initial results of the model, in which the complete data set was used, are presented in table 17; for the sake of convenience the same alphabetic abreviations discussed earlier are used here. The value in the parentheses below each parameter estimate is the chi-square statistic for testing the statistical significance of each of the independent variables at one degree of freedom.[126] The model chi-square[127] and the "D" statistics are also presented.[128]

In the table model IA refers to the parameter estimates in which the explanatory variable DSR was used to measure debt servicing capicity. Model IB refers to the parameter estimates in which the debt burden is measured by NDX. As is apparent from the table, the estimated results broadly confirm the influences on debt rescheduling. In the case of model IA, however, only the ratio of international reserves to imports (RSM), real per capita economic growth (GRO), the ratio of global external borrowing to imports (EXBOR), and the inflationary erosion of debt (INX), were shown to be statistically significant. In model IB, on the other hand, the statistically significant variables included the amortization ratio (AMZ), per capita income growth, and the net external debt/exports ratio (NDX). Of some interest is the apparent insignificance of the debt service ratio (DSR) in explaining the incidence of debt rescheduling during this period. Also of some significance is the fact that preliminary reservations concerning the hypothesized sign of

the regressor AMZ were vindicated, in addition to the fact that the regressor INX has a positive impact on debt rescheduling. This, of course, suggests (as mentioned earlier) that the positive inflationary impact upon the debt servicing burden probably outweighs its negative effect upon the inflationary erosion of the overall debt burden, i.e. a higher inflation rate suggests an increased likelihood of external repudiation. These initial results are confirmed by the final parameter estimates presented in table 20. In addition, an examination of the correlation matrix of the estimates presented in table 18 suggest why the debt service ratio was shown to be statistically insignificant. In the table the degree of association between DSR and INX is strong at -.55. In table 19 the degree of association between NDX and INX is -.81, although in the case of model IB NDX survived the estimation procedure while INX did not. Both models IA and IB are highly significant exhibiting chi-square values at four and three degrees of freedom of 37.61 and 38.52, respectively, while the value of the D-statistic in the two models is .442 and .463, an improvement in both cases over the initial estimates.

Finally, in order to ascertain the overall predictive accuracy of the models, consider tables 21 and 22 which indicate the number of type I and type II errors committed at various a priori critical values. In terms of the minimum number of total errors decision rule it was found that in model IA at a critical value between .71 and .83 the total

number of type I and type II errors was 25 out of a total of 190 predictions, or an overall predictive accuracy of .87. More specifically, there were 25 type I errors, or an error rate of 13.8 percent, and zero type II errors, or an error rate of 0.0 percent. These results compare favorable with Cline's findings in which he reported type I and type II errors of 9.1 and 13.0 percent, respectively. These results seem to lend credence to the efficacy of restricting the analysis to the post-oil-embargo period in order to take advantage of improvements in data, as well as to account for basic structural changes.

If, on the other hand, we invoke the P*=.5 decision rule then the total number of type I and type II errors committed in model IA is slightly higher at 29 (a predictive accuracy of .85). There were 24 type I and 5 type II errors committed with a percentage distribution of 13.1 and 71.4, respectively.

With respect to model IB, using the minimum errors rule it was found that at .39<P*<.42 the total number of errors was 20, or an overall predictive accuracy of .90. There were 16 type I errors (9.1 percent) and 4 type II errors (28.6 percent). In terms of P*=.5 there were 18 type I errors (10.1 percent) and 3 type II errors (27.3 percent) for an overall predictive accuracy of .89.

It would appear that on the basis of these initial results that there is some advantage to be gained by restricting our attention to the period after 1976. What is more, it would seem that, at least initially, the use of the

variable NDX is the superior regressor in explaining the influence of the burden of current debt servicing upon the incidence of external debt rescheduling.

Next, in an attempt to improve upon the overall performance of the model two additional explanatory variables were introduced. On the supply side the variable OPECM, the ratio of OPEC current account surplusses to imports of goods and services of NOLDC's, was introduced as an indicator of the total availability of credit in international financial markets. The reason for the introduction of this variable is twofold. First, as was mentioned earlier, the variable EXBOR, which was used by Cline, is suspect due to the possibility of an identification problem, i.e. whether this variable indeed represents the availability of lendable funds per se or whether it is merely an equilibrium value. Second, the use of OPECM highlights the petrodollar recycling issue which was at the forefront of the economic debates of the mid-1970's and which was, in fact, the genesis of the present LDC debt crisis.

On the demand side of the model the regressor variable MEMi is introduced which is essentially a non-economic explanatory variable designed specifically to take into account a country's willingness to meet its external debt obligations. MEMi is a memory element spanning i years. It is introduced under the assumption that a country which has rescheduled its external debt in the past is more likely to do so again in the future than a country which has never

rescheduled. It is, if you will, an attempt to incorporate into the model a country's credit history as a proxy for its committment to meet its future overseas obligations.

In this study, the model has been tested for memories of one, three, five, seven, and ten years. In other words, the model has explicitly accounted for the fact that a country may have rescheduled its external debt up to i years subsequent to the episode, i.e define the variable MEMi such that

$$(5.9) \quad MEMi(t) = \begin{cases} 1, \text{ if } Y(t-1)=1 \text{ or } Y(t-2)=1 \ldots \text{ or } Y(t-i)=1 \\ \emptyset, \text{ otherwise.} \end{cases}$$

Table 23 presents the results of the reestimated models IA and IB using the memory element, as well as OPECM in place of EXBOR. The new models have been labled IAA and IBB. In the case of model IAA all of the regressors which proved statistically significant in model IA are also thus here. In fact, OPECM is a significantly stronger explanatory variable. What is more, MEM5, the five year memory element, is also highly significant. The model is significant exhibiting a chi-square value of 41.88 at 5 degrees of freedom, while the D-statistic rose from .44 to .46. Furthermore, there was also been an improvement in the overall predictive capacity of the model. In the case of model IA using the minimum error and the P*=.5 decision rules the predictive accuracy of the model was .86 and .85, respectively. In model IAA, however, these values rose to .87 and .86, respectively. These improvements were due no doubt to the improved measure

of credit availability as well as the model's enhanced ability to identify those countries with a seemingly "good" credit history from those with a seemingly "bad" credit history.

Focusing attention on model IBB the results are no less encourageing. As in the case of model IAA, all variables present in model IB are represented in model IBB. In addition, the liquidity ratio, RSM, has appeared as statistically significant, as well as the ten year memory element, MEM10. The fact that OPECM has not appeared in the final estimates is also not suprising since its predeccesor EXBOR was also not significant in model IB. As in the case of model IAA the overall model is significant with a chi-square of 48.04 at 5 degrees of freedom and an improvement in the D-statistic to .50 (.46 previously). Likewise, as in the case of model IAA, there has been an improvement in the overall predictive accuracy of the mosel. Using the minimum errors and P*=.5 decisions rules, the predictive accuracy of the model increased from .90 and .89 to .91 and .90, respectively.

Finally, consider the impact of lenders attitudes on the rescheduling process. In other words, while an attempt has been made to explicitly consider a borrower's "willingness to pay," might it not also be possible to introduce on the supply side a creditor's "willingness to lend"? This consideration harkens back to the discussion in chapter 1 in which it was suggested that "psychological

shifts" in the international credit market resulting from a debt servicing breakdown by a major country might restrict capital flows to the entire region. For this purpose the country ratings developed by Institutional Investor (129) were incorporated into the estimation procedure. As was mentioned previously, since these ratings were only available since 1979, thereby abbreviating the basic data set, it was decided to introduce these indices at a separate stage of the procedure. The Institutional Investor credit ratings are based on evaluations provided by leading international banks. In the evaluation process, bankers were asked to grade a number of countries on a scale of zero to 100, with zero being the least, and 100 being the most, credit worthy (the ones with the least likelihood of default). According to Institutional Investor:

> "The individual responses are weighted, using an Institutional Investor formula that properly gives more weight to responses from banks with the largest worldwide exposure and the most sophisticated country analysis system."(130)

Table 24 presents the final parameter estimates using the variable III. The new models have been labled IAAA and IBBB. As is apparent by these results the regressor III is not significant in either model. Two possible reasons for this suggests themselves. On the one hand, the hypothesis of "psychological shifts" is incorrect or, if it is correct, that the regressor III is incapable of capturing that effect. On the other hand, however, if III is, indeed, the product of "sophisticated country analysis systems" then this variable may, in fact, be redundant information. This would be

especially true if models IAA and IBB were successful in capturing the essential default elements. In other words, the regressor III may be a somewhat less than effective proxy for the predicted probabilities of the present model. Subsequent discussion on alternative specifications of the basic model may shed some light on this possibility.

Large Debtors versus Small Debtors

In this, and in subsequent, sections of the present discussion attention is directed towards the further improvement of the predictive accuracy of the model by sub-dividing the original data set into the classes of "large" debtors and "small" debtors.(131) The rationale underlying this procedure is the recognition of possible parametric differences between the two classes of borrower countries. As will be argued again later in this study the ideal situation would be to construct a logit model for each and every country under the supposition that only in this way will the exclusive use of economic indicators capture the willingness to pay aspect of debt reschedulings cited earlier. Unfortunately, however, adequate and sufficient country specific data is largely unavailable. The next best step, therefore, would appear to be a sub-division of the panel data set into alternative categories of countries which broadly share similar characterists. The final estimates of the class of large debtor countries utilizing DSR and NDX in a manner similar to that outlined for the complete data set

are summarized in table 25. In the case of DSR the model is referred to as IIA while for NDX the model is referred to as IIB.

In the case of model IIA it is significant that the regressor RSM is absent from the list of statistically significant variables. In spite of this the model exhibits a fairly high degree of significance along with an improvement in the D-statistic from .44 in model IA to .57 here. Furthermore, by employing the minimum total errors decision rule, at $.37<P^*<.41$ the predictive accuracy of the model improves to .90 (up from .86 in model IA), while at $P^*=.5$ the predictive accuracy of the model is .89 (compared with .85 previously). In the case of model IIB, while the variable AMZ is no longer included in the array of statistically significant regressors, the model itself remains highly significant while the corresponding D-statistic has ballooned to .66 (from .46 in model IB). What is more, the predictive accuracy of the model at $.54<P^*<.57$ stands at .92 (from .90 in model IB), while at $P^*=.5$ the predictive accuracy of the model is .90 (from .89 earlier).

Turning our attention to the class of small debtors (table 26) it is interesting to note that in both models IIIA and IIIB the explanatory variable GRO is no longer present, although the liquidity ratio, RSM, has reemerged. Furthermore, the variable EXBOR which appeared in models IA and IIA is no longer statistically significant. Also of some interest is the emergence of the debt service ratio, albeit with the wrong sign.

In order to get a clearer insight into the economic forces underlying these results consider the breakdown of total external debt of both groups of countries in 1982 into its public and private components. Of the 17 largest debtor countries in the sample total external debt amounted to about $456 billion, of which approximately 60 percent, or $274 billion, was comprised of public debt on concessional terms, and about 40 percent, or about $182 billion in private debt on "harder" terms. Compare these figures with those of the 16 smallest debtor countries in which total external debt amounted to approximately $39 billion, of which more than 90 percent, or $35 billon, was made up of "soft" public loans, and less than 10 percent, or about $4 billion, in private financing. The fact that the regressor is significant in the large debtor case highlights the greater reliance of this class of borrower on the availability of private financing and movements in the international credit market. In addition, the presence of GRO in models IIA and IIB attest, perhaps, to the increased significance of domestic economic performance in the acquisition of additional financing from private sources. What is more, in recognizing the significance of the liquidity ratio in the small debtor case, as opposed to its absence in the large debtor model, a number of alternative explanations come to mind. For one, it has been suggested that countries with a diversified export base and stable foreign exchange earnings are less subject to financial crises and are, therefore, better able to tolerate

higher debt servicing requirements than those countries with a much narrower export base. A cursory examination of the small debtor and large debtor samples suggests that the former relies to a greater extent on the export of primary commodities which are more sensitive to price fluctuations while a significantly higher percentage of exports of the later category is made up of manufacturers and a more diversified export base. June Flanders,(132) for example, points out that among the most important reasons why countries demand international reserves are such considerations as the systematic or random fluctuations in current account receipts due to shifts in demand for exports which affect prices, quantities, or both, or sudden unexpected declines in exports earnings due to such factors as war, crop failures, precipitous changes in capital movements, etc. Clearly each of these factors tends to impact those countries which rely to a greater extend on exports of primary goods. What is more, these countries also tend to be the poorest of the LDC's and as such do not have quick access to private capital. It is, therefore, significant that when considering a variety of economic indicators in order to flag potential debt servicing difficulties that the class of borrower be considered as well. Clearly, those factors which have the greatest impact on a country's decision to repudiate its external debt will be closely linked to the stage of that country's economic development, especially in so far as the variegation of its export base is concerned.

Finally, the fact that the amortization ratio, AMZ, is significant in the small debtor case seems to suggest a higher level of concern with the "bunching" of maturities than in the case of large debtors. This result is at once suprising and reassuring. Reassuring since it highlights the fact that the primary component of debt service payments of these countries are principal repayments; suprising since public debt usually carries with it relatively long payout periods. These two facts together may help to explain why the debt service ratio, while significant, has the wrong sign. In other words, longer payout periods in fact improve a country's debt profile. It should be pointed out that in the case of model IIIA although the chi-square values for AMZ and RSM are not impressive, this is due in large measure to the relatively high degree of correlation between AMZ and DSR (-.42), between DSR and INX (-.66), and between RSM and AMZ (.28). The point is that the best overall results were obtained when all four regressors were included than when any one or two were eliminated.

Although models IIIA and IIIB are statistically significant there was a deterioration in the explanatory power of both models as is demonstrated by the relatively large reduction in the D-statistic. Be that as it may, the predictive accuracy of the models is still good. In the case of model IIIA at $.41<P^*<.56$ (and at $P^*=.5$) the predictive accuracy of the model is .88, while for model IIIB at $.41<P^*<.45$ the predictive accuracy of the model is .89,

while at P*=.5 it is .87. These results are roughly equivilent to the results obtained in models IA and IB.

Next, examine the final results of the reestimated large debtor model incorporating the variable OPECM and alternative specifications of the memory element as presented in table 27. The first thing to consider is that in neither case did any of the memory specifications prove statistically significant. There are any of a number of possible explanations for this result but the three most reasonable explanations appear to be, a) in the case of the large debtor sub-sample there are no sufficient differences between individual cases insofar as past repayment history is concerned to distinguish "good" risks from "bad" risks, b) that individual credit histories for this class of borrowers was irrelevant in international credit markets, i.e. it is not past performance which is of importance but future prospects, or c) that because of the amounts owed to private lenders that any interruption in the flow of new credit might seriously threaten global financial stability; in other words, private lenders are "locked in." To paraphrase J.M. Keynes on this last point; if a borrower defaults on a million dollar loan then he is in trouble, but if the borrower defaults on a billion dollar loan then the bank is in trouble.

Although it is not possible to say <u>a priori</u> which of the above represents the most likely explanation since there are valid grounds in support of all three, nevertheless, in many quarters the second of these possiblities rings truest.

As John Makin observed in his excellent study of the global debt crisis:

> "It was a deep-seated feeling of unease that somehow all was not well in their own countries, that they (the commercial bankers) were running out of the things they would need to keep the machinery running and furnishing the life style they had come to expect. They wanted a piece of the part of the world that was deemed still to hold tremendous promise for the future, rich in raw resources that could be fed into the machinery. Brazil held that promise. Its growth had averaged 6 percent between 1920 and 1967. The 'Brazilian miricle' of 1968 to 1973 saw growth pound along at 11 percent a year - more than twice the average rate in industrial countries and closer to three times the rate in many, including the United States. Other countries besides Brazil held similar promise, especially after the first oil shock jolted even the less imaginitive bankers into the realization that the era of plentiful raw materials at low cost was over. The quest was for 'energy', both literally and figuratively, and it was sought with an intensity akin to that of the aging seeking the fountain of youth."(133)

All of the countries in this class of borrower experienced, especially in recent years, a rash of financial difficulties necessitating, at times, draconian corrective measures. On the other hand, many of these countries, notably Mexico and Brazil, abounded with latent potential for tremendous economic growth. Either way, using the memory element seems not to have enhanced the logit model's ability to explain the rescheduling process.

On the brighter side, however, is the fact that OPECM proved to be statistically significant in both models IIAA and IIBB. In the case of model IIAA OPECM supplanted EXBOR in rather impressive fashion, while in the case of model IIBB OPECM sallied forth as a significant regressor even though the variable EXBOR proved to be an impotent explanatory

variable. As a result, both models IIAA and IIBB performed noticable better. In the case of model IIAA both the model chi-square (35.71 (3)) and the D-statistic (.60) are impressive compared with the results of model IIA (33.28 (3) and .57, respectively). The same can be said for model IIBB (43.87 (3) and .67, respectively) in spite of the already impressive results (40.19 (2) and .66) of model IIB.

These assuring results are also mirrored in the predictive performance of both models. In model IIAA the predictive accuracy of the model using the minimum errors rule is .91, as against .90 in model IIA, while at P*=.5 this figure is .88, only slightly lower than the .89 in model IIA. As for model IIBB, using the minimum errors rule the predictive accuracy of the model is .94 (.92 in model IIB), while at P*=.5 it is also .94 (.90 previously).

In short, both models IIA and IIB benefited from the redefinition of the credity supply variable, and although there were no improvements forthcoming through the use of the memory element this fact in and of itself suggests additional insights into the dynamics of the international credit market mechanism. Clearly, additional research needs to be devoted in this particular direction, i.e. the credit worthiness trade-off, if any, between past debt servicing difficulties and future economic prospects.

Finally, neither the inclusion of OPECM or the memory element was shown to be significant in the small debtor case. Again, this is not suprising since, as was already discussed, these countries do not, by and large, have access to foreign sources of private funding. Certainly, neither OPECM or EXBOR were statistically significant underscores the fact that these variables are primarily indicators of financial movements in private credit markets; markets which this group of borrowers is largely excluded. Furthermore, the fact that the memory elements proved also not to be significant suggests that a country's inability to promptly service its external debt arises, as Dhonte has pointed out, from an inability to roll-over maturing obligations at relatively easy terms. Since the bulk of these countries external debt is on concessional terms then clearly this is not an issue. By and large, it might be concluded that past incidences of debt repudiation have not affected these countries credit ratings in private credit markets since these countries do not have access to these markets in any case. Consequently, the fact that these countries rescheduled at all may not be the result of any systematic sequence of events but the results of random shocks -- social, economic, or political.

Lastly, in order to ascertain the effect of the inclusion of the regressor III into the analysis, consider, first, table 28 which presents the correlation matrices of this variable with those found statistically significant in

the large debtor models (IIAA and IIBB). What is truly striking about these results is the incredibly high degree of correlation among nearly all of the explanatory variables. In fact, because of the high degree of association it was impossible to calculate parameter estimates in most cases.[134] Consequently, in order to estimate the logit model one explanatory variable each from models IIAA and IIBB had to be elimated. The final results are presented in table 29 while table 30 presents the corresponding correlation matrices.

On the surface, at least, the results presented in table 29 are most impressive. Both models are strongly significant while the predictive accuracy under either of the decision rules is quite impressive. Unfortunately, these results must be rejected out of hand since, as table 30 illustrates, there remains an unacceptably high degree of association between III and the remaining explanatory variables. These results seem to suggest that the variable III is not a good proxy for "bankers subjective probabilities"[135] of default as argued by Feder and Ross. Indeed, the variable III seems to be merely a proxy for the predicted probabilities of default based upon the economic indicators included in the model. This, of course, should not be suprising since even the compiler of the rankings admit that the greatest weight was assigned to those rankings "from banks with the largest worldwide exposure and <u>the most sophisticated country analysis systems</u> (my emphasis)."[136] What is suprising,

however, is that Feder and Ross should have concluded otherwise, i.e. that these rankings represented "a reasonable measure of the markets perceived (read subjective) default probabilities," when, in fact, they appear to be the result of objective evaluation systems based largely upon economic factors. If this conslusion is correct then it would, of course, cast serious doubt upon the validity of the Feder and Ross study. The authors conclude with this observation:

> "As the results indicate that credit pricing in the market is generally consistent with lender's risk perceptions, judgement regarding the appropriateness of credit pricing will need to focus on the quality of country risk analyses performed by the lenders."(137)

Indeed, since risk perceptions and the quality of an objective country risk analysis appear to be one and the same, this admonition seems inappropriate.

These observations are supported somewhat by an examination of the final parameter estimates of the small debtor sample following the inclusion of the parameter III. These results are presented in table 31. Notice that in model IIIAAA all of the variables found significant in model IIIA have been supplanted by III, while in model IIIBBB only the regressor NDX remains.(138) While the overall preformance of the model was improved somewhat indicating the embodied within III are statistically significant variables not included here, there was in fact a decline in the predictive accuracy of the models. This result should not be taken too seriously, however, due to the differences in the time periods tested. It would appear, therefore, that on the basis of these results that a continued effort to identify

additional economic variables in the small debtor case would in all likelihood be most fruitful.

Large Debtors/Small Debtors - Latin America

In the previous sections it was observed that by restricting the analysis to the 1976-82 period that the predictive accuracy of the model was rather good. In the case of the "large debtor" sub-sample in particular the overall improvement in the model's predictive performance was quite encouraging, although less could be claimed for the "small debtor" case. Furthermore, as was also shown, although some improvement in the predictive accuracy of both models could be accomplished by redefining the variable for the availability of credit, the inclusion of the memory element was of no consequence. In fact, the only accomplishment of the regressor seems to have been to distinguish between large debtors and small debtors, although, as was recognized, the small debtors are generally those countries which are precluded from private financing.

It is clear from the above that while those economic variables which were included in the analysis were of consequence in explaining the incidence of default that there is every indication to suspect that significant variables may have been omitted. These findings suggest three possible alternatives: a) that the excluded variables are economic in nature, b) that there is some other aspect of the rescheduling process that cannot be captured by the inclusion

of just economic indicators, or c) unexplained random shocks. While alternative c) threatens no quick solution to the dilemma of improving the predictive ability of the model, alternatives a) and b) appear to lie at the hear of the "ability versus willingness" to meet external servicing obligations discussion above.

Ideally, if analyses of debt rescheduling is to be restricted to economic indicators alone then the best of all possible worlds would be to estimate the logit model on a country by country basis. The reason for this being that while specific non-economic variables are not considered, different attitudes towards default may nonetheless be captured in the variability of threshold levels of the regressor variables prior to default. In other words, in those cases where there is a rather high propensity to default in the event of financial or economic crises then the regressor values are likely to be lower. Conversely, when there is a low propensity to default the regressor values would be high. For example, if it were found that the variable DSR was significant in explaining default occurances at relatively low values then we might conclude a reluctance to meet external financing requirements. If, on the other hand, the value of the regressor DSR attained relatively high levels prior to debt rescheduling then this would indicate a greater willingness on the part of that country to meet its foreign obligations. Unfortunately, due to the paucity of data on an individual country by country basis this procedure does not hold much promise.

It is well known that most major commercial banks, official government and international agencies, as well as research institutions, who are actively engaged in country risk analysis are organized along regional lines, i.e. Latin America, sub-Saharan Africa, East Asia, South Asia, etc. The primary reason for such geographic subdivisions is the perception that these regions share certain common ethnic, religious, cultural, social, political, and economic simialrities, not to mention the fact that many international events tend to be regional rather than country specific. Following from this, therefore, it might be assumed that should this supposition of commonality have any validity that this might also be extended towards attitudes concerning default. Following this line of reasoning, and having established that there are basic structural differences between large and small debtor countries, consider the results of the reestimated logit model in which the sample is restricted to large debtors in Latin America.(139) As before, separate analyses are performed using the regressors DSR and NDX (models IVA and IVB), the results of which are presented in table 32.

The first most striking result to consider is the fact that neither the regressors DSR or NDX are statistically significant. Consequently, both analyses are one and the same. Little else can be said regarding these results except to note with some suprise the emergence of the liquidity ratio, RSM, as statistically significant; suprising since it

was absent in the large debtor model and had appeared only one time before (in the small debtor model). At .64<P*<.65 the overall predictive accuracy is .88, while at P*=.5 it is .83. In either case it is outperformed by the large debtor models in spite of the fact that the model itself is statistically significant.

Next, consider the sub-set of small debtors in Latin America.(140) These results are presented in table 33 (and are appropriately labeled VA and VB).

In the case of model VA only INX is statistically significant. What is more, the model does not perform particularly well. Although the model is statistically significant, the D-statistic is disappointing (.20). As for the predictive accuracy of the model, using the minumum total errors criterion at .43<P*<1.00 the predictive accuracy of the model is .90, as it is for P*=.5. While these results are better than for model IIIA, they are not impressively so.

In the case of model VB it is to be noted that this model shares all the same explanatory variables with model IIIB. In fact, model VB is an improvement over model IIIB. At .49<P*<.87 the predictive accuracy of the model is .92 (as it is for P*=.5). Only model IIB, i.e. the large debtor model using NDX, performed as well.

There were no changes in the final parameter estimates of models IV or V with the inclusion of OPECM and alternative specifications of the memory element. This is not suprising since the variable EXBOR did not perform well initially, while it has become clear that the memory element is only

useful in identifying the class of debtor, i.e. large or small. Once the data is subdivided between these classes of debtors then its usefulness evaporates. In addition, the fact that these two variables were incapable of improving the model was to be expected on the grounds that as attempts are made to further homogenize the sample groupings that additional variables designed to isolate distinguishing characteristics are bound to become increasingly more difficult to locate and quantify. In other words, at increasingly more specialized sample specifications it becomes increasingly more difficult to identify individual rescheduling characteristics. In the extreme case of an individual country such attempts are, of course, no longer necessary, and as has been stated before only then does the exclusive use of economic indicators suffice in the modeling process. Be that as it may, while the use of the logit model is an important tool in isolating many of the determinants of debt rescheduling it cannot substitute for an in-depth case by case economic, social, and political analysis.

Finally, in the case of the Large Debtor - Latin America sub-sample there were no changes in models IVA and IVB. In other words, neither the introduction of the variable MEMi, OPECM, or III had any impact on the descriptive or predictive accuracy of the model. It is interesting to note, however, that as in the case of the large debtor model above the variable III was highly correlated with each of the statistically significant variables (see table 34). Of

additional interest is that, as before, at least one variable had to be dropped from the estimation procedure, only this time that variable was III. This would seem to suggest that at least insofar as the underlying models of the Institutional Investor index is concerned the large debtor model presented appears to have performed, on average, better.

Similarly, in the Small Debtor - Latin America case the regressor III was unable to improve significantly upon earlier results. Unlike the earlier models, however, III did not demonstrate the pervasive degree of correlation that was evidenced in the Large Debtor - Latin America case.

Chapter 6

Summary and Conclusions

The results of the estimated logit model of debt rescheduling are briefly summarized in table 35. First, in every case examined the variable net external debt/exports ratio (NDX) outperformed the debt service ratio (DSR). In other words, using Dhonte's terminology, a countries "involvement" in external debt is, by and large, a better summary indicator of potential debt servicing problems than is a country's ability to meet its current debt servicing requirements as embodied in the debt service ratio. The fact that the ratio of net debt to exports was shown to be a consistently significant regressor suggests that in the decade following the initial oil price shock a country's debt servicing requirements represent a source of potential financial instability only in those instances where the country in question had already assumed considerable overseas debt obligations. Sudden increases in interest rates or drops in export earnings which create momentary debt servicing difficulties is a necessary but not a sufficient condition for a rescheduling crisis. Where a country is already heavily indebted (say two or three times export earnings) then unanticipated short-term difficulties in servicing that debt will likely lead to a disequilibrium condition resulting in a formal rescheduling package. The reason for this is ostensibly explained as follows. Countries with a relatively light overseas debt burden and

reasonably bright economic prospects tend to have little difficulty in attracting new capital in times of foreign-exchange short-falls. This is obviously less so for countries already heavily indebted and where the net placed at risk by private lenders is already considerable. What is more, this situation is likely to be further aggrevated by adverse developments in the supply of lendable funds as was the case in the early 1980's when a drop in OPEC current account surplusses coincided with a rash of debt rescheduling episodes. It is not suprising, therefore, that the variable OPECM should also have proved to be highly significant for large debtors while insignificant in the case of small debtors which were either well below the external debt threshold or were simply not deemed by private lenders as credit worthy in the first place due to dismal economic and political prospects.

These results also endorse the conclusions of Saini and Bates (141) in which it was found that "the debt service ratio, without adjustment, is virtually useless in isolating debt service problems." This is not to suggest that the debt service ratio is not a significant explanatory variable in isolation, only that when combined with more direct measures of debt servicing capacity such as the amortization ratio, the inflationary erosion of debt, the availability of foreign credit, the real economic growth rate, and the liquidity ratio, the variable DSR is a second best substitute. This is also not to suggest that for casual analytical purposes that the DSR as a "rule of thumb" indicator of debt servicing

difficulty be abandoned altogether, only that an in-depth analysis of debt servicing capacity should eschew such summary indicators not only in favor of more direct measures of debt servicing requirements but also that they be considered within the context of the country's overall debt profile and general international financial conditions. To the extent that some analysts feel compelled to continue to use the debt service ratio as a "flag" for impending financial crises they should do so within the general context as outlined above.

To be sure, one important conclusion to be drawn from the present study is the apparent and continued impact of the oil price shocks of the 1970's on the global debt structure. Furthermore, that the direct influence of the OPEC nations upon the economic development of non-oil-producing less developing countries, and indirectly upon the future prospects of the economically advanced nations of the world vis-a-vis the superstructure of international credit, continues to be significant and pervasive. In contrast to earlier studies, therefore, the analysis of country risk in the post-oil-embargo era can no longer be confined to financial developments within specific countries (if, indeed, it ever could) but must be expanded to explicitly account for major shifts in international trade and payments imbalances.

Another aspect of the results to consider is the fact that when the complete panel data set is examined that, for the most part, the descriptive and predictive accuracy of the

logit models is not as powerful as when the data is sub-divided into smaller categorical sub-sets, as for example with large debtor and small debtor countries. This weakness is rectified somewhat however through the use of a memory element to further segregate different classes of borrower countries. This could be of considerable importance in those instances where a paucity of data does not permit the researcher to estimate the logit model for particularly small categories of debtors. In this study the model performed best using the memory element only in the complete sample case. At smaller data specifications the memory element was not able to contribute anything to either the descriptive or predictive performance of the model. It was suggested earlier that one possible reason for this was that for rapidly developing economies, such as Brazil in the 1970's, the overriding consideration from the point of view of private lenders was the perceived prospects for future economic growth and not past credit histories. However, as the above discussion suggests, the memory element may simply be isolating those countries which are already heavily indebted and are, therefore, good candidates for a rescheduling crisis. Of course, these two considerations are not independent since countries with bright economic prospects are likely to be those countries with the greatest relative external debt.

It ought to be reemphasized that this study was not an ad hoc search for more meaningful economic indicators of external debt repudiation. Nor, for that matter, did the

study represent any significant theoretical advance over earlier attempts. It was, instead, designed to overcome inherent difficiencies in the logit approach by (1) using improved alternative data specifications and (2) by restricting the data set to the post-oil embargo period using the Cline (1982) model as a backdrop. To see if this procedure was successful compare the percentage of type I and type II errors committed by models IA, IB, and IIA with Cline's models C, D, and L (table 36). In terms of the number of type I errors committed the models outperformed those of Cline in two out of three cases. On the other hand, however, Cline's models did better with respect to the number of type II errors committed in two out of three cases. These results are not, however, very meaningful in so far as the overall predictive accuracy of the model is concerned by virtue of the fact that since this logit model attempts to predict the probability that a rescheduling occurs then as these values approach unity the failure rate becomes distorted by the particular distribution of the observations. For example, in the case of model IIA, the model was incorrect in predicting that no rescheduling would occur at $.37<P^*<.41$ 7 out of 99 cases, or 7.1 percent of the cases observed. On the other side, the model was incorrect in predicting that a rescheduling would occur 4 out of 11 times. If the critical value had been established at, say, $P^*=.81$, then the percentage of type I and type II errors committed would have been 11.1 and Ø.Ø percent, respectively. In terms

of percentages model IIA outperformed model L on both counts, even though the total number of errors would have risen from only 11 to 12! In other words, the particular percentage distribution of errors depends crucially upon the critical value chosen and need not be consistent with the minumum total number of errors committed. For this reason it is perhaps best to consider the total number of successes at a given P* as a percentage of the total number of trials, i.e. the overall predictive accuracy of the model. Unfortunately, Cline does not give these figures so a comparison of the models is not possible. Nevertheless, in examining table 35, one is struck by the consistently accurate predictive ability of all the models estimated. The success rate ranges from .863 in model IA using the minimum errors rule all the way up to .936, while at P*=.5 the success rate ranges from .847 to .936. These results are impressive by almost any standard. In addition, as a review of the separate results will testify, it is comforting to recognize just how close was the probability interval associated with the minumum errors rule with the expected probability of rescheduling of .5 which is suggested by the assumption of normality.(142) These probability intervals are presented in table 37. In fact, out of the thirteen final models estimated, the probability interval included the value .5 in five cases, while it was within 10 percentage points on either side of the interval in nine cases. This is significant since it seems to suggest that the bulk of the rescheduling process is explainable by the regressor (essentially economic) variables.

Finally, consider the actual predictions generated as presented in table 38. The second column indicates the particular country considered while the first column indicates which model was used to generate the predicted value. The remaining columns indicate the particular year for which the prediction was made. Those values accompanied by an asterisk indicate that a debt rescheduling actually occured in that year.

A few observations regarding these results are in order. Firstly, if we employ the critical value of P*=.5, we find that of the 190 cases represented here that there were 15 type I errors (an error rate of 8.6 percent) and 2 type II errors (an error rate of 23.1 percent) committed, for an overall predictive accuracy of 91.1 percent. Yet, in spite of these impressive results an examination of the data in table 37 suggests why such models have performed so badly in predicting future rescheduling episodes. Consider, for example, the case of Mexico. In 1979, with the benefit of hindsight, model IIBB predicted a default probability of .006 percent. In 1980 and 1981, these predictions rose to .7 and 1.8 percent, respectively, while in 1982, the year in which the rescheduling actually occurred, the predicted probability skyrocketed to 78.1 percent. This story is replicated in the case of Nicaragua. From 1978 to 1981 the predicted probabilities were 2.3, 2.6, 18.8, and 30.0 percent, respectively. In 1982, the default year, the predicted value vaulted to 86.8 percent. Once again, in Chile from 1978

until 1981 the predicted probabilities rose 2.2 percent to 3.5 percent, yet in 1982 this value exploded to 99.9 percent. This scenario is repeated again and again. In short, in spite of the descriptive accuracy of the logit approach, many of these rescheduling episodes are perhaps better described as financial ruptures, occurring with little or no advanced warning. It is not suprising, therefore, that the predictive accuracy of these models has been so poor.

In order to examine this admittedly casual observation consider the following alternative specification of the international credit market:

$$L^d_t = f(X) = aP_t \tag{6.1}$$

$$L^s_t = g(X) = bP^e_t + u_t \tag{6.2}$$

$$L^d_t = L^s_t \tag{6.3}$$

where L^d_t and L^s_t represent the demand and supply of international credit, X a vector of relevant explanatory variables, and P_t an index summarizing the effect of X upon the dependent variable. Equation (6.1) states that the demand for credit is a deterministic function of P_t, the known probability of debt rescheduling. Equation (6.2), on the other hand, indicates that the supply of international credit is a function of the expected probability of debt rescheduling. This formulation is predicated on the notion that only the borrower knows the true desperateness of his

financial situation while the lender is subject to uncertainty due to the lack of reliable information regarding the financial condition of the lender as well as the general uncertainty associated with the supply of credit in the global credit market. Equation (6.3) is the equilibrium condition.

If we assume that $E(u_t) \neq \emptyset$, i.e. serial correlation, and that u_t follows a first order autoregressive scheme, then

$$u_t = pu_{t-1} + e_t \tag{6.4}$$

where

$$E(e_t) = \emptyset \tag{6.5}$$

and

$$E(eiej) = \begin{cases} \sigma^2, & i=j \\ \emptyset, & i \neq j \end{cases} \tag{6.6}$$

It can be shown that (143)

$$P_t^e = [b/(a+b)] \sum_{j=1}^{\infty} [a/(a+b)]^{j-1} P_{t-j} \tag{6.7}$$

If we assume a two period lag, i.e. j=1,2, then (6.7) becomes

$$P_t^e = [b/(a+b)]P_{t-1} + [b/(a+b)][a/(a+b)]P_{t-2} \tag{6.8}$$

This formulation, however, is tantamount to a linear probability model in which the predicted probability of debt rescheduling may assume values which are greater than unity or less than zero. In order to preserve the character of P_t as belonging to the interval [Ø,1] it is assumed that the predicted probability of debt rescheduling is functionally related to past values as,

$$P_t = \frac{e^{z}}{[1+e^{z}]} \qquad (6.9)$$

where

$$z = b_Ø + b_1 P_{t-1} + b_2 P_{t-2} \qquad (6.10)$$

A nonlinear optimization technique is used to derive the maximum likelihood estimates of equation (6.9). Utilizing the logit models emunerated in table 37 to estimate values of P_t,[144] table 39 contains the parameter estimates of equation (6.9) using the Gauss-Newton[145] procedure with accompanying asymptotic "t" statistics[146] for the sixteen largest debtor countries in 1982.

Since it is assumed that rescheduling crises are stochastic events the null hypothesis to be tested is that the parameter estimates are zero, i.e. that they are statistically insignificant. In other words, the test is whether P_t is a Markov process. As can be seen by the

parameter estimates in table 39, of the sixteen countries examined, only five (Brazil, Venezuela, Peru, the Philippines, and Colombia) exhibited any dynamic tendencies with regards to the development of an external debt crisis, and of these only two (Brazil and the Philippines) had actually experienced a rescheduling during the trial period. These results appear to broadly confirm the earlier observation that rescheduling crises are largely unpredictable on the basis of observed annual data. In other words, given that the sufficient condition for a debt repudiation exists, i.e. a heavy external debt burden, then unanticipated shocks to the system which cause a sudden increase in a country's debt servicing requirements or a foreign-exchange shortfall will result in a rescheduling crisis. This is not to say that an overt recognition of the development of the conditions conducive to such episodes is not possible, only that the event itself is not predictable. That is to say such crises are not <u>per se</u> predictable from observed past values of the explanatory variables. Of those countries in which past predicted probabilities are useful in explaining future rescheduling episodes, i.e. which exhibit a Markov process, the final parameter estimates in table 40 indicate explosive behavior. This suggests, once again, that rescheduling crises occur quite rapidly and with little advanced warning, especially considering the paucity of timely economic data.

Of course, these results should be taken with the usual grain of salt since the small sample size renders the

statistical estimates unreliable. Be that as it may, the above does provide a clearer understanding of why econometric techniques in general have performed so poorly in predicting rescheduling crises. On the one hand, the use of cross sectional time series data is very likely to mask any Markov process specific to individual countries necessary for reasonable predictions of future rescheduling episodes based solely on prior data. On the other hand, even where it is possible to isolate individual countries for the most part no such process is evident, and where it is the behavior appears to be highly explosive which, by itself, makes timely predictions for policy purposes quite suspect given the lack of current economic data.

The above observations tend to reinforce the basic notion that the first best use of econometric techinques is as part of an ongoing conprehensive risk evaluation system, and not as a single means to an end. In other words, econometric techniques are best employed as but a single tool in the researchers analytical kit. The area economist must keep up to date with developments as they occur and not be bridled by the periodicity of the data. Clearly, therefore, the main advantage of the logit, or for that matter any econometric, technique is that it helps to identify which, perhaps minor, financial disruptions are likely to explode into a full-blown debt crisis.

In brief, the results of the qualitative and quantitative investigations of this study may be summarized

as follows. First, it has been demonstrated that changes in OPEC trade and payments surplusses since the oil-embargo continue to be a significant element in explaining the incidence of debt rescheduling as late as 1982, and very likely beyond; certainly, at least, for the foreseeable future. Second, that the mere fact of temporary foreign-exchange short-falls and current servicing difficulties is not enough to throw a country into a full-blown debt crisis. The evidence seems to suggest that while such conditions are necessary for formal reschedulings to occur, they are not sufficient. Sufficiency requires that a country be already heavily laden with foreign debt which stifles its ability to attract short-term emergency financing. Third, that by limiting the time frame under consideration to the post-oil-embargo decade in order to account for structural parametric changes resulting from the dramatic increases in oil prices, by sub-dividing the available data set as much as is statistically feasible in order to account for the individual characteristics of borrower and lender, and by explicitly taking into account past credit histories, that there is a significant improvement in the overall descriptive ability of the model. Fourth, that the predictive ability of the model continues to be problematical and is not dependent upon the selection of the critical value per se. By and large, this is explained by the apparent random nature of adverse economic developments which push already heavily indebted countries over the brink. To the extent that a portion of the rescheduling process is predictable in certain instances

it tends to exhibit highly explosive behavior and is therefore of litle policy value given the paucity of timely data. Consequently, it must be emphasized that the use of logit analysis, or for that matter any econometric technique, ought not to be viewed as the last word. Such methods should be used only as a research tool designed to augment a thorough and in-depth analysis of each situation. In the hands of an expert, such techniques can provide powerful insights into the rescheduling process thereby suggesting reasonable and effective solutions.

Footnotes

1. Data obtained from U.S. Multinational Banking Semiannual Statistics, Salomon Brothers, Inc., Bank Securities Department; various issues.

2. For an excellent discussion of this and other topics see William R. Cline, International Debt and the Stability of the World Economy, Institute for International Economics, Policy Analyses in International Economics 4, (M.I.T. Press, London: September, 1983).

3. The difference between the two concepts stems from the high leverage of banks, whose loans are as much as twenty times as large as their capital.

4. From most to least indebted countries: Brazil, Mexico, Argentina, Venezeula, Indonesia, Egypt, Philippines, Chile, Peru, and Nigeria.

5. Nicocles L. Michas and Henry L. Wojtyla, The Incredible Growing LDC Debt Crisis, Rosenkrantz, Ehrenkrantz, Lyon & Ross, Investment Strategy Special Report (March 9, 1984), p. 3.

6. A cartel of thirteen developing nations including the United Arab Emirates, Iraq, Kuwait, Qatar, Saudi Arabia, Algeria, Libya, Ecuador, Venezuela, Iran, Indonesia, Gabon, and Nigeria. In 1978 OPEC controlled roughly 65 percent of free world oil production, and approximately 50 percent of total world oil production.

7. The balance on current account includes net income on exports of goods, services, and unilateral transfers.

8. Inelastic export demand implies that by increasing the production of exports for the purpose of increasing revenues will have the opposite effect as a result of downward pressure on prices.

9. John H. Makin, The Global Debt Crisis, (New York: 1984), pp. 6-7.

10. Michas and Wojtyla, p. 8.

11. There were basically two reasons why developing countries were turning away from institutions such as the International Monetary Fund for their extraordinary financing requirements. In the first place, the IMF simply did not possess the financial resources necessary to satisfy LDC loan demand. In the second place, preconditions for IMF loans had become increasingly more severe. Concerned primarily with establishing balance in the external accounts the IMF often

required borrowers to adopt draconian domestic economic policies. Fearing that such measures would enrage the local citizenry governments opted instead for private financing. As a result, the LDC's borrowed increasingly greater amounts at harder terms for current consumption and less for internal investment purposes which might have formed the foundation for generating or saving much needed foreign-exchange.

12. Cline, pp. 22-26.

13. LIBOR on U.S. dollar deposits minus the U.S. wholesale price index.

14. Cline, p. 23.

15. Ibid.

16. International Monetary Fund, International Financial Statistics, (September, 1984).

17. Cline, p. 24.

18. World Bank, World Development Report 1983, Part II (Washington, 1983).

19. Cline, pp. 29-30.

20. Argentina, Turkey, Brazil, Chile, Ghana, Indonesia, India, Peru, Kampuchea, Pakistan, and Bangladesh.

21. This figure includes reschedulings of previously rescheduled maturities.

22. India, Zaire, Sierra Leone, Gabon, Peru, Turkey, Sudan, Togo, Liberia, Central African Republic, Madagascar, Pakistan, Senegal, and Uganda.

23. See Chandra S. Hardy, Rescheduling Developing Country Debts, 1956-1981: Lessons and Recommendations, Overseas Development Council, Monograph No. 15 (Washington: June, 1982).

24. Except for Yugoslavia where loan "rollovers" were substituted in order to avoid the stigma attached to reschedulings.

25. For a more detailed picture see Cline, pp. 40-44.

26. See "Federal Reserve, FDIC, and Comptroller of the Currency Program for Improved Supervision and Regulation of International Lending," Joint Memorandum (Washington: April 7, 1983).

27. These classifications include Loss, Reservable, and Debt-Service Impaired.

28. This system is more fully discussed in "A New Supervisory Approach to Foreign Lending," Quarterly Review, Federal Reserve Bank of New York (Spring, 1978), pp. 1-6.

29. Johnathan Eaton and Mark Gersovitz, Poor Country Borrowing in Private Financial Markets and the Repudiation Issue, Princeton Studies in International Finance, No. 47, International Finance Section (Princeton: June, 1981), p. 2.

30. Although unrealistic, especially in the case of developing countries, this assumption is invoked in order to highlight the essential aspects of the model. Furthermore, this model also invokes the so-called purchasing-power-parity theorem, i.e.

$$P = eP^*$$

where P is the domestic price level, P* the foreign price level and e the exchange rate, which implies that prices are equalized internationally via changes in a market determined exchange rate.

31. If international financial markets were completely frictionless then covered interest arbitrage would guarantee that $i=i^*$ instantaneously. This simple model assumes, however, that informational and institutional obstacles are such that this will not be so in the short-run.

32. See R. McKinnon, "Foreign Exchange Constraints in Economic Development and Efficient Aid Allocation," Economic Journal, 74 (1964), pp. 388-409, and H.B. Chenery and A.M. Stout, "Foreign Assistance and Economic Development," American Economic Review, 56 (1966), pp. 679-733.

33. See Joseph Stiglitz and Andrew Weiss, "Credit Rationing in Markets with Imperfect Information," American Economic Review, 71 (June, 1981), pp. 343-410.

34. That is, net lending deducting the previous loans which banks no longer wish to roll over.

35. According to Cline the effective interest rate ceiling appears to have been in the range of 2.5 percentage points above LIBOR. See William R. Cline, "A Logit Model of Debt Rescheduling, 1967-82," Institute for International Economics unpublished working paper (May, 1983).

36. The distinction between capital scarcity and foreign exchange scarcity underlies the "two gap model" of economic growth. See footnote 32.

37. Reasons for such a right-shift in the demand schedule might be the result of an increased demand for foreign exchange due to commodity price increases (as was the case

with OPEC oil), domestic crop failures and the need for increased imports of food stuffs, declines in export prices, etc. The supply curve, on the other hand, might demonstrate a left-shift due to a tightening of credit markets as was the case for Eastern Europe in 1981 and for Latin America in 1982 and 1984.

38. Cline, "A Logit Model ...", p. 8.

39. For a more detailed description of the systems in use for certain major U.S. banks see John Dizard, "The Revolution in Assessing Country Risk," Institutional Investor (October, 1978), pp. 65-75.

40. Jerome K. Blask, "A Survey of Country Evaluation Systems in Use," Export-Import Bank of the United States, mimeo (December 22, 1976).

41. As a practical matter area specialists are rarely called upon to make specific proposals with respect to country exposure limits. Country evaluation reports are, for the most part, educational devices designed to provide basic economic and political information to those who are ultimately responsible for making overseas marketing decisions. In some instances the regional economist might have direct input into the decision making process as a participating member of an in-house country exposure committee, but this is the exception rather than the rule. In fact, it is very often the case that lending officers directly responsible for making such decisions and area economists are at loggerheads regarding certain lending situations. On the one hand, the loan officer is motivated by "bottom line" considerations where professional prestige is often measured by the number of earning assets in the portfolio under his authority. The economist, on the other hand, often plays the role of "devil's advocate" taking the high ground in matters of exposure since poor analysis is often cited for any failure to perceive adverse economic or political developments leading to a debt crisis. In other words, the loan officer has a tendency to be somewhat aggressive in his outlook while the economist somewhat conservative. For additional insights see Stephen Goodman, "How the Big U.S. Banks Really Evaluate Sovereign Risk," Euromoney (December, 1976).

42. See Appendix II for a more detailed discussion of this and other commonly used economic indicators.

43. Although inconvertible and bilateral clearing account balances may also be included.

44. The terms balance of payments surplus or deficit is standard phraseology, although they are, by construction, non sequitors.

45. See Fritz Machlup, "Three Concepts of the Balance of Payments and the So-Called Dollar Shortage," Economic Journal, Vol. LX (March, 1950), pp. 46-68.

46. Dragoslav Avramovic, et al., Economic Growth and External Debt (Baltimore: 1968).

47. Charles R. Frank, Jr. and William R. Cline, "Measurement of Debt Servicing Capacity: An Application of Discriminant Analysis," Journal of International Economics, Vol. I, No. 3 (1971), pp. 327-344.

48. Krishan Saini and Philip Bates, Statistical Techniques for Determining Debt-Servicing Capacity for Developing Countries: Analytical Review of the Literature and Further Results, Federal Reserve Bank of New York Research Paper No. 7818 (September, 1978).

49. Gordon W. Smith, The External Debt Prospects of the Non-Oil-Exporting Developing Countries: An Econometric Analysis, Overseas Development Council Monograph No. 10 (October, 1977).

50. For additional considerations see Henry J. Bittermann, The Refunding of International Debt, Duke University Press (Durham: 1973), chapter 2.

51. For an excellent discussion of this and other aspects of international commercial bank lending see T.H. Donaldson, International Lending by Commercial Banks (New York, 1977), chapter 3.

52. Ibid., p. 48.

53. Makin, p. 76.

54. See Richard Puz, "How to Find Out When a Sovereign Borrower Slips from A-1 to C-3," Euromoney (December, 1977).

55. The normal practice is not to use absolute measures but rather ratios which "normalize" the data.

56. Since the late 1970's a number of prestigious publications have periodically published country rankings based to one degree or another on the checklist approach. Among the most significant of these publications are Euromoney, and Business International.

57. Business International, (1975).

58. Saini and Bates, p. 2.

59. For an extremely interesting attempt at dealing with the problem of forecasting economic turning points see Salih N. Neftci, "Optimal Prediction of Cyclical Downturns," Journal

of Economic Dynamics and Control, 4 (1982), pp. 225-241.

60. Makin, p. 41.

61. For two excellent literature reviews see Saini and Bates, and Donogh C. McDonald, "Debt Capacity and Developing Country Borrowing: A Survey of the Literature," International Monetary Fund Staff Papers, 29 (December, 1982), pp. 603-646.

62. See, for example, David J. Ott, Atriat F. Ott, and Jang H. Yoo, Macroeconomic Theory, (New York: 1975), pp. 269-272.

63. Frank and Cline.

64. Discriminant analysis is a statistical technique whereby it is possible to discriminate between two groups on the basis of a set of explanatory Variables. Denoting the set of explanatory variables as X1, X2,..., Xn, the discriminant function can be written as:

$$Z = \sum_{i=1}^{n} B_i X_i \qquad l = 1,2,\ldots, n$$

which is a linear combination of n explanatory variables. Z is a composite index of debt servicing capacity. In terms of the present discussion we denote the group of rescheduling countries as π_1 and the non-rescheduling countries as π_2. In order to maximize the discriminant function's ability to differentiate between these two groups, B's are assigned in such a manner so that the ratio of the variance between the two groups is maximized. We wish to find a critical value Z* such that if Z>Z* then we classify that country as coming from the first group, and if Z<Z* we classify that country as comming from the second group. In order to determine the critical value Z*, however, a priori probabilities must be assigned to countries belonging to either group. For an excellent treatment of this technique see G.S. Maddala, Limited Dependent and Qualitative Variables in Econometrics, (New York: 1983), chapter 2.

65. The eight economic indicators examined by Frank and Cline include:
1. Debt service ratio.
2. Growth rate of exports.
3. An index of export fluctuation.
4. "Non-compressible imports" to total imports ratio.
5. Per capita income.
6. Debt amortization to total external debt ratio.
7. Total imports to GNP ratio.
8. Total imports to international reserves ratio.

66. Discriminant analysis assumes that the explanatory variables which are being used to characterized the countries included in the rescheduling and non-rescheduling groups are

multivariate, normal, independent, and identically distributed. It has been argued by Robert Eisenbeis in "Pitfalls in the Application of Discriminant Analysis in Business, Finance, and Economics," Journal of Finance, Vol. XXXII, No. 3 (June, 1977), that the assumption of normality is likely to be the exception rather than the rule, and that tests of significance and estimated errors will likely be biased.

67. The expected cost of making type I and type II errors is

$$C = q_1 C(I)p(I) + q_2 C(II)p(II)$$

where C(I) and C(II) are the costs of making type I and type II errors, respectively, and p(I) and p(II) the probability of making those errors. We wish to choose a function, f(X), and a critical value, Z*, such that the expected cost of the errors is minimized. Assuming, as Frank and Cline have, equal costs of misclassification and equal prior probabilities, the critical value of the quadratic discriminant function is zero.

68. Pierre Dhonte, Quantitative Indicators and Analysis of External Debt Problems, IMF Paper (February 27, 1974) and "Describing External Debt Situations: A Roll-Over Approach," IMF Staff Papers, Vol. XXII, No.1 (March, 1975), pp. 159-186.

69. The method of principal components is a technique whereby it is possible to identify the number of independent sources of variation which exist within and among explanatory variables. In this case the explanatory variables are the selected economic indicators. Principal components analysis provides a technique whereby k observed variables are expressed as a linear combination of linearly independent principal components. The first principal component explains as much of the variation as possible, and so on. Suppose, for example, that there exists k explanatory variables. Consider the linear functions,

$$l_1 = a_{11}x_1 + a_{22}x_2 + \ldots + a_{kk}x_k$$

$$l_2 = b_{11}x_1 + b_{22}x_2 + \ldots + b_{kk}x_k \quad \text{etc.}$$

In principal components, we select a's such that the variance of l_1 is maximized subject to the condition that $a_2 + a_2 + \ldots + a_k = 1$. The l_1 is said to be the first principal component. The same procedure is performed on l_2 such that l_2 is uncorrelated with l_1. Then l_2 is said to be the second principal component, and so forth. Following the procedure, we find k linear functions $l_1, l_2, \ldots, l_k$. It can be shown that

$$\text{var}(l_1) + \text{var}(l_2) + \ldots + \text{var}(l_k) =$$

$$\text{var}(x_1) + \text{var}(x_2) + \ldots + \text{var}(x_k)$$

But unlike x1, x2, ..., xk, which may be highly correlated, l1, l2, ..., lk are mutually orthogonal or uncorrelated.

Following this we regress the independent variable y on the l's. There are two principal drawbacks, however, to the use of the principal components. First, the first principal component, though it picks up the major portion of the variances of the x's, it need not necessarily be the one which is most correlated to the dependent variable y. Second, the linear combination of the l's often has no meaningful economic interpretation. Third, in the context of the present study, there is no technique available for an optimal selection of the indicators by a stepwise process of a limited number of indicators from an extended list. The procedure is, therefore, trial and error. For a more complete discussion of this method see S. James Press, Applied Multivariate Analysis, (New York, 1972) chapter 9.

70. Dhonte's list of ten economic indicators:
1. International reserves to total external debt ratio.
2. Debt service to disbursements ratio.
3. Debt service to total external debt ratio.
4. Debt service ratio for 1970.
5. Total external debt to exports for 1970.
6. Total external debt to GNP.
7. Growth rate of total external debt.
8. Growth rate of exports.
9. Net transfers to total imports ratio.
10. Disbrusements to total imports ratio.

In renegotiation cases the values of the indicators were those of the year prior to renegotiation.

71. Dhonte defines "involvement" in debt as the ratio of total external debt (disbursed) to imports. It is a concept which, according to Dhonte, covers both the measure of a country's debt outstanding and that of the related flows.

72. This is measured as the ratio of debt service payments to total external debt. This indicator represents the extent to which debt obligations may "bunch" over time, i.e. a summary measure of the time distribution of debt service obligations.

73. Logit analysis assumes that the probability that a country will reschedule its external debt is related to a vector of economic indicators (X) logistically as:

$$P(X) = (\exp(B'X))(1+\exp(B'X))^{-1}$$

As in the case of discriminant analysis, the dependent variable is binary; y=1 for countries which reschedule in a given year, and y=0 otherwise. It must therefore hold that

$$\Pr(y=0 \mid X=X_i) = (1+\exp(B'X_i))^{-1}$$

$$\Pr(y=1 \mid X=X_i) = (\exp(B'X_i))(1+\exp(B'X_i))^{-1}$$

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

$$L = \frac{\prod_{i=1}^{n} \exp(B'X_i y_i)}{\prod_{i=1}^{n} (1+\exp(B'X_i))}$$

Maximizing the likelihood function with respect to B yields a set of non-linear equations which can be solved using iterative procedures. The maximum likelihood estimators can be shown to be consistent and asymptotically unbiased and efficient. For a detailed discussion of this technique see Madalla, Limited Dependent and Qualitative Variables...

74. Gershon Feder and Richard E. Just, "A Study of Debt Servicing Capacity Applying Logit Analysis," Journal of Development Economics, 4 (1977), pp. 25-38.

75. The ratio of "non-compressible imports" to total imports is not used by Feder and Just since available data for all countries in the study were not comparable. In addition, this ratio was omitted because "theoretical arguments have been developed which qualify this indicator" (p. 26).

76. Unlike discriminant analysis which assumes that there exists two completely different populations (rescheduling and non-rescheduling), logit analysis assumes that "discrete" events occur after the combined effect of certain economic variables reach some critical threshold. As Feder and Just point out: "...it makes more sense to claim that, in a specific period, the country was pushed beyond some critical level, leading to rescheduling, than to claim that the country suddenly became a member of a different population" (p. 26).

77. Logistic distributions are virtually indistinguishable from normal distributions except at the extreme ends. As a result, asymptotic tests are available for considering the exclusion of potential independent variables. If the independent variables are normally distributed, the

discriminant-analysis estimator is the true maximum likelihood estimator and therefore is asymptotically more efficient than the logit maximum likelihood estimator. However, if the independent variables are not normal (see Eisenbeis) then the discriminant-analysis estimator is not even consistent, while the logit maximum likelihood estimator is. It should also be pointed out that in spite of the assumption of normality the logistic distribution is preferred over the normal distribution because of computational efficiency. This does not, in general, pose much of a problem unless the sample size is large so that there are sufficient observations at the tails. For a fuller discription on this and the comparison with discriminant analysis see Maddala, Limited Dependent and Qualitative Variables..., chapters 2 and 4, and G.S. Maddala, Econometrics, (New York, 1977) chapter 9.

78. Feder and Just, p. 35.

79. Saini and Bates.

80. For an example of this see Alice L. Mayo and Anthony G. Barret, "An Early Warning Model for Assessing Developing Country Risk," Proceedings of a Symposium on Developing Countries' Debt, ed. Stephen H. Goodman, sponsored by the Export-Import Bank of the United States (August, 1977).

81. One study which explicitly considers structural parametric changes by export price fluctuations and domestic inflationary pressures is Nicholas Sargen's "Optimum Foreign Borrowing, Interest Rates and Exchange Rates in Pacific Basin Countries," paper presented at the Western Economic Association Meetings, Anaheim, California (June, 1977).

82. These are foreign loans without which rescheduling per se would have been necessary.

83. Voluntary debt reschedulings are those in which there existed no apparent balance of payments problems.

84. The eleven economic indicators uxamined by Saini and Bates include:
1. Total imports to international reserves ratio.
2. Per capita GDP.
3. Consumer price index.
4. Total imports to GDP ratio.
5. Money supply growth.
6. Export growth rate, averaged over three years.
7. Current account balance minus (plus) increase (decrease) in international reserves to total exports ratio.
8. 5-year cumulative current account balance minus (plus) increase (decrease) in international reserves to total exports-in-the-latest-year.
9. Net foreign assets of the banking system to money supply.
10. Growth rate of international reserves.

11. Debt service payments to total exports.

85. According to Saini and Bates the debt service ratio in some studies was adjusted upwards of 25 percent in rescheduling cases. This, they say, not only biased the results but also appears to have been unnecessary since the explanatory variables were lagged by one year.

86. This is not suprising given the events of the early 1970's. Following the OPEC price hikes and subsequent petrodollar recycling episode there was a dramatic shift in the nature of overseas financing by many LDC's. Substantially greater amounts of foreign capital inflows were beginning to take the form of unguaranteed private commercial loans. Saini and Bates, however, obtained their data on debt service payments from the World Debt Tables which include only information on public and publically guaranteed debt. It is not suprising, therefore, that the debt service ratio should have performed so poorly especially since data for the study included fully four years of the post-embargo era. Later studies, especially those by Cline, confirm the importance of the debt service ratio in explaining the incidence of debt rescheduling.

87. Given the fact that Saini and Bates used a proxy variable for recognizably poor data on debt service payments it is not too suprising that their results should have been better in the latter period investigated (see previous footnote). Although not denying the fact that there were, indeed, structural shifts during this time it seems at least equally plausible that these results were the consequence of deficiencies in available and accurate data.

88. Saini and Bates, pp. 23-24.

89. For a more detailed account of the supply side literature see McDonald, pp. 627-637.

90. Gershon Feder and Knud Ross, "Risk Assessments and Risk Premiums in the Eurodollar Market," Journal of Finance, 37 (June, 1982), pp. 679-691.

91. Ibid., pp. 679-680.

92. In subsequent surveys the rankings ranged from 0 to 100.

93. Ibid., p. 680.

94. This is believed so because the adjusted terms at the time of rescheduling seem to have compensated lenders for the postponement of debt servicing.

95. Cline, "A Logit Model..."

96. Ibid., p. 7,9.

97. The variable hCAX broadly defined equals the full amount of new financing required. Cline has defined the variable as quadratic in order to take account of the fact that the demand for foreign credit may be non-linear. In other words, as the current account deficit nears the credit rationing ceiling the probability of an induced demand for rescheduling is expected to rise rapidly. Further, if the current account is in deficit, h=-1, while if it is in surplus, h=1. This device is used to preserve the integrity of the influence of the current account since squaring necessarily make all signs positive.

98. Note that the debt service ratio appears as an argument in both the supply and demand functions. Certain factors tend to shift the demand curve for foreign credit to the right and the supply curve to the left. This implies, accordding to Cline, that private capital markets become especially unstable as countries near rescheduling situations. In other words, when a credit market gap develops from both the supply and demand sides then rescheduling situations tend to develop "abruptly and dramatically."

99. Cline suggests that an alternative to the debt service ratio might be the ratio of net debt (total external debt less international reserves) to exports. It is a longer term measure which examines the "stock" concept of the country's balance sheet rather than the "flow" concept of the current rate of debt service (which may be distorted by "bunching").

100. Here $\dot{p}$ is a measure of world inflation, D is total outstanding debt, and X exports of goods and services. The term $\dot{p}D$ is the measure of inflationary erosion of external debt which has been normalized by exports. Cline points out that although inflation does provide some debt relief, it is also accompanied by higher nominal interest rates. The net effect was a cash flow pressure in which loans were forced to be repaid ahead of schedule in real terms because the higher interest payments were immediate but the inflationary erosion of debt would not be realized until some future time. In general, however, the real long-term burden of debt was overstated as long as real interest rates remained unchanged while the nominal interest rate and observed debt service ratios were rising.

101. Because of the lack of economic information regarding debt certain basic economic measures serve as proxy measures of creditworthiness. Per capita income, according to Cline, serves as a screen on creditor supply.

102. Another proxy of creditworthiness, the presence of a high savings rate provides some measure of assurance that funds borrowed from abroad will not be used simply to replace domestic savings thereby permitting high rates of

consumption.

103. In the Cline study L is defined as the ratio of total net external borrowing by all NOLDC's as a fraction of total imports of these countries: L=B/M.

104. The existence of DSR and y in both the supply and demand functions is a source of "simultaneous equation bias." According to Cline, however, since the purpose of the study is the prediction of future debt rescheduling and policy prescription that this difficiency is not deemed as debilitating.

105. Net external debt is defined as total external debt less international reserves (less gold). The first partial of this variable is also assumed to be positive.

106. Cline, op. cit., p. 19.

107. Once this equation is estimated (using maximum likelihood techniques) the resulting dependent variable Z is transformed into an indicator of the probability of rescheduling by

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

where PC is the composite indicator of the probability of rescheduling. This indicator of the probability of rescheduling varies from zero (as Z approaches negative infinity) to unity (as Z approaches positive infinity).

108. The alphabetic abbreviations employed by Cline are as follows: DSR (debt service ratio), RSM (international reserves to imports), INX (the inflationary erosion of debt), AMZ (the amortization ratio), SQCA (the current account ratio), SAV (the savings rate), GRO (real economic growth rate), GDP (per capita GDP), EXBOR (the global supply of credit), NDX (net external debt to exports), and XGR (real export gorwth). In those cases where the regressor is preceeded by an "L" this indicates that the variable has been lagged by one period.

109. Cline, op. cit., p. 42.

110. Saini and Bates, p. 12.

111. See Feder and Ross.

112. There were 114 observations using the Institutional Investor index, and 193 observations without.

113. Cline, op. cit., p. 21.

114. Note that this definition differs slightly from that used by Cline where only amortization on medium- and long-term debt is included. This, it is believed, is an inappropriate procedure since short-term payments on external debt represent a significant drain on a country's export earnings and ought, therefore, to be explicitly accounted for.

115. International Monetary Fund, Balance of Payments Yearbook, (Washington: various issues).

116. International Bank for Reconstruction and Development, World Debt Tables: External Debt of Developiong Countries, (Washington: various issues).

117. Bank for International Settlements, The Maturity Distribution of International Bank Lending, (Basle: various issues).

118. International Monetary Fund, International Financial Statistics, (Washington: various issues).

119. International evidence shows a systematic tendency for the exchange rate to understate the real value of domestic income in lower-income countries due to the fact that labor intensive goods and services in which they have a lower-cost production tend not to be traded goods.

120. International Monetary Fund, World Economic Outlook, (Washington: various issues).

121. These countries include Argentina, Brazil, Chile, Ecuador, Mexico, Nicaragua, Philippines, and Peru.

122. See T.W. Anderson and R.R. Bakadur, "Classification into Two Multivariate Normal Distributions with Different Covariance Matrices," Annals of Mathematical Statistics, 33,2, pp. 420-431. This article also discusses the Bayesian and minimax approach to the selection of the critical value. See also B.L. Welch, "Notes on Discriminant Functions," Biometrica, 31, pp. 218-220.

123. Feder and Just, p. 36.

124. See D.R. Cox, The Analysis of Binary Data, (London: 1970), chapter 7.

125. In practice, of course, the selection of the critical value depends crucially upon the costs involved in making type I and type II errors. For example, if C(I) is very high relative to C(II) then P* will be set "low," and vice versa.

126. The chi-square statistic for testing the hypothesis that a parameter is zero is calculated by computing the square of the parameter estimate divided by its standard

error, which is estimated by calculating the square root of the appropriate diagonal element of the estimated covariance matrix. The hypothesis test assumes the estimates are asymptotically normally distributed. For example, for one degree of freedom at the 80, 90, 95, and 99 percent confidence intervals the chi-square values are 1.64, 2.71, 3.84, and 6.64, respectively.

127. The model chi-square is twice the difference in the log likelihood of the current model from the likelihood based on the intercept only.

128. The D statistic is R^2 in the normal setting. It is the value such that

$$D(n-p)/(1-D) = \text{model chi-square}$$

where p is the number of variables in the model including the intercept, and n is the number of observations.

129. See Institutional Investor, March, 1980-1982 issues.

130. Institutional Investor, (March, 1984), p. 291.

131. For this analysis the large debtors included Brazil, Argentina, Chile, Venezeula, Peru, Colombia, Mexico, Indonesia, Philippines, Egypt, Nigeria, South Korea, Turkey, Yugoslavia, Thailand, and Malaysia. The small debtors included Bolivia, Uruguay, Ecuador, El Salvador, Costa Rica, Jamaica, Paraguay, Dominical Republic, Panama, Trinidad & Tobago, Nicaragua, Togo, Sierra Leone, Gabon, Ghana, Zaire, and Burma.

132. M. June Flanders, The Demand for International Reserves, Princeton Studies in International Finance No. 27 (Princeton: 1971).

133. Makin, p. 5.

134. This was because the standard errors of the explanatory variables were virtually zero thus resulting in an assumed infinite coefficient value.

135. Feder and Ross, p. 688.

136. Institutional Investor, op. cit. As one who has been a participant in similar exercises, the following scenario seems most probable. A questionaire is received from, say, Institutional Investor requesting that he, a lender, "subjectively" rank a spectrum of countries according to "perceived credit risks." This questionaire is forwarded to the bank's economic research department for completion. Recognizing it for what it is, the resident bank economist completes the questionaire on the basis of a country by country rating system developed by the bank, whereupon it is

returned. As noted earlier perceptions regarding the character of country exposure is likely to vary quite considerably between that of the lending officer and that of the economist. In short, it is most probable that the Institutional Investor rankings represent not the lender's perception, but rather the perception of the bank economist which will, in all likelihood, be based upon a "mechanical" country evaluation system.

137. Feder and Ross, p. 689.

138. It should be pointed out that while the variable NDX and III are both significant at between the 80 and 90 percent confidence interval, when NDX was removed models IIIAAA and IIIBBB became identical, i.e. III was significant at roughly the 98 percent level.

139. These countries include Brazil, Argentina, Chile, Venexuela, Peru, Colombia, Mexico.

140. These countries include Bolivia, Uruguay, El Salvador, Costa Rica, Jamaica, Paraguay, Dominican Republic, Panama, Trinidad & Tobago, and Nicargua.

141. Saini and Bates, p. 15.

142. See the discussion of the selection of the "critical value" above.

143. See, for example, John F. Muth, "Rational Expectations and the Theory of Price Movements," Econometrica, Vol. 29, No. 3 (July, 1961), pp. 315-335.

144. Predicted probabilities covered the period 1970-82. Data on external debt prior to 1976 was calculated on the basis of the average percentage of total external debt that was from private sources from 1976-82 for each country examined. This was made necessary by the fact that while public and publically guaranteed debt is available prior to 1976, private debt is not.

145. The Gauss-Newton iterative method involves regressing the residuals on the partial derivatives of the model with respect to the parameters until the iterations converge.

146. Unfortunately, in small samples the maximum liklihood (ML) estimator of the variance is biased, whereas the OLS estimator is not. However, as the sample size increases indefinitely, the ML and OLS estimators tend to be equal.

Appendix I: Structured Qualitative Country Evaluation

COUNTRY ECONOMIC REPORT: THAILAND

In brief November 27,1979

- Buoyed by favorable world market demand, the Thai economy grew 8.7% in real terms in 1978, compared with 8.4% in 1977, although continued difficulties in the agricultural sector are expected to reduce real growth in 1979 to 6%-7%.

- Rising energy and labor costs, and overheating in certain sectors of the economy, caused an acceleration in the inflation rate in 1978 to 7.5% from 6.5% in 1977. Increased oil prices and the lifting of price controls domestically are expected to push the inflation rate in 1979 into the 15%-20% range.

- Thailand's trade account posted a $1.4 billion deficit in 1978, compared with $1.3 billion in 1977, reflecting continued weakness in agricultural exports. Continued short-falls in rice production and higher priced oil imports are expected to widen the trade gap to $2 billion by the end of 1979. Although net invisible earnings exhibited modest improvement, the current account deficit grew to $1.13 billion, as against $1.09 billion in 1977. These trends have continued into 1979 with the year-end current account deficit projected at around $1.6 billion.

- Thailand's balance of payments deficit in 1978 was $652 million, comapred with $369 million in 1977. Net capital inflows in 1978 of $780 million were insufficient to offset a widened trade gap largely because of a marked deceleration in direct foreign investment which has been traced to continued political difficulties in the region. Long-term capital inflows did accelerate, however, due to a worsening trade deficit resulting in a sharp rise in external debt. Investor confidence is on the upswing, however, and a relative improvement in Thailand's overall payments position in 1979 can be expected.

- In spite of the increased payments deficit in 1978, international reserves rose to $2.1 billion, compared with $1.9 billion in 1977, largely as a result of extraordinary financing by the IMF. This level of reserves remained unchanged through October, 1979. External debt rose $700 million to $1.8 billion reflecting continued weakness in the current account. The debt service ratio remained under 4%. Through the first four months of 1979, total public external indebtedness had grown to $1.97 billion.

- The outlook for 1980 is based upon three factors: an economic slowdown in OECD, higher priced OPEC oil, and a return to "normalcy" in agriculture. The first two factors are certainly to be detrimental to Thailand's economic health, although these developments could be overshadowed by an increase in rice exports. In brief, assuming rebounded agricultural production, real growth in 1980 is likely to be roughly that of 1979, with moderately higher rates of inflation.

COUNTRY ECONOMIC REPORT: THAILAND

In spite of the fact that rice production was seriously impeded for the second consecutive year by a combination of floods and droughts, the Thai economy managed to grow 8.7% in real terms in 1978, as against 8.4% and 6.9% in 1976 and 1977, respectively. This generally upbeat performance was due to a surge in exports of tapioca root, as well as renewed strength in tin mining operations resulting from higher world prices. Unfortunately, this higher level of economic activity, coupled with the short-fall in the production of food grains, conjoined to accelerate the rate of inflation. Overall, prices rose by roughly 7.5% on the year, compared with 6.5% in 1977.

I. Domestic Developments

1. Gross Domestic Product

The Thai economy grew 8.7% in real terms to $21.8 billion in 1978. This performance was paced by a 14.7% rate of real growth in the mining sector, followed by construction at 13.5%, manufacturing at 12.2% and agriculture at 9.4%. As a percentage of total GDP in current prices, these sectors accounted for roughly 2.2%, 5.6%, 19.1% and 27.1%, respectively. Of the remaining 46%, nearly a third was accounted for by the wholesale and retail trade sectors, while another fifth was derived from services.

Even though agriculture has made impressive contributions to Thailand's economic growth process in terms of income, employment and

export earnings, its relative importance has been declining because of significant changes in the structure of the economy. In 1965, for example, the ratio of agricultural output to GDP was a larger 35%, while industrial production accounted for a modest 15.5%. By 1978, these figures had changed to 27.1% and 19.2%, respectively.

On the expenditure side of the national accounts, spending on consumer goods accounted for nearly 78% of GDP in 1978, and about 84% of that was derived from the private sector. Investment expenditures accounted for about 27%, nearly a third of which came in the form of government spending for development purposes.

Total government expenditures amounted to nearly a fifth of GDP, and of that amount 39% was devoted to internal capital development, a total of about $1.7 billion.

Although Thailand's net export position for 1977 exhibited a deficit equivalent to about 5.3% of GDP, gross exports amounted nearly 22% of GDP, up from 21% in 1976. In 1978, Thailand's trade gap was roughly $900 million (up from $800 million in 1977), while the deficit in the current account reached approximately $1.3 billion, or 5.5% of GDP. Gross exports declined to 19% of GDP, however, largely because of shortfalls in rice production.

As to more recent significant sectoral developments, rebounding from the flooding which seriously hampered output in 1977, agricultural recovery has spearheaded Thai economic growth to its highest rate since 1973. In 1978, with the exception of rice production, which suffered a serious set-back in October due to further flooding caused by unusually heavy monsoon rains, significant advances were made in the output of other products, particularly rubber and tapioca.

A decade ago, Thailand's preeminant foreign exchange earners included rice, rubber and tin. In 1978, for the first time, rice was surpassed as the country's leading foreign exchange earner by tapioca root, used principally in Europe as animal feed, bringing in nearly $533 million.

Still, in spite of the fact that net exports of Thai rice declined by over a fifth in 1978 to a level of $508 million, Thailand remains the only net exporter of food grains in Asia, and only one of five in the world. Export receipts from tapioca, on the other hand, grew by 40% in 1978, largely as a result of increased volume. Prior to World War II, Thailand was the world's largest exporter of tapioca. In addition, exports of rubber products rose by nearly 35% to $406 million. In 1978, total exports amounted to nearly a fifth of Thailand's GDP with agricultural products accounting for about three quarters of total exports. Increased government efforts to expand and diversify Thailand's agricultural base, upgrading its technological level to take advantage of a rapidly expanding world market for it's traditional commodities.

Industrial production increased significantly in 1978. The output of machinery and metal products led the way with an estimated 15% to 18% growth rate. Textiles, the country's single largest industrial export industry, also displayed renewed strength in the latter part of 1978 (following a slump in production the previous year due to the imposition of import quota restrictions by major overseas customers) due to an increase in the U.S. textile import quota for Thailand. An increase of 11.0% in textile production, to about 1.8 billion square yards, at about 90% of capacity, was achieved in 1978. Overall manufacturing output increased by about 9%, and there is every indication that this level of growth

in industrial production has continued through at least the first half of 1979.

Another sector that showed considerable strength in 1978 was the construction industry which grew nearly 24% in current prices. Prompted by significant increases in government investment expenditure for infrastructure development, the building boom was in the forefront of the overall buoyant trend in investment for 1978. Cement and construction materials industries were, by year-end, running at full capacity, with government housing, highway, and waterworks projects pacing construction activity. This trend is likely to slacken somewhat in 1979 as the government is expected to decelerate government investment expenditure in an attempt to retard the nation's inflation rate.

Because of favorable prices on the international market for Thailand's major mineral resources (including tin, tungsten ores and fluorite), mining activity for 1978 continued at high levels growing nearly 21% over 1977. Tin exports were estimated at 29,000 tons, up 35% on the previous year, resulting in total export receipts of roughly $350 million (up from $225 million in 1977). For the year, tin ranked as Thailand 's fourth major foreign exchange earner after tapioca, rice and rubber.

Official sources are predicting that real growth in the Thai economy will slacken somewhat in 1979 to around 7.5%, although some private estimates put the real GDP growth rate at around 5.5%. Our estimates that real growth will be closer to 6% on the year. Nonetheless, the inevitable decline is attributed to another off year in agricultural production, despite the fact that industrial growth appears brisk. It has been estimated on the basis of available data through the first three

quarters of the year that agricultural production will expand by only 6.5% in real terms in 1979, substantially less than the 9.4% recorded last year. This decline was due to late rains which seriously impeded output for most major cash crops. Industrial production is forecast to expand by about 9% in 1979, although this situation is not expected to continue due to additional oil price hikes, as well as the economic slowdown in OECD. Tin production has also increased as world prices continued to remain firm.

As for 1980, although it is impossible to know with any certainty what the future may have in store for agricultural production, the price of crude oil and tin prices, based upon a predicted real rate of economic growth in OECD of 1.5%, an average increase in petroleum prices of 35% and a return to "normalcy" in food production, real growth on the year can be expected to rebound slightly to around 7%.

2. Prices

As was indicated indicated in an earlier report (April 27, 1979), inflation in Thailand in recent years has been the result of a variety of factors. On the cost side, the most notable of these factors has been the steady increase in the price of OPEC oil which, in 1973, almost singlehandedly ended a decade of virtual price stability. Other cost-push elements included higher prices for basic materials for a rapidly expanding construction industry, as well as increased labor cost due to an increase in the minimum wage rate. On the demand side, accelerated rates of government and private expenditures were instrumental in bidding up prices, although, as was indicated, monetary and fiscal policies have lately begun to address themselves to this problem.

Through the first eight months of 1979, consumer prices soared by over 12%, or an annualized rate of 18-20%. During this time, the price of imported oil products rose an average of 56%. Statistical analysis indicates that for every 5% increase in price of imported oil, consumer prices increase by roughly 1%. In addition to recent oil price hikes, price controls were lifted on a variety of restricted products last June, followed by a 40%-60% boost in domestic oil prices in July. As a result, in those two months alone, consumer prices soared nearly 5%, or an annualized rate of over 30%. Other factors also responsible for the recent surge in prices, although to a considerably lesser degree, were increases in transportation and utility rates.

Given the variety of factors which come into play in determining the country's inflation rate, it is, indeed, difficult to formulate confident prognoses. Nevertheless, it would appear that barring additional exogenous price shocks for the balance of the year, inflation should register around 15% for 1979. Obviously, projecting rates of price increase for 1980 is at least geometrically more difficult, nevertheless, in spite of the slowdown in world economic activity, especially in the OECD countries, and an average yearly price increase in OPEC oil of 35%, we expect inflation on the year to be roughly 25%.

II. External Developments

I. Merchandise Trade

The Thai current account has traditionally been plagued with a deterioration in its international terms of trade. This situation became its worst when in the period 1973-1975, for example, when the country's overall terms of

trade deteriorated almost 30%. This occurred primarily as a result of the oil price hike of 1973-1974, and resulted in a trade deficit in 1975 of $989 million, i.e. 41% higher than in 1974.

In 1978, a marked deterioration in rice exports contributed substantially to a further increase in Thailand's trade deficit. The monsoon rains which caused widespread flooding in October resulted in a 46% decline in the volume of rice exports, although high prices limited the decline in revenues to just over 22%, or a total of $510 million. Fortunately, soaring prices for tapioca root helped salvage an otherwise dismal export performance with a 41% increase to $534 million. In addition, a 59% increase in the value of tin exports, and a 28% increase in the value of manufactured exports, especially textiles, resulted in an estimated $4 billion in total exports for 1978.

On the import side, payments for petroleum products continued to pace all other items, although the increase of about 9%, to $1.1 billion, was considerably off the 1977 rate of 25%. This outcome was the result of rationing through higher prices imposed by the government, as well as possibly attesting to the government's success at developing its rather substantial natural gas reserves. In terms of importance, petroleum imports are closely followed by non-electrical machinery and spare parts which grew by 26% to $780 million.

As a result of an estimated 17% overall increase in Thailand's export position, as against a 14% increase in imports, the resulting trade deficit in 1978 was slightly under $1.4 billion, up about $142 million from 1977. While this figure is substantial in its own right, it represents an increase of only 11% over the 1977 figure which was itself

130% higher than in 1976.

In the first five months of 1979, total exports exhibited a 35% increase over a comparable period in 1978, as against a 31% rise in imports. Consequently, the total trade gap through May was roughly $600 million, as against $500 million in the first five months of 1978. If this trend persists, the trade short-fall is expected to go to around $2.2 billion by year end. Interestingly, tapioca exports during thiseriod period fell to third place in foreign exchange earnings at $260 million, a 21% increase over 1978, while exports of rice regained the number one position at $270 million, a 33% increase over the same period a year earlier. Petroleum products continued to lead the import pack, however, expanding roughly 17% to $550 million over the same period in 1978.

2. Current account

The net deficit on exports of goods and services remained virtually unchanged in 1978, rising a scant 3% to $1.17 billion, as against an increase of 145% registered in 1977. The modest increase in the net deficit reflects a 90% overall improvement in the services portion of the current account which all but wiped out a $142 million increase in the trade deficit. In 1978, the net balance on services was $223 million, as against a surplus $118 million recorded in 1977.

This overall improvement in the services accounts was paced by 66% increase in net tourist earnings to $320 million, while net disbursements on investment income, the largest debit item, rose 110% to $153 million. Net receipts on freight and insurance associated with increased merchandise trade declined by 4%, however, to $22 million. Coupled with a virtually unchanged net inflow of unrequited transfers, most notably foreign country grants, Thailand's overall current account deficit rose 3.3% to $1.13 billion,

from $1.1 billion in 1977. This slow rate of increase compares quite favorably, however, with 1977 figures which showed a 150% deterioration in the current account balance as a result slow export growth in connection with low crop yields.

In the first quarter of 1979, net service receipts advanced by 14% over the comparable quarter in 1978 to $96 million. Unfortunately, however, a poor performance in the trade accounts limited overall improvement in the current account just over a percent to a deficit of $180 million, compared with a deficit of $178 million in the first quarter of 1977.

2. Capital Accounts

The chronically unstable political situation within and without Thailand in recent years had given rise to much uncertainty and unwillingness to incur risks on the part of both foreign and domestic companies. As a result, from 1974 to 1976, direct long-term investment declined by about 42% to $79 million while during 1976 alone inflows of private and public, long- and short-term loans and credits declined 13% to $260 million.

Following the rise to power of Kriangsak Chamanand in October 1977, and the promulgation of his administration's economic priorities on December 1, 1977, business confidence took a decided turn for the better. Following an outline for rapid economic development as set forth in the Fourth Plan, domestic and foreign investment was actively solicited. As a result, net capital inflows grew by 51% in 1977 to $684 million, and in the first half of 1978, these inflows amounted to about $581 million, almost double the rate of the same period in 1977. The 1977 figure was led by a 122% increase in long-term private and public loans and credits, followed by an 84% increase in short-term financing.

Unfortunately, in many respects, Thailand's capital accounts took it on the chin in 1978. Following a promising first half of the year when the net capital inflows exhibited year on quarter increases of 81% and 135%, respectively, the second half of 1978 recorded declines of 39% and 76%. Although this trend took a turn for the better in the first quarter of 1979, up nearly 22% over the fourth quarter of 1978, net capital inflows still displayed a year on quarter decline of almost 65%. For all of 1978, net capital inflows registered a 6% increase to $730 million, compared with a 51% increase in 1977.

The rapid slowdown in net capital inflows is primarily the result of a heightened sense of investor insecurity surrounding Thailand's continuing border problems, viz. the conflict between Vietnamese forces and the Khmer Rouge, as well at the latent fear among many within the business community of Vietnamese adventurism into Thailand itself. Nowhere are these fears more amply demonstrated than in the capital accounts. On the year, total direct foreign investment declined by over 50% to around $50 million, compared with 1977 when foreign investment rose by 34% to $106 million. In fact, by the fourth quarter of 1978, direct foreign investment actually recorded a net outflow of $13 million. Although there has been some improvement in the first quarter of 1979, the year on quarter results show an 11% decline over the same period last year.

The slowdown in direct foreign investment was, however, in part offset by an 8% net increase in long term credits to official enterprises to $250 million, compared with 160% rise in 1977. Not surprisingly, however, net inflows of private long-term credit declined by nearly 21% to $34 million, as against a 26% increase in 1977 when net long-term private credits totalled

$43 million. The single largest increase, however, was a whopping 685% rise in net long-term government loans totalling nearly $300 million. This rather large increase was, for the most part, necessitated by the slow-down in agricultural output which seriously retarded the growth in export receipts.

In all, Thailand exhibited an overall balance of payments deficit of $652 million--a 76% deterioration over 1977. This situation appears to have improved somewhat in the first quarter of 1979, however, as before, this improvement is still considerably below performance levels of a year earlier.

4. International Reserves

Not withstanding the recent deterioration in Thailand's overall balance of payments and chronic trade deficits, the country's total international reserve position totalled $2.1 billion by year end, i.e. 4.6 months import cover, and an increase of $200 million over the end-1977 figure. This improvement is surprising especially in light of the fact that the balance of payments deficit for 1978 was around $650 million. To some extent, the discrepancy is accounted for by continued drawings on various IMF facilities to finance its balance of payments deficit. In October, 1979, total international reserves stood at around $2.1 billion.

The current situation viz. the country's international reserves situation, highlights a deteriorating trend which began in 1972. In that year, monthly import cover stood at 8.6. Since that time, this relationship has eroded by nearly 50% to its current 4.6, which, nonetheless, can be regarded as adequate import coverage. Although this trend is likely to continue certainly through 1979, and possibly into the early 1980's, government efforts to develop its natural gas reserves as an energy offset

to the country's oil imports, as well as Thailand's continued excellent international credit rating, would seem to indicate that this downward trend is on the verge of a significant reversal.

5. External Debt

From the point of view of economic performance, as well as an exceptional credit record, recent increases in Thailand's external debt position have prompted little concern, either privately or officially. Although the recent upward trend in total external indebtedness (public and private) has exhibited considerable growth in recent years (up 23% annually since 1973). By as late as 1978, this figure was still less than 10% of GDP. Between 1973 and 1978, Thailand's external debt rose by about 200% to $2.8 billion, with the public portion increasing by 300% to $1.8 billion. Prior to 1977, privately held external debt comprised the bulk of the country's total external indebtedness.

There are basically three underlying factors which account for these comparative and absolute changes in Thailand's external indebtedness since 1973. In the first place, the four-fold increase in the price of petroleum imports in 1973 placed severe strains on Thailand's current account situation. Larger deficits had to be financed largely by foreign capital inflows and, as a result, total external debt increased in 1974 grew by 28%, from $906 million to $1.2 billion. Of this additional $255 million in debt, approximately 31% was accounted for by official borrowings, the rest being assumed by the private sector. From 1975 on this percentage did a complete turnaround and by 1977, largely as a result of an increase in government expenditures for economic development, nearly 85%, or $275 million, was accounted for by public borrowings. Since 1977, however, much of the increase in new foreign debt was the result of poor crop yields and a

relative decline in export earnings. Largely as a result of the continued poor performance in agricultural sector, which resulted in a $1.4 billion trade deficit, Thailand's external public debt grew by over 56% in 1978 to $1.8 billion. This figure, amounted to roughly 8% of GDP, compared with 5.6% in 1977.

III. Outlook

Economic development in Thailand seems critically dependent upon four factors: a) recovery and growth in the agricultural sector; b) favorable world economic conditions; c) the development of natural resources, particularly natural gas; d) a stable investment climate.

As is abundantly clear by the foregoing discussion, agricultural growth has been an essential element of overall national economic growth. In one respect, this was a natural consequence of agriculture's preeminant position in the domestic economy, but more importantly, as the country's historically dominant source of foreign exchange earnings. Failure in this sector places clear restrictions on the government's ability to meet its development financing objectives.

Despite being one of the top three exporters of rice in the world, as well as the world's leading exporter of tin, Thailand has surprisingly little influence over movements in commodities prices. It is, perhaps, for this reason that government planning officials have deemed it necessary to broaden the country's industrial base. Be that as it may, favorable world prices for Thailand's major export commodities is essential if the country is to achieve adequate levels of growth and development for the foreseeable future.

There is little doubt that the development of Thailand's natural gas reserves will have a considerably beneficial impact upon economic growth. The Natural Gas Orgnaization estimates, for example, that known reserves in the Gulf of Thailand are approximately 7.6 trillion cubic feet; about 20 years' reserves, as estimates are presently made. Once the gas is used commercially in power plants and industries, Thailand should by able to reduce its imports of crude oil by, perhaps, as much as 25%. However, the avoidance of sectoral imbalance arising therefrom is an issue which rightly is a concern of the country's development planners. To this end, there appears to be little doubt that, correctly, the government does not consider natural gas as a panacea for all its economic and social problems.

In economic terms Thailand's economic future is bright, however if success is to be achieved within a reasonably short period of time, it will be essential that a stable climate for foreign and domestic investment prevail. The present administration has shown that it is not only amenable to the concerns of business, but also that it has the political and economic acumen to successfully achieve what appear to be equitable and stable growth objectives. It is, therefore, essential that political developments both within and without Thailand's borders be monitored closely.

ROYAL KINGDOM OF THAILAND
ECONOMIC DATA SHEET

1. Area, Population, Income per Capita

. Area	198,500 square miles
. Population[1/]	
Total (1977)	44.16 millions
Growth (1975-1977)	2.7 percent
. GDP/GNP per capita	483 dollars

2. Gross Domestic Product[2/]

	1975	1976	1977	1978
. Current prices ($ billions)	14,539	16,283	18,159	21,785
. Constant 1975 prices ($ billions)	14,539	15,737	16,707	18,358
. Constant prices (% change)	7.7	8.2	6.2	8.7

3. Inflation[1/]

	1975	1976	1977	1978
. Consumer prices (% change)	4.1	5.0	7.2	7.9

4. Government Finance ($ millions)[2/]

	1975	1976	1977	1978
. Deficit (-) or Surplus	-367	-791	-598	-660
--Revenues	1,914	2,133	2,638	3,190
--Expenditures (recurrent and capital)	-2,281	-2,925	-3,286	3,850

5. Balance of Payments ($ millions)[2/]

	1975	1976	1977	1978
. Merchandise Trade Balance	-989.3	-543.4	-1,255.2	-1,356.6
--Exports, f.o.b.	2,177.0	2,958.9	3,454.1	4,033.8
--Imports, f.o.b.	-3,166.3	-3,502.3	-4,706.6	-5,390.4
. Current account balance	-606.9	-440.1	-1,097.9	-1,134.0
. Overall balance	-140.4	-4.1	-369.3	-652.2

ROYAL KINGDOM OF THAILAND
ECONOMIC DATA SHEET

5. Balance of Payments (continued)

	1975	1976	1977	1978[2/]
. Int'l. Reserves	1,775	1,893	1,915	2,121
. Monthly Import Cover	7.5	7.2	5.4	4.6

6. International Reserves[1/]

. Total ($ millions; March 1979)	2,250
. Import cover (in months)	4.6

7. External Debt[3/]

	1975	1976	1977	1978[2/]
. Total, disbursed public only ($ millions)	615.5	821.7	1,050.6	1,777.1
. Debt service (principal and interest)	73.2	87.7	126.5	186.3
. Debt service ratio (%)	2.4	2.4	3.0	2.3

1/Source: International Monetary Fund, International Financial Statistics, November, 1979.
2/Source: Bank of Thailand, Monthly Bulletin, May,1979.
3/Source: World Bank, World Debt Tables-Supplements, October 15,1979.
4/All dollar figures for 1975, 1976, 1977 and 1978 were obtained using the exchange rates were Baht 20.379, 20.400, 20.400 and 20.390, respectively.

Appendix II: Selected Economic Indicators

Because of the fact that economic indicators continue to comprise the focal point of most risk analysis, the following is a brief discussion of the most commonly chosen indicators used to examine the health and vigor of a country's economy.

The Debt Service Ratio

The debt service ratio is the most commonly used indicator of a country's ability to service its external debt obligations. It is defined as the ratio of annual interest payments and principal repayments on external debt to the annual earnings from exports of goods and services. As a practical matter, the value of the ratio is likely to vary, even widely, from year to year.

The underlying rationale for the use of this ratio is that an increase in the debt service ratio suggests an increased vulnerability to foreign exchange crises. This is so because declines in a country's ability to generate the hard currency needed to service foreign debt must be compensated for by a reduction in international reserve holdings, a rise in capital imports, a reduction in imports, or some combination of these. Since in any given year debt servicing represents a fixed obligation then the higher the ratio the greater is the relative burden on import reduction, etc.

It is often taken as a rule of thumb among, especially, commercial bankers that a debt service ratio below, say, 10 percent is considered favorable. Should the ratio rise above 20 percent then the situation is taken to be of a potentially serious nature. Unfortunately, taken by itself the debt service ratio is not a particularly good indicator of a country's ability, and certainly not of its willingness, to meet its external debt obligations. In the first place, the debt service ratio is simply an indicator of the proportion of foreign exchange earnings relative to the particular demand on those earnings. If exchange earnings are high relative to import demand then a high debt service ratio can be maintained. For some countries a high debt service ratio may indicatre a better than average ability to attract foreign capital and manage its external debt. Countries with a good credit standing in international credit markets may be able to finance a high debt service through increased borrowing. Moreover, a sudden drop in the ratio may indicate an inability to meet debt servicing ability. Indeed, in looking at performance, technically the debt service ratio is computed on the basis of disbursed debt service payments and not on payments due; therefore, if a country has been unable to meet its obligations then the ratio will drop. If the debt service ratio is high, then one might look at the degree of compressibility of imports. A reduction in imports can perhaps facilitate resolution of an immediate debt repayment problem. Finally, the level of reserves that a country can

draw upon during a period of low exchange earnings can be a mitigating factor.

The several shortcomings of looking at the debt service ratio as an analytical tool have been commented upon widely. It is, nonetheless, a fact that although the ratio is not meaningful for all countries in all circumstances, it remains a significant indicator of future debt servicing ability for the more or less hundred or so countries in the income range of $200 to $2,000 per capita using 1975 as the base year.

The following groups of countries illustrate examples where the use of the ratio can be misleading. First, the developed market economies (15 or so countries with per capita income of $5,000 or more) unlike developing countries, can usually resort to large short-term credit lines available from the International Monetary Fund, the Group of Ten, or, as in the case of the members of the European Economic Community, their fellow members. On the other hand, a large proportion of these countries' external debts is short-term and they are rolled over every year. Repayments of principal are thus relatively small, and so is the debt service ratio despite the size of the debt. Finally, major borrowers in the developed countries -- the government, banks, large corporations -- are often important lenders on world financial markets. Consequently, they can draw on their foreign assets when the need arises. In the case of developed countries, the debt service ratio may appear to be high in some cases while at the same time they are net lenders abroad.

Secondly, some of the oil exporting countries are net lenders and can draw on their foreign assets relatively easily.

Thirdly, the communist countries within the Soviet sphere, members of the Council of Mutual Economic Assistance, and the People's Republic of China, can and do compress imports with greater ease, or more drastically, to the extent desired by the state, than can countries more directly responsive to an electorate and market allocation of resources.

Finally, some twenty-nine or so developing countries (less than $200 per capita income in 1975) usually have a low debt service ratio, not merely because they have small foreign debt but because they are so poor that they have no access to private external capital. In their case, in spite of the low debt service ratio, the risk is very high.

Thus the debt service ratio may be misleading as an indicator of country risk for developed market economies, oil exporting countries, the communist bloc countries, and the poorest, least developed countries. The ratio is more meaningful when applied to the hundred or so remaining developing countries with per capita incomes of between $200 and $2,000 using 1975 as a benchmark.

Exports of goods and services (in the denominator) are the main source of foreign exchange. It is important to determine the pattern, stability, and growth of the country's exports. Here again it is desirable to collect figures for, say, a five year period, and real growth should be

distinguished from possibly transitory price effects. A good track record on export growth is a key factor when looking at country risk.

In general, it is important to look at the composition of exports and to know whether the country has a diversified range, or an increasingly diversified range, of export products which makes it less dependent on adverse trends in the demand or price of a singe principal export or any one of its exports. If a country depends on one product for export, any change in the world demand or price of that commodity can severely affect the foreign exchange earnings of the country.

It is also important to know what portion of total exports is made up of manufactured goods. This is a good indication of the country's level of development, as well as an indication of diversity of export earnings. A high share of manufactured goods tends to assure greater stability and sustained growth of export revenues, unless international economic conditions become widely unfavorable. Generally speaking a growing manufacturing industry backed by a good agricultural sector is an indication of potential growth and economic strength.

One of the shortcomings in attempting to use the debt service ratio is that published data on debt often include only government and government guaranteed debt. Significant private external debt service burden may exist about which information is not readily available, and there is wide variation among countries as to the ratio of private and public debt to the total.

The Ratio of Total External Debt to Exports

The shortcomings of the debt service ratio have led to the use of additional ratios either to compliment it or, in some instances, to substitute for it. One such ratio is total external debt (public and private) outstanding at the end of a given year as a percentage of total export earnings for the same year. This indicator attempts to capture the importance of foreign debt in relation to the size of an economy's external sector thus suggesting a country's ability to service its obligations. From a statistical point of view, however, this indicator has been criticized since it relates a stock concept (debt) to a flow concept (exports). Clearly the smaller the percentage of total external debt to total exports the better.

The Ratio of Total External Debt to GNP

A third indicator is the ratio of total external debt outstanding at the end of a given year to the total output of an economy during the same year. Gross National Product (GNP) is the total output of goods and services of a goven country. While not a direct measure of repayment capacity, it is a measure of a country's economic status because standard of living, investment, consumption, and aggregate growth depend upon real output that it generates. The GNP can therefore be used as a yardstick to measure the size of the local market and thus the diversity of investment or lending opportunities offered by the country.

The underlying rationale for the use of this indicator

is similar to that for the debt/export ratio. The ratio has been criticized, however, since it relates the external debt of a country to a variable which itself is only indirectly connected to a country's ability to generate the requisite foreign exchange. What is more, in so far as this indicator does have something to say about the likelihood of a debt servicing crisis the question inevitably arises as to whether the Gross Domestic Product in the denominator is not preferable to the GNP.

The Ratio of International Reserves to Imports

Sometimes referred to as the "liquidity ratio" this indicator is meant to illustrate a country's ability to withstand temporty fluctuations in foreign exchange earnings. The total international reserves of a country include its gold holdings, special drawing rights, reserve position in the IMF, and foreign exchange holdings. As a general rule, countries with large international reserve levels will also be found to be practicing good economic management in other respects as well. As one would expect, the higher the ratio of international reserves to imports the greater is a country's capacity to service its external debt. Reserves adequate to cover three months of imports are generally considered satisfactory.

It should be cautioned, and it represents a practical assessment problem, that most sources of data on reserves yield gross rather than net figures, that is, the short-term liabilities of the exchange authority are not taken into account. Such liabilities could represent a significant lien

against the country's liquid foreign assets.

The Growth Rate of Exports

A fifth indicator, the rate of growth of exports, is almost self explanatory. As was already mentioned, exports represent a country's principal source of hard currency from abroad. If foreign exchange earnings do not expand at a rate sufficient to meet not only its external debt servicing requirements but also to satisfy import requirements associated with growth in domestic income and savings, then the country will almost certainly experience growth spasms and debt crises. Of course, the severity of these possibilities rests in large part with the degree of import compressibility attainable within a particular country, although it should be obvious that as a general rule the higher the growth rate of exports the less likely will be the probability of a country experiencing difficulties in servicing its external debt.

The Ratio of Imports to GNP

A sixth commonly used indicator is the ratio of imports to GNP. Imports are, of course, the principal cause of foreign exchange expenditure. It is, therefore, essential to determine how large they are, what the trend is, and what kinds of goods comprise the imports. Imports of a large volume of capital goods, particularly over a period of time, would indicate emphasis on and prospects for future development. If imports are made up of significant amounts of consumer and luxury goods, it would be useful to estimate

the "compressibility" of imports, i.e. to what extent could imports be curtailed if necessary in order to permit repayment of foreign debt during periods of adverse circumstances in the external sector.

Because of the fact that in many LDC's a large proportion of imports is comprised of capital and intermediate goods, this ratio tends to reflect a degree of rigidity since import reductions imply lower real growth and higher unemployment. Since unemployment is a cost not readily tolerated it is likely that the higher the import/GNP ratio the greater will be the probability of short-run debt servicing difficulties.

Per Capita GNP

Another commonly used indicator is GNP per capita. This measure is utilized under the presumption that the lower is per capita income in a country the less flexibility for reducing consumption in times of crises, and the more likely the possibility of repayment problems.

An interesting shortcoming of this measure is that it gives no indication of the distribution of income. It is often the case that countries with high per capita income may have a narrow distribution of wealth and thus be more subject to class tensions and potential conflict while countries with lower but more evenly distributed per capita income posess a more stable social environment. On the other hand, as an economic indicator, high per capita income suggests a greater ability to service external debt obligations.

An Index of Export Fluctuation

Another useful indicator is an index of export fluctuation. The idea here is that stable export earnings are less vulnerable to foreign exchange crises and can therefore tolerate higher debt service ratios.

The Ratio of "Non-Compressible Imports" to Total Imports

As was mentioned above, it is useful to have some estimate of import compressibility, i.e. the extent to which it is possible to contract imports with a minimum of sacrifice in economic growth. Compressible imports are usually identified with luxury consumer goods, while non-compressible imports relate to capital goods, intermediate goods, and food stuffs. The ratio of non-compressible imports to total imports is meant to capture the degree to which imports may be reduced in time of balance of payments crises. Clearly, the higher is this ratio the less able is a country to reduce its consumption in order to service its external debt obligations.

The Ratio of Debt Amortization to Total External Debt

Another important ratio is that of debt amortization to total outstanding debt, i.e. the inverse of the "average" maturity of outstanding loans. A low value for this ratio suggests a predominance of long-term liabilities which may suggest that there is little short-run flexibility in reducing debt commitments by temporarily reducing overseas borrowing. This ratio is useful in helping to identify potential difficulties associated with the bunching of

maturities. But it does not follow, of course, that because maturities are bunched that debt servicing difficulties are inevitable or probable. The bunching of debt maturities may cause not debt servicing problems if the country is able to earn relatively substantial amounts of foreign exchange from exports of goods and services, attract large amounts of capital in the form of direct investments or new, perhaps refinanced, loans, or if it has large foreign exchange reserves. What is more, the absence of short-term liabilities may in fact suggest that a country does not have access to short-term capital markets, suggesting that a particular country is not deemed "credit worthy." The lack of a good reputation makes it more difficult for a country to obtain capital on short notice in the event of short-falls in foreign earnings, in which case rescheduling is likely to follow.

Additional Considerations

In some economies significant real growth has been accompanied by what would normally be regarded as high rates of inflation. In such cases, the record of other economic variables may overcome the usual inverences about high inflation rates. As a general rule, low rates of inflation are a more favorable indicator because they reflect prudent monetary and fiscal policy and are an indication of economic stability.

The consumer price index is one good yardstick of inflation within a country that can be applied generally for inter-country comparison. Another measure is the wholesale

price index which tends to point to future price developments and may be revealing with respect to the competitiveness of exports as well.

A country with high rates of inflation, among other things, is likely to be much more prone to currency devaluations, thus increasing the local cost of repaying and servicing loans denominated in dollars or other currencies, not to mention the possible social implications of higher prices for essential imports. Naturally, it is important to determine whether the high rates of inflation are in an increasing or a decreasing phase.

In addition, there is the added consideration of debt relief through inflation worldwide. It has been argued, for example, that the rise in export prices of the higher- and middle-income NOLDC's provided substantial reductions in the burden of external debt servicing. It would appear, therefore, that a consideration of relative price changes does indeed constitute a relevant aspect of the rescheduling process.

Another indicator, called the investment ratio, is the country's investment as a percentage of GNP. This ratio, depending upon the marginal efficiency of capital, can demonstrate the stimulus that exists for economic development and prospective growth. It is adviseable to use net investment, however, and not gross investment in order to eliminate replacement investment. When gross investment is equal to replacement investment then the state of an economy

could be considered stagnant, although the replacements are probably technologically superior and may therefore stimulate economic growth.

Generally speaking, the larger the share of investment in GNP the greater the proportion of total activity that is devoted to expanding plant and equipment, thus assuring future growth. Individual countries sometimes have displayed high investment ratios without showing the usual accompanying dynamism. Ordinarily there are special pricing or taxing reasons for this. Investment goods may bear a heavily unfavorable exchange rate for imports and/or they may bear inordinately high, protected domestic producer prices.

If a country channels a significant portion of its activity into capital formation, prospects for the servicing and repayment of debts are likely to be better over time. A rise in the new investment ratio from under 12 percent to 20 percent within a five-year period would be an unusually good indication of a country's efforts towards development. In rapidly expanding economies, investment ratios of between 20 percent and 30 percent are not unusual.

It is very useful to examine the history of a currency's exchange rate fluctuations, particularly the number and magnitude of devaluations over, say, a ten year period. During the system of fixed exchange rates the infrequent cases of a borrower's currency appreciating was an especially positive indicator of the financial quality of the country and reduced the burden of generating the local currency needed for conversion to make foreign payments. Under a

managed float where greater attention is given to baskets of key trading partner currencies, it is necessary to take an even closer look at the underlying economic forces affecting exchange rate fluctuations. It may be the consequence of weakness in the partner's currency rather than general strength in the country that is involved.

By examining the frequency and the magnitude of devaluations the analyst can draw inferences about the country's economic management, future trends in the rate for the currency, and, after looking at the domestic situation as well, the degree of difficulty for the borrower in amassing the larger amounts of local funds to convert for foreign payment.

Observation of the exchange rate behavior illustrates the obvious inadequacy of looking at a single variable and the necessity of looking behind the raw data. A steadily depreciating rate with relatively modest immediate impact, what is sometimes referred to as a "crawling peg," may well represent efficient economic management and the maintainance of appropriate relationships between domestic and international price levels. By contrast, an exchange rate with a prolonged record of stability may, in fact, become increasingly overvalued, with internal and external prices increasingly out of line with the probabilities of a sharp devaluation imminent.

Appendix III: Business International Checklist

Country Rated: _____

Political-Legal-Social Factors

			Score
1)	Political Stability		
	a. Long-term stability guaranteed	( )	15
	b. Strong government but vulnerable institutions	( )	10
	c. Active internal factions	( )	5
	d. Strong probability of Overthrow (external and internal)	( )	2
2)	Probability of Nationalization		
	a. No threat	( )	15
	b. State participation in selected firms	( )	12
	c. Full takeover of specific firms	( )	9
	d. Nationalization of key sectors	( )	6
	e. Large-scale nationalization	( )	3
3)	Restrictions on Capital Movements		
	a. No restrictions on any transfers	( )	15
	b. Minimum controls	( )	12
	c. Limits on certain inflows and/or outflows	( )	9
	d. Strict resteictions on remittances and repatriation	( )	6
	e. No transfers permitted	( )	3
4)	Desire for Foreign Investment		
	a. No restriction on any type of foreign investment	( )	10
	b. Favorable climate with incentives	( )	8
	c. Selective investment policy	( )	6
	d. Lukewarm climate for foreign capital	( )	4
	e. Hostile foreign investment climate	( )	2
5)	Limits on Foreign Ownership		
	a. No ceiling on foreign equity percentage	( )	10
	b. Desire but no requirements for local equity	( )	8
	c. Local majority required in many or key industries	( )	6
	d. Strict joint venture requirements	( )	4
	e. Only foreign minority position tolerated	( )	2

continued

Political-Legal-Social Factors (cont'd.)

6) Limits on Expansion of Foreign-Owned Firms

a.	No government restrictions on expansion	( ) 8
b.	Obstacles to expansion, e.g. antitrust, environment	( ) 5
c.	Limits on specific industrial sectors	( ) 3

7) Government Intervention in Business

a.	Free enterprise system	( ) 8
b.	Limited government controls, e.g. price controls	( ) 6
c.	Strong but selective government intervention	( ) 4
d.	Tightly controlled economy	( ) 2

8) Likelihood of Internal Disorder and Vandalism

a.	No threat of disorder	( ) 8
b.	Isolated cases of unrest	( ) 6
c.	Strong possibility of vandalism, kidnappings	( ) 4
d.	Probability of social revolution or civil war	( ) 2

9) Delays in Getting Approval

a.	No red tape	( ) 6
b.	Occasional delays	( ) 4
c.	Exasperating red tape	( ) 2

10) Cultural Interaction

a.	Easy to grasp cultural and business concepts	( ) 5
b.	Difficult to establish confident rapport	( ) 3
c.	Impossible to assimilate country's culture	( ) 1

Total: _____

Commercial Factors		Score
1) Present Market Size as Indicated by GNP		
a. Above $500 billion	( )	12
b. $100-$500 billion	( )	9
c. $50-$100 billion	( )	6
d. $10-$50 billion	( )	3
e. Less than $10 billion	( )	1
2) Annual Average Real GNP Growth (last five years)		
a. High growth (above 8%)	( )	6
b. Good (5%-8%)	( )	4
c. Moderate (3%-5%)	( )	2
d. Poor (less than 3%)	( )	1
3) Annual Average Real GNP Growth (next five years)		
a. High growth (above 8%)	( )	8
b. Good (5%-8%)	( )	6
c. Moderate (3%-5%)	( )	4
d. Poor (less than 3%)	( )	2
4) Present Market Sophistication as Indicated by Income per capita		
a. Above $5,000	( )	12
b. $3,000-$5,000	( )	9
c. $2,000-$3,000	( )	6
d. $1,000-$2,000	( )	3
e. Less than $1,000	( )	1
5) Restrictions on Foreign Trade (next three years)		
a. No restrictions	( )	12
b. Minor restrictions	( )	9
c. Substantial restrictions	( )	6
d. Stiff restrictions	( )	3
6) Availability of Local Capital (next three years)		
a. Abundant and inexpensive	( )	12
b. Available but costly	( )	8
c. Difficult to get and costly	( )	4
7) Availability of Labor (next five years)		
a. Plentiful skilled and unskilled	( )	12
b. Shortage of skilled labor	( )	9
c. Tight and costly	( )	6
d. Very tight	( )	3

continued

Commercial Factors (cont'd.)

8) Stability of Labor (next five years)

a. Very stable	( )	12
b. Active unions but reliable labor	( )	9
c. Frequent labor unrest	( )	6
d. Continuous politically motivated strikes	( )	3

9) Corporate Tax Level (next five years)

a. Low (income tax less than 35%)	( )	8
b. Fair (income tax 35% to 50%)	( )	4
c. High (income tax at least 50%)	( )	2

10) Quality of Infrastructure (next five years)

a. Good services readily available	( )	6
b. Adequate but specific shortcomings	( )	4
c. Inadequate infrastructure	( )	2

Total: _____

Monetary-Financial Factors		Score
1) Annual Inflation (last three years)		
a. Low (less than 4%)	( )	8
b. Acceptable (4%-8%)	( )	6
c. High (8%-15%)	( )	4
d. Rapid (over 15%)	( )	2
2) Annual Inflation (next three years)		
a. Low (less than 4%)	( )	16
b. Acceptable (4%-8%)	( )	10
c. High (8%-15%)	( )	5
d. Rapid (over 15%)	( )	2
3) Number of Devaluations (past 10 years)		
a. No devaluations	( )	5
b. One to two devaluations	( )	4
c. Three devaluations	( )	3
d. Frequent, erratic devaluations	( )	1
4) % of Devaluation (past 10 years)		
a. Zero	( )	5
b. Up to 5%	( )	4
c. 5% to 10%	( )	3
d. 10% to 20%	( )	2
e. Over 20%	( )	1
5) Currency Forecast (next three years)		
a. Continuously strong currency	( )	16
b. Occasional weakening	( )	12
c. Weak with predictable manipulations	( )	8
d. Continuous depreciation expected	( )	4
6) Overall Balance of Payments (past 10 years)		
a. No deficit	( )	8
b. One to three deficit years	( )	6
c. Three to six	( )	4
d. Over six	( )	2
7) Overall Balance of Payments (next three years)		
a. Strong with continuous surplusses	( )	12
b. One to two expected deficits	( )	6
c. Continuous deficit position	( )	2
8) Reserves/Import Ratio (past 12 months)		
a. Highly favorable (three months or more)	( )	6
b. Satisfactory (two to three months)	( )	4
c. Unsatisfactory (less than two months)	( )	2

continued

Monetary-Financial Factors (cont'd.)

9) Reserves/Imports Ratio (next 12 months)

a. Highly favorable (three months or over)	( )	8
b. Satisfactory (two to three months)	( )	5
c. Unsatisfactory (less than two months)	( )	2

10) Convertibility in Foreign Currencies (next three years)

a. Freely convertible	( )	16
b. Minor restrictions	( )	12
c. Strict controls on specific transfers	( )	8
d. Prior approval for all transfers	( )	4

Total: _____

Appendix IV: Commercial Bank Checklist

Country Rated: _____

Economic Factors

Internal Economic Factors		Score
1) GNP as an Indicator of Market Size		
a. Above $500 billion	( )	10
b. $100-$500 billion	( )	8
c. $50-$100 billion	( )	6
d. $10-$50 billion	( )	4
e. Less than $10 billion	( )	2
2) GNP per Capita as an Indicator of Market Sophistication		
a. Above $5,000	( )	10
b. $3,000-$5,000	( )	8
c. $2,000-$3,000	( )	6
d. $500-$2,000	( )	4
e. Less than $500	( )	2
3) Annual Average Real GNP Growth (last 5 years)		
a. High growth (above 8%)	( )	10
b. Good (5%-8%)	( )	8
c. Moderate (3%-5%)	( )	6
d. Poor (less than 3%)	( )	3
e. Negative	( )	0
4) Annual Average Real GNP Growth (next 3 years)		
a. High (above 8%)	( )	10
b. Good (5%-8%)	( )	8
c. Moderate (3%-5%)	( )	6
d. Poor (less than 3%)	( )	3
e. Negative	( )	0
5) Annual Inflation Rate (last 3 years)		
a. Low (less than 4%)	( )	10
b. Acceptable (4%-8%)	( )	8
c. High (8%-20%)	( )	6
d. Rapid (over 20%)	( )	3
6) Annual Inflation Rate (next 3 years)		
a. Low (less than 4%)	( )	10
b. Medium (4%-8%)	( )	8
c. High (8%-20%)	( )	6
d. Rapid (over 20%)	( )	3

Economic Factors (cont'd.)

7) Government Budget (last 5 years)

a. Surplus	( )	10
b. Rough balance	( )	8
c. Two to three deficits	( )	6
d. Continuous deficits	( )	2

8) Government Budget (next 5 years)

a. Surplus	( )	10
b. Rough balance	( )	8
c. Two to three deficits	( )	6
d. Continuous deficits	( )	2

9) Annual Average Gross Investment (last 5 years)

a. High (more than 20%)	( )	10
b. Acceptable (12% to 20%)	( )	7
c. Low (less than 12%)	( )	4
d. Negative	( )	0

10) Annual Average Gross Investment (next 5 years)

a. High (more (more than 20%)	( )	10
b. Acceptable (12%-20%)	( )	7
c. Low (less than 12%)	( )	4
d. Negative	( )	0

11) Number of Devaluations (past 10 years)

a. No devaluations	( )	10
b. Predictable continuous "creeping peg" devaluations	( )	8
c. One to two devaluations	( )	6
d. Three devaluations	( )	4
e. Frequent, erratic devaluations	( )	2

12) Percentage of Total Devaluation (past 10 years)

a. Zero	( )	10
b. Up to 10%	( )	8
c. 10% to 20%	( )	6
d. 20% to 30%	( )	4
e. Over 30%	( )	2

13) Currency Forecast (next 3 years)

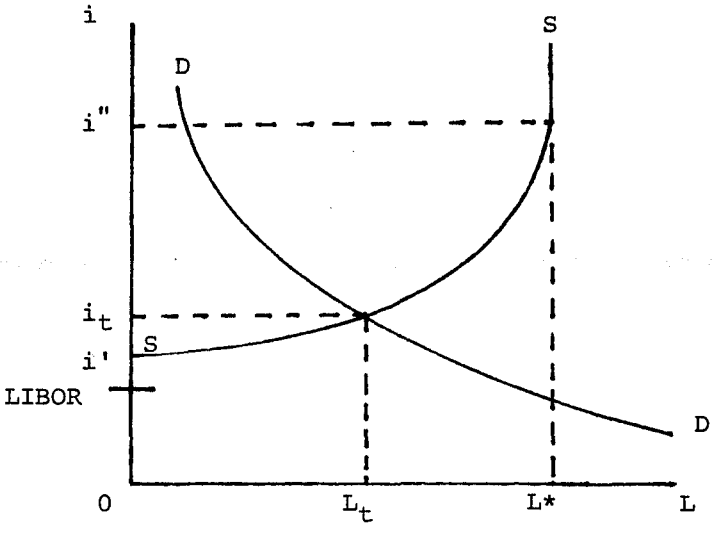
a. Continuously strong currency	( )	10
b. Occasional weakening in rate but no significant change	( )	8
c. Weak with predictable "creepint peg" devaluations	( )	6
d. Repeated depreciations expected	( )	4
e. Overvaluation due to governmental control	( )	2

Economic Factors (cont'd.)		Score
14) Convertibility in Foreign Currencies (next 3 years)		
a. Freely convertible	( )	10
b. Minor restrictions	( )	8
c. Strict controls on specific transfers	( )	6
d. Prior and restrictive approval for all transfers	( )	3
e. Inconvertible	( )	0
External Economic Factors		
1) Annual Trade Balance (past 5 years)		
a. Surplus	( )	10
b. One or two deficits	( )	6
c. Three or four deficits	( )	4
d. Continuous deficits	( )	2
2) Annual Trade Balance (next 5 years)		
a. Surplus	( )	10
b. One or two deficits	( )	6
c. Three or four deficits	( )	4
d. Continuous deficits	( )	2
3) Import Compressibility		
a. High compressibility	( )	10
b. Moderate	( )	6
c. Modest	( )	4
d. Little or none	( )	0
4) Current Account Balance (past 5 years)		
a. Surplus in every year	( )	10
b. One or two deficits	( )	6
c. Three or four deficits	( )	4
d. Continuous deficits	( )	2
5) Current Account Balance (next 5 years)		
a. Surplus in every year	( )	10
b. One or two deficits	( )	6
c. Three or four deficits	( )	4
d. Continuous deficits	( )	2
6) Overall Balance of Payments (past 5 years)		
a. Surplus	( )	10
b. One or two deficits	( )	6
c. Three or four deficits	( )	4
d. Continuous deficits	( )	2

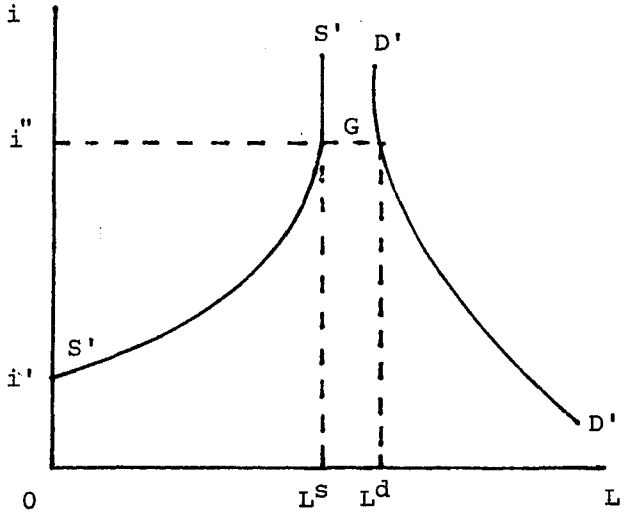
External Economic Factors (cont'd.)		Score
7) Overall Balance of Payments (next 5 years)		
a. Surplus in every year	( )	10
b. One or two deficits	( )	6
c. Three or four deficits	( )	4
d. Continuous deficits	( )	2
8) Reserves/Import Ratio (past 12 months)		
a. Highly favorable (5 months or more)	( )	10
b. Satisfactory (3 to 5 months)	( )	8
c. Unsatisfactory (less than 3 months)	( )	3
9) Reserves/Import Ratio (next 12 months)		
a. Highly favorable (5 months or more)	( )	10
b. Satisfactory (3 to 5 months)	( )	8
c. Unsatisfactory (less than 3 months)	( )	3
10) Debt Service Ratio (past 10 years)		
a. Low (less than 10%)	( )	10
b. Acceptable (10%-15%)	( )	8
c. High (15%-25%)	( )	4
d. Alarming (more than 25%)	( )	2
11) Debt Service Ratio (next 5 years)		
a. Low (less than 10%)	( )	10
b. Acceptable (10%-15%)	( )	8
c. High (15%-25%)	( )	4
d. Alarming (more than 25%)	( )	2
Political-Legal Factors		
1) Political Stability		
a. Long-term stability probable	( )	10
b. Strong government but vulnerable institutions	( )	6
c. Activist internal opposition factions	( )	4
d. Strong probability of overthrow	( )	2
2) Likelihood of Internal Disorder		
a. Little or no threat of civil unrest or disorder	( )	10
b. Isolated cases of unrest or disorder	( )	8
c. Frequent cases of unrest or disorder	( )	6
d. Probability of social revolution or civil war	( )	2

Political-Legal Factors (cont'd.)		Score
3) Government Intervention in Business Activity		
a. Basically a market economy or free enterprise system	( )	10
b. Moderate government restrictive controls	( )	8
c. Strong but selective government intervention	( )	6
d. Tightly restricted economy, virtually to operate	( )	2
4) Climate for Foreign Investment		
a. Favorable climate with promotional incentives	( )	10
b. No restrictions on foreign investment	( )	8
c. Selective investment policy	( )	6
d. Lukewarm climate for foreign investment	( )	4
e. Hostile foreign investment climate	( )	2
5) Limits on Foreign Ownership		
a. No ceiling on foreign equity percentage	( )	10
b. Local majority required in many or key industries	( )	6
c. Strict joint venture requirements	( )	4
d. No foreign minority position tolerated	( )	2
6) Restrictions on Capital Movements		
a. No restrictions on any transfers	( )	10
b. Minimum controls	( )	8
c. Limits on specific inflows or outflows	( )	6
d. Strict restrictions	( )	4
e. No transfers permitted	( )	2
7) Probability of Nationalization		
a. No threat, or already nationally-owned	( )	10
b. State participation in selected firms or industries	( )	6
c. Nationalization of key firms or industries probable	( )	4
d. Large scale nationalization probable	( )	2
8) Restrictions on Foreign Trade (next 3 years)		
a. No restrictions	( )	10
b. Minor restrictions	( )	8
c. Significant restrictions	( )	4
d. Tight and pervasive restrictions	( )	2
9) Corporate Tax Level		
a. Low (income tax less than 35%)	( )	10
b. Fair (income tax 35%-50%)	( )	8
c. High (income tax above 50%)	( )	4
		_____
Total:		_____

Appendix V: Diagrams



Panel A: Equilibrium



Panel B: Disequilibrium

Figure 1

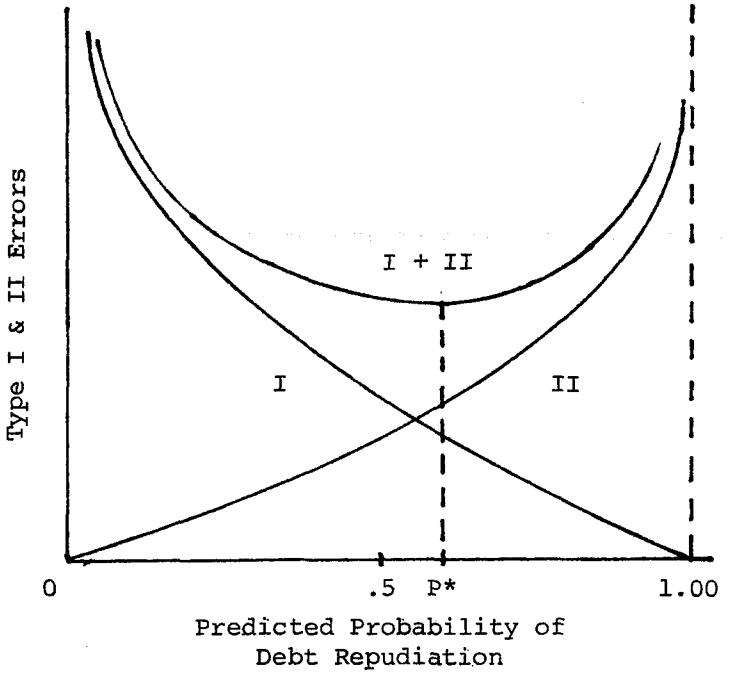

Type I & II Errors
I + II
I
II
0
.5
P*
1.00
Predicted Probability of
Debt Repudiation

Figure 2

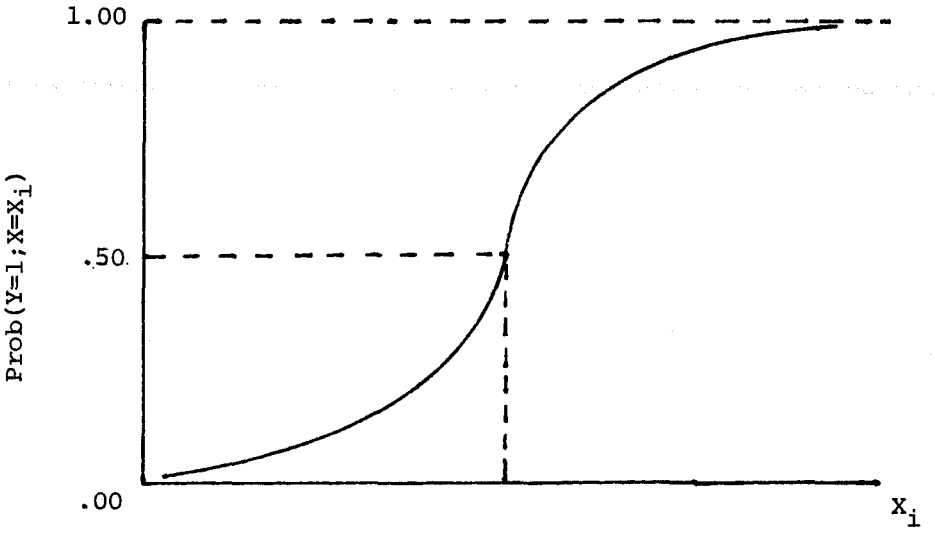


Figure 3

Appendix VI: Tables

Table 1. Exposure of U.S. Banks in Eastern Europe and Non-Oil Developing Countries, Relative to Capital
(percentages, end year)

All Banks	1977	1978	1979	1980	1981	1982	Value, 1982 ($millions)
Eastern Europe	16.7	15.8	16.1	13.9	12.9	8.9	6,278
Non-Oil LDS's	114.9	114.4	124.2	132.3	148.3	146.1	103,181
Sum	131.6	130.2	140.3	146.2	163.5	155.0	109,459
Mexico	27.4	23.4	23.0	27.6	34.3	34.5	24,377
Brazil	29.4	28.6	27.3	25.4	26.9	28.9	20,438
Nine Largest Banks							
Eastern Europe	25.0	23.5	23.9	21.8	19.5	13.9	4,045
Non-Oil LDC's	163.2	166.8	182.1	199.3	220.6	221.2	64,149
Sum	188.2	190.3	206.0	221.1	240.1	235.2	68,194
Mexico	32.9	30.4	29.6	37.8	44.4	44.4	12,262
Brazil	41.9	42.4	40.3	39.3	40.8	45.8	13,296

Source: Federal Reserve Board of Governors, Country Exposure Lending Survey

Table 2. Exposure as a Percentage of Capital, Major Banks, end-1982

	Argn	Braz	Mexo	Vnez	Chil	Total	Capital ($millions)
Citibank	18.2	73.5	54.6	18.2	10.0	174.5	5,989
BankAmerica	10.2	47.9	52.1	41.7	6.3	158.2	4,799
Chase Manhattan	21.3	56.9	40.0	24.0	11.8	154.0	4,221
Morgan Guaranty	24.4	54.3	34.8	17.5	9.7	140.7	3,107
Manufact. Hanover	47.5	77.7	66.7	42.4	28.4	262.8	2,592
Chemical	14.9	52.0	60.0	28.0	14.8	169.7	2,499
Contl. Illinois	17.8	22.9	32.4	21.6	12.8	107.5	2,143
Bankers Trust	13.2	46.2	46.2	25.1	10.6	141.2	1,895
First Natl. Chicago	14.5	40.6	50.1	17.4	11.6	134.2	1,725
Security Pacific	10.4	29.1	51.2	4.5	7.4	82.5	1,684
Wells Fargo	8.3	40.7	51.0	20.4	6.2	126.6	1,201
Crocker National	38.1	57.3	51.2	22.8	26.5	196.0	1,151
First Interstate	6.9	43.9	63.0	18.5	3.7	136.0	1,080
Marine Midland	n.a.	47.8	28.3	29.2	n.a.	n.a.	1,074
Mellon	n.a.	35.3	41.1	17.6	n.a.	n.a.	1,024
Irving Trust	21.6	38.7	34.1	50.2	n.a.	n.a.	996
First Natl. Boston	n.a.	23.1	28.1	n.a.	n.a.	n.a.	800
Interfirst Dallas	5.1	10.2	30.1	1.3	2.5	49.2	787

n.a. Not Available

a. Bank capital includes shareholders equity, subordinated notes, and reserves against possible loan losses.

b. Argn (Argentina), Braz (Brazil), Mexo (Mexico), Vnez (Venezuela), Chil (Chile).

Source: William R. Cline, International Debt and the Stability of the World Economy, Institute for International Economics (September 1983).

Table 3. Debt Ratios for all Developing Countries and Ten Largest Debtors

	All Developing Countries			Ten Largest Debtors		
Year	Exports ($billions)	Debt	Debt/Exports (Times)	Exports ($billions)	Debt	Debt/Exports (Times)
1973	$ 98.8	$135	1.37	28.3	$ 49	1.73
1975	150.6	202	1.34	45.4	83	1.83
1977	211.0	305	1.45	63.9	126	1.98
1978	236.7	377	1.59	65.4	165	2.52
1979	311.3	442	1.42	94.0	205	2.18
1980	398.6	535	1.34	128.7	251	1.95
1981	410.0	624	1.52	129.5	299	2.31
1982	385.0	689	1.79	114.3	346	3.03
1983	380.0	730	1.92	111.5	377	3.38
1984e	400.0	790	1.97	112.0	405	3.62
83/73 (% change per year)	14.4%	18.4%	3.5%	14.7%	22.6%	6.9%

Source: Nicocles L. Michas and Henry Wojtyla, "The Incredible Growing LDC Debt Crisis," Rosenkrantz, Ehrenkrantz, Lyon & Ross Investment Strategy Special Report (March 9, 1984).

Table 4. Total External Debt Ten Largest Debtors

Country	1973	1975	1977	1978	1979	1980	1981	1982	1983e	1984e	Avg. Yr. % change
Mexico	8.6	16.9	27.1	33.6	40.8	53.8	67.0	84.6	90.0	90.0	26.0
Brazil	13.8	23.3	35.2	48.4	57.4	66.1	75.7	82.2	93.0	100.0	21.0
Argentina	6.4	7.9	9.7	12.5	19.0	27.2	35.7	38.0	40.0	42.0	20.0
Chile	3.2	5.4	5.6	7.9	9.5	11.4	15.6	17.2	18.0	19.0	18.9
Venezeula	4.6	5.7	12.3	16.3	23.7	27.5	29.3	31.3	31.0	32.0	21.0
Peru	1.4	4.0	5.7	6.4	7.9	9.2	10.0	11.2	13.0	14.0	25.0
Indonesia	5.7	8.9	12.8	14.5	14.9	17.0	18.0	21.9	26.0	30.0	16.4
Philippines	1.9	3.8	7.1	9.3	11.2	13.9	17.3	20.7	26.0	32.0	30.0
Egypt	2.2	5.9	10.0	12.9	15.4	17.8	20.3	21.8	24.0	26.0	27.0
Nigeria	1.2	1.1	0.9	3.3	5.2	7.1	9.9	11.2	16.0	20.0	30.0
TOTAL	49	83	126	165	205	251	299	346	377	405	22
% change		69.2	52.5	30.6	24.2	22.4	19.0	15.8	8.9	7.4	

Source: Nicocles L. Michas and Henry Wojtyla, "The Incredible Growing LDC Debt Crisis," Rosenkrantz, Ehrenkrantz, Lyon & Ross Investment Strategy Special Report (March 9, 1984).

Table 5. Indicators of External Debt, Non-Oil Developing Countries, 1973-82
($billions and percentages)

	1973	1976	1979	1980	1981	1982
External Debt						
Total	130.1	228.0	396.9	474.0	550.0	612.4
Long-Term	118.8	194.9	338.1	388.5	452.8	499.6
Total, 1975 prices a.	169.0	218.0	294.7	308.6	331.3	357.8
Exports b.	112.7	181.7	333.0	419.8	444.4	427.4
Debt/Exports (%)	115.4	125.5	119.2	121.9	124.9	143.3
Debt Service c./Exports (%)						
Reported	15.9	15.3	19.0	17.6	20.4	23.9
Adjusted d.	n.a.	10.5	6.9	4.9	11.7	22.3
Debt/GDP (%)	22.4	25.7	27.5	27.6	31.0	34.7
Oil as % of Imports e.	5.9	15.6	16.2	20.4	21.0	19.0

n.a. Not Available

a. Deflating by U.S. wholesale prices.
b. Goods and Services.
c. Includes interest (but not amortization) on short-term debt.
d. Deducting the inflationary erosion of debt.
e. Net oil importers only.

Source: IMF, World Economic Outlook, 1982 and 1983.

Table 6. Impact of Higher Oil Prices on Debt of Non-Oil Developing Countries a.
($billions)

Year	Oil Imports		Additional Cost
	Actual (A)	Hypothetical (B)	(C = A-B)
1973	4.8	4.8	Ø.Ø
1974	16.1	5.3	1Ø.8
1975	17.3	5.7	11.6
1976	21.3	6.8	14.5
1977	23.8	7.5	16.3
1978	26.Ø	8.6	17.4
1979	39.Ø	1Ø.9	28.1
198Ø	63.2	11.9	51.3
1981	66.7	12.1	54.6
1982	66.7	11.9	54.8
Total, 1974-82	344.9	85.5	259.5

a. Net oil importers only.
b. If oil prices had risen no more than the U.S. wholesale price index from 1973.

Source: William R. Cline, International Debt and the Stability of the World Economy, Institute for International Economics, (September, 1983).

Table 7. Impact of Exogenous Shocks on External Debt of Non-Oil Developing Countries
($billions)

Effect	Amount
Oil price increase in excess of U.S. inflation, 1974-82 cumulative a.	$260
Real interest rate in excess of 1961-80 average: 1981 and 1982	41
Terms-of-trade loss, 1981-82	79
Export volume loss caused by world recession, 1981-82	21
Total	$401
Memorandum items	
Total debt: 1973	130
1982	612
Increase: 1973-82	482

a. Net oil exporters only.

Source: William R. Cline, International Debt and the Stability of the World Economy, Institute for International Economics (September, 1983).

Table 8. Financial Rescue Packages for Argentina, Brazil, Mexico, and Yugoslavia
($billions)

	Argentina	Brazil	Mexico	Yugoslavia
Financial Support				
IMF				
Stand-by	1.7	-	-	Ø.6
Extended Fund facility	-	4.6	3.7	-
Compensatory finance and other	Ø.5	1.3	Ø.22	-
World Bank	-	-	-	Ø.3
Bank for International Settlements	Ø.5	1.2	Ø.925	Ø.5
United States				
Oil Payments	-	-	1.Ø	-
Commodity Credit	-	-	1.Ø	Ø.2
Federal Reserve	-	Ø.4	Ø.925	-
Treasury	-	1.53	-	-
Private Banks, new loans	1.5	4.4	5.Ø	3.8b
Government Trade Credits	-	-	2.Ø	1.1
Total	4.25	13.4	14.7	6.5
Debt Rescheduling				
Amount	5.5	4.9	19.5	n.a.
Originally Due	1982-83	long-term 1983	8/1982 to 12/1984	n.a.
Coverage	public	public	public	n.a.
Pending negotiation	all private	n.a.	15.Ø private	n.a.

- Zero or negligible.
n.a. Not applicable.

a. Pressures on banks to maintain short-term credit lines.
b. New loans, $6ØØ million; $1.4 billion to repay matured debt; $1.8 billion stretch-out of short-term loans.

Source: William R. Cline, International Debt and the Stability of the World Economy, Institute for International Economics (September, 1983).

Table 9. Matrix for Establishing Country Exposure Guidelines a.

	Country	Indicator X1	Rank	Indicator X2	Rank	Indicator X3	Rank	Total of Ranks	Overall Rank
1.	Argentina	18,733	15	818	23	B	30	68	14
2.	Australia	26,692	9	2,260	6	A	10	25	6
3.	Austria	11,350	22	1,452	16	A	10	48	12
4.	Belgium	19,686	14	2,039	8	A	10	32	9
•									
•									
•									
77.	Venezeula	8,709	26	94	73	A	10	109	25
78.	Vietnam	2,709	42	98	71	D	70	183	74
79.	Yugoslavia	9,135	24	468	32	C	50	106	23
80.	Zambia	1,175	57	298	41	B	30	128	50

a. All data hypothetical.
b. X1 (GNP), X2 (exports), X3 (DSR).

Table 10. Frank and Cline: Type I and Type II Errors Based Upon Discriminant Analysis Estimates a.

	Type I	Type II
3-Variable Case-Linear		
Iteration 1	3 (23.1)	14 (10.6)
Iteration 10	1 (7.7)	25 (19.9)
2-Variable Case-Linear		
Iteration 1	1 (7.7)	17 (12.8)
Iteration 10	0 (0.0)	26 (19.7)
3-Variable Case-Quadratic	1 (7.7)	21 (15.8)
2-Variable Case-Quadratic	0 (0.0)	12 (9.0)

a. Numbers in parenthesis are percentages.

b. Variables included: debt service ratio, real growth rate of exports, an index of export fluctuation, "non-compressible imports"/total imports ratio, real per capita income, debt amortization/total external debt ratio, total imports/GNP ratio, and total imports/international reserves ratio.

Table 11. Feder and Just: Type I and Type II Errors Based Upon Logit Analysis Estimates

p*	Case (b)[a] # Type I Errors	Case (b)[a] # Type II Errors	Case (c)[b] # Type I Errors	Case (c)[b] # 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

a. Variables included: debt service ratio, imports/reserves, income per capita, capital inflow/debt service, and export growth.

b. Variables included: debt service ratio, imports/reserves, income per capita, capital inflow/debt service, GDP growth, and export growth.

Table 12. Saini and Bates: Type I and Type II Errors Based Upon Discriminant and Logit Analysis Estimates

	Type I Errors	Type II Errors	Total Errors
Discriminant Analysis: Dependent Variable 1, 1960-77			
Number of Errors	4	50	54
Number of Observations	22	270	292
Error Rate	18%	18.5%	18.5%
Logit Analysis: Dependent Variable 1, 1960-77			
Number of Errors	7	49	56
Number of Observations	22	270	292
Error Rate	32%	18%	19%
Discriminant Analysis: Dependent Variable 2, 1960-77			
Number of Errors	4	42	46
Number of Observations	23	275	298
Error Rate	17%	15%	15.5%
Logit Analysis: Dependent Variable 2, 1960-77			
Number of Errors	4	53	57
Number of Observations	23	275	298
Error Rate	17%	19%	19%
Discriminant Analysis: Dependent Variable 2, 1960-77			
Number of Errors	5	5	10
Number of Observations	11	162	173
Error Rate	45%	3%	6%
Logit Analysis: Dependent Variable 2, 1960-77			
Number of Errors	5	8	13
Number of Observations	11	162	173
Error Rate	45%	5%	7.5%

Discriminant Analysis:			
Dependent Variable 2, 1971-77			
Number of Errors	2	10	12
Number of Observations	12	112	124
Error Rate	17%	9%	9.5%
Logit Analysis:			
Dependent Variable 2, 1971-77			
Number of Errors	1	11	12
Number of Observations	12	112	124
Error Rate	8%	10%	9.5%
Discriminant Analysis:			
Dependent Variable 2, 1960-77			
Modified Procedure			
Number of Errors	3	10	13
Number of Observations	23	136	159
Error Rate	13%	7%	8%
Logit Analysis:			
Dependent Variable 2, 1960-77			
Modified Procedure			
Number of Errors	2	14	16
Number of Observations	23	136	159
Error Rate	9%	10%	10%

a. Dependent Variable 1 = debt rescheduling/nonrescheduling cases. Dependent Variable 2 = balance of payments support loans and involuntary debt reschedulings/voluntary rescheduling and nonrescheduling cases.

b. The modefied procedure replicates the procedure used by Feder and Just.

c. Error rates calculated by evaluating type I and type II errors with 5 to 1 weights, respectively.

Table 13. Estimates of Cline's Logit Model of Debt Rescheduling a.

Model:	A	B	C	D	E
Variable:					
LDSR	10.000	...	11.029	...	12.405
	(3.45)		(5.45)		(5.24)
LRSM	-15.523	-12.148	-15.063	-10.189	-16.554
	(3.85)	(3.38)	(4.18)	(3.12)	(4.19)
LINX	-2.102	9.450	...	...	...
	(0.43)	(2.41)			
LAMZ	-12.172	-1.532	-12.772	-1.157	-12.875
	(2.18)	(0.43)	(2.70)	(0.36)	(2.48)
LSQCA	-1.304	-1.074	-1.201	-0.932	-1.383
	(2.04)	(1.69)	(1.99)	(1.60)	(2.16)
LSAV	0.424	-0.508	...	...	...
	(0.16)	(0.21)			
GRO	-0.123	-0.129	-0.130	-0.139	-0.135
	(3.10)	(3.16)	(3.36)	(3.58)	(3.25)
GDP	0.0001	0.0003	...	...	...
	(0.43)	(1.17)			
EXBOR	-15.374	-23.496	-13.874	-21.466	-15.025
	(3.04)	(4.40)	(3.72)	(4.43)	(3.74)
LNDX	...	0.734	...	1.273	...
		(1.92)		(4.15)	
XGR	...	...	...	...	-1.424
					(0.94)
Observations	640	640	670	670	574
Reschedulings	22	22	22	22	20
Chi-Square b.	772	762	812	795	700
Error (%):					
Type I	9.1	18.2	9.1	13.6	10.0
Type II	13.6	14.6	13.0	16.1	12.5

a. t-statistic in parentheses.

b. Type I: Failure to predict actual rescheduling. Type II: prediction of rescheduling when none occurs. Cutoff=.041.

Table 14. Estimates of Cline's Logit Model of Rescheduling: Large Debtor Sample (31 countries) [a.]

Model L

Variable	Coefficient
LDSR	12.77
	(3.63)
LRSM	-16.74
	(3.Ø2)
LAMZ	-15.72
	(2.25)
LSQCA	-2.23
	(1.92)
GRO	-Ø.24
	(2.93)
EXBOR	-15.83
	(3.Ø8)
DMEX	-Ø.97
	(Ø.72)
Observations	362
Reschedulings	14
Chi-Square	442
Errors (%): b.	
Type I	22.4
Type II	2.6

a. t-statistic in parentheses.

b. Cutoff probability = .24.

Table 15. Debt Rescheduling Cases

Argentina - 1976, 1982

Bolivia - 1981

Brazil - 1982

Chile - 1982

Costa Rica - 1982

Ecuador - 1982

Gabon - 1978

Jamaica - 1978, 1981

Mexico - 1982

Nicaragua - 1982

Peru - 1976, 1978, 1982

Philippines - 1982

Sierra Leone - 1977, 1980

Togo - 1979

Turkey - 1978-80, 1982

Zaire - 1976-77, 1979, 1981

Tables 16. Countries Included in the Logit Analysis of Debt Rescheduling

Brazil	1976-82	Trinidad & Tobago	1979-82
Argentina	1976-82	Paraguay	1978-82
Chile	1978-82	Dominican Rep.	1978-82
Venezuela	1976-82	Panama	1978-82
Peru	1976-82	Nicaragua	1978-82
Bolivia	1978-82	South Korea	1976-82
Uruguay	1978-82	Turkey	1976-82
Colombia	1978-82	Togo	1977-80
Ecuador	1978-82	Sierra Leone	1977-82
El Salvador	1978-82	Gabon	1977-79
Mexico	1976-82	Ghana	1977-82
Indonesia	1976-82	Zaire	1977-82
Philippines	1976-82	Yugoslavia	1977-82
Egypt	1976-82	Thailand	1977-82
Nigeria	1976-82	Malaysia	1977-82
Costa Rica	1978-82	Burma	1977-82
Jamaica	1978-82		

Table 17. Estimates of the Logit Model of Debt Rescheduling: All Debtors

Variable	Model IA	Model IB
Intercept	0.007	-1.553
	(0.00)	(0.61)
DSR	0.014	-
	(0.72)	
RSM	-0.075	-0.051
	(5.58)	(2.57)
INX	0.958	-0.356
	(4.15)	(0.23)
AMZ	0.043	0.078
	(1.32)	(3.64)
SQCA	0.004	-0.004
	(0.24)	(0.23)
SAV	-0.004	-0.007
	(0.03)	(0.08)
GRO	-0.104	-0.095
	(5.49)	(4.60)
GDP	-0.229	-0.151
	(0.13)	(0.05)
EXBOR	-0.152	-0.125
	(2.69)	(1.71)
XGR	-0.004	0.002
	(0.08)	(0.03)
NDX	-	0.013
		(6.19)
Observations	190	190
Reschedulings	26	26
Model Chi-Square (df)	40.58 (10)	46.69 (10)
D	.368	.419

Table 18. Correlation Matrix of the Estimates: All Debtors (DSR)

	Incpt	GDP	GRO	SQCA	DSR	RSM	XGR	EXBOR	AMZ	SAV	INX
Incpt	1.000										
GDP	-0.088	1.000									
GRO	0.257	0.005	1.000								
SQCA	0.232	-0.062	0.303	1.000							
DSR	-0.054	-0.278	0.066	-0.007	1.000						
RSM	-0.164	0.012	0.031	-0.150	-0.225	1.000					
XGR	-0.083	-0.177	-0.372	-0.248	-0.121	0.025	1.000				
EXBR	-0.863	-0.095	-0.145	-0.146	0.127	-0.012	0.085	1.000			
AMZ	-0.098	0.045	-0.258	-0.150	-0.130	0.069	0.105	-0.062	1.000		
SAV	-0.156	-0.139	0.014	-0.014	-0.106	0.047	-0.107	0.048	-0.521	1.000	
INX	-0.070	0.101	-0.065	0.269	-0.545	-0.029	0.065	-0.211	0.153	0.085	1.000

Table 19. Correlation Matrix of the Estimates: All Debtors (NDX)

	Incpt	GDP	GRO	SQCA	NDX	RSM	XGR	EXBOR	AMZ	SAV	INX
Incpt	1.000										
GDP	-0.111	1.000									
GRO	0.230	0.020	1.000								
SQCA	0.218	-0.061	0.306	1.000							
NDX	-0.326	-0.041	0.052	-0.024	1.000						
RSM	-0.188	-0.082	0.108	-0.127	0.218	1.000					
XGR	-0.143	-0.241	-0.336	-0.244	0.148	0.029	1.000				
EXBR	-0.841	-0.057	-0.156	-0.134	0.115	0.002	0.105	1.000			
AMZ	-0.211	0.026	-0.218	-0.132	0.355	0.075	0.145	-0.023	1.000		
SAV	-0.129	-0.168	0.024	-0.025	-0.096	0.012	-0.144	0.077	-0.551	1.000	
INX	0.170	0.018	-0.077	0.170	-0.814	-0.268	-0.079	-0.184	-0.194	0.080	1.000

Table 20. Final Estimates of Logit Models IA and IB

Variable	Model IA	Model IB
Intercept	0.621	-4.983
	(0.14)	(32.76)
GRO	-0.092	-0.097
	(5.83)	(5.79)
RSM	-0.074	-
	(6.14)	
EXBOR	-0.162	-
	(3.40)	
INX	1.176	-
	(11.16)	
NDX	-	0.012
		(19.47)
AMZ	-	0.071
		(4.27)
Observations	190	190
Reschedulings	26	26
Model Chi-Square (df)	37.61 (4)	38.52 (3)
D	.442	.463
Predictive Accuracy of the Model at P*=.5	.847	.889
Errors (%):		
Type I	13.1	10.1
Type II	71.4	27.3
Predictive Accuracy of the Model at:		
a) .71<P*<.83	.863	
b) .39<P*<.42		.895
Errors (%):		
Type I	13.8	9.1
Type II	0.0	28.6

Table 21. Model IA Errors

P*	Type I	Type II	Total
.00	0 (-)	164 (86.3)	164 (86.3)
.05	1 (1.3)	90 (78.3)	91 (47.9)
.10	3 (2.6)	53 (69.7)	56 (29.5)
.15	5 (3.8)	39 (65.0)	44 (23.2)
.20	9 (6.3)	30 (63.8)	39 (20.5)
.25	9 (5.9)	21 (55.3)	30 (15.8)
.30	11 (7.0)	18 (54.5)	29 (15.3)
.35	16 (9.6)	13 (56.5)	29 (15.3)
.40	16 (9.4)	10 (50.0)	26 (13.7)
.45	21 (11.8)	7 (58.3)	28 (14.7)
.50	24 (13.1)	5 (71.4)	29 (15.3)
.55	25 (13.6)	5 (83.3)	30 (15.8)
.60	25 (13.3)	1 (50.0)	26 (13.7)
.65	25 (13.3)	1 (50.0)	26 (13.7)
.70	25 (13.7)	1 (50.0)	26 (13.7)
.75	25 (13.8)	0 (0.0)	25 (13.2)
.80	25 (13.8)	0 (0.0)	25 (13.2)
.85	26 (13.7)	0 (-)	26 (13.7)
.90	26 (13.7)	0 (-)	26 (13.7)
.95	26 (13.7)	0 (-)	26 (13.7)
1.00	26 (13.7)	0 (-)	26 (13.7)

Table 22. Model IB Errors

P*	Type I	Type II	Total
.00	0 (-)	164 (86.3)	164 (86.3)
.05	2 (2.7)	91 (79.1)	91 (47.9)
.10	6 (5.4)	58 (76.3)	64 (33.7)
.15	9 (6.5)	34 (66.7)	45 (23.7)
.20	11 (7.5)	28 (65.1)	39 (20.5)
.25	13 (8.1)	16 (55.2)	29 (15.3)
.30	15 (8.9)	11 (50.0)	26 (13.7)
.35	16 (9.2)	7 (41.2)	23 (12.1)
.40	16 (9.1)	4 (28.6)	20 (10.5)
.45	18 (10.1)	3 (27.3)	21 (11.1)
.50	18 (10.1)	3 (27.3)	21 (11.1)
.55	19 (10.5)	2 (22.2)	21 (11.1)
.60	20 (10.9)	1 (14.3)	21 (11.1)
.65	20 (10.9)	1 (14.3)	21 (11.1)
.70	22 (11.9)	1 (20.0)	23 (12.1)
.75	22 (11.8)	0 (0.0)	22 (11.6)
.80	23 (12.3)	0 (0.0)	23 (12.1)
.85	24 (12.8)	0 (0.0)	24 (12.6)
.90	25 (13.2)	0 (0.0)	25 (13.2)
.95	26 (13.8)	0 (-)	26 (13.7)
1.00	26 (13.8)	0 (-)	26 (13.7)

Table 23. Final Estimates of Logit Models IAA and IBB

Variable	Model IAA	Model IBB
Intercept	-1.229	-4.275
	(1.72)	(17.05)
INX	1.242	-
	(11.19)	
GRO	-0.090	-0.092
	(5.75)	(5.30)
RSM	-0.073	-0.069
	(5.76)	(4.66)
MEM5	1.062	-
	(4.07)	
OPECM	-5.554	-
	(4.15)	
NDX	-	0.011
		(15.03)
MEM10	-	1.096
		(4.13)
AMZ	-	0.069
		(3.98)
Observations	190	190
Reschedulings	26	26
Model Chi-Square (df)	41.88 (5)	48.04 (5)
D	.458	.501
Predictive Accuracy of the Model at P*=.5	.863	.895
Errors (%):		
Type I	11.1	9.5
Type II	45.5	20.0
Predictive Accuracy of the Model at:		
a) .63<P*<.65	.874	
b) .46<P*<.51		.905
Errors (%):		
Type I	13.3	9.0
Type II	25.0	18.2

Table 24. Final Estimates of Logit Models IAAA and IBBB

Variable	Model IAAA	Model IBBB
Intercept	-1.851	-5.476
	(1.40)	(10.82)
INX	2.429	-
	(10.07)	
GRO	-0.083	-0.096
	(2.06)	(2.68)
RSM	-0.096	-0.123
	(3.01)	(4.08)
MEM5	2.035	-
	(5.35)	
OPECM	-10.779	-
	(6.91)	
III	0.013	0.016
	(0.31)	(0.45)
NDX	-	0.015
		(11.38)
MEM10	-	2.344
		(7.11)
AMZ	-	0.030
		(0.18)
Observations	114	114
Reschedulings	17	17
Model Chi-Square (df)	32.75 (6)	34.36 (6)
D	.551	.573

Table 25. Final Estimates of Logit Models IIA and IIB
Large Debtors

Variable	Model IIA	Model IIB
Intercept	1.149	-5.904
	(Ø.22)	(17.69)
GRO	-Ø.364	-Ø.325
	(11.24)	(7.86)
EXBOR	-Ø.3ØØ	-
	(4.54)	
INX	1.638	-
	(9.18)	
NDX	-	Ø.Ø19
		(12.11)
Observations	11Ø	11Ø
Reschedulings	14	14
Model Chi-Square (df)	33.28 (3)	4Ø.19 (2)
D	.57Ø	.657
Predictive Accuracy of the Model at P*=.5	.891	.9ØØ
Errors (%):		
Type I	8.8	7.1
Type II	37.5	36.4
Predictive Accuracy of the Model at:		
a) .37<P*<.41	.9ØØ	
b) .54<P*<.57		.918
Errors (%):		
Type I	7.1	11.1
Type II	36.4	Ø.Ø

Table 26. Final Estimates of Logit Models IIIA and IIIB Small Debtors

Variable	Model IIIA	Model IIIB
Intercept	-2.636	-4.068
	(4.70)	(17.59)
INX	2.353	-
	(9.13)	
DSR	-0.065	-
	(3.32)	
AMZ	0.065	0.074
	(2.14)	(3.74)
NDX	-	0.009
		(7.70)
RSM	-0.110	-
	(2.20)	
Observations	80	80
Reschedulings	12	12
Model Chi-Square (df)	17.14 (4)	10.03 (2)
D	.365	.299
Predictive Accuracy of the Model at P*=.5	.880	.867
Errors (%):		
Type I	11.3	13.4
Type II	25.0	0.0
Predictive Accuracy of the Model at:		
a) .41<P*<.56	.880	
b) .41<P*<.45		.880

Table 27. Final Estimates of Logit Models IIAA and IIBB

Variable	Model IIAA	Model IIBB
Intercept	-1.691	-3.739
	(1.90)	(4.90)
GRO	-0.342	-0.332
	(10.10)	(7.25)
INX	1.947	-
	(10.10)	
OPECM	-11.662	-8.670
	(5.97)	(3.23)
NDX	-	0.019
		(12.01)
Observations	110	110
Reschedulings	14	14
D	.595	.672
Predictive Accuracy of the Model at P*=.5	.880	.936
Errors (%):		
Type I	8.9	5.1
Type II	44.4	18.2
Predictive Accuracy of the Model at:		
a) .61<P*<.69	.910	
b) .47<P*<.89		.936
Errors (%):		
Type I	9.4	5.1
Type II	0.0	18.2

Table 28. Correlation Matrices of Significant Variables in Models IIAA and IIBB with Variable III

Model IIAA with Variable III

	Intercept	GRO	OPECM	INX	III
Intercept	1.000				
GRO	-0.949	1.000			
OPECM	-0.847	0.970	1.000		
INX	-0.039	-0.275	-0.496	1.000	
III	-0.977	0.991	0.934	-0.168	1.000

Model IIBB with Variable III

	Intercept	GRO	OPECM	NDX	III
Intercept	1.000				
GRO	-0.967	1.000			
OPECM	-0.966	0.993	1.000		
NDX	0.841	-0.940	-0.945	1.000	
III	-0.985	0.986	0.980	-0.905	1.000

Table 29. Final Estimates of Logit Models IIAAA and IIBBB

Variable	Model IIAAA	Models IIBBB
Intercept	4.514	Ø.885
	(2.2Ø)	(Ø.Ø6)
OPECM	-46.2Ø5	-29.481
	(6.88)	(5.79)
INX	7.Ø34	-
	(5.Ø9)	
III	-Ø.1Ø2	-Ø.Ø93
	(4.43)	(3.27)
NDX	-	Ø.Ø36
		(4.72)
Observations	68	68
Reschedulings	1Ø	1Ø
Model Chi-Square (df)	42.21 (3)	41.8Ø (3)
D	.799	.794
Predictive Accuracy of the Model at P*=.5	.96	.97
Errors (%):		
Type I	3.4	1.7
Type II	11.1	1Ø.Ø
Predictive Accuracy of the Model at:		
a) .22<P*<.37	.985	
b) .33<P*<.49		.985
Errors (%):		
Type I	Ø.Ø	Ø.Ø
Type II	9.1	9.1

Table 30. Correlation Matrices of the Estimates

Model IIAAA

	Intercept	OPECM	INX	III
Intercept	1.000			
OPECM	-0.462	1.000		
INX	0.100	-0.898	1.000	
III	-0.720	0.640	-0.536	1.000

Model IIBBB

	Intercept	OPECM	INX	III
Intercept	1.000			
NDX	-0.400	1.000		
OPECM	-0.283	-0.722	1.000	
III	-0.507	-0.442	0.673	1.000

Table 31. Final Estimates of Logit Models IIIAAA and IIIBBB

Variable	Model IIIAAA	Model IIIBBB
Intercept	Ø.545	-1.392
	(Ø.39)	(Ø.73)
III	-Ø.1Ø5	-Ø.Ø78
	(5.Ø6)	(2.35)
NDX	-	Ø.ØØ6
		(2.Ø1)
Observations	46	46
Reschedulings	7	7
Model Chi-Square (df)	8.86 (1)	11.14 (2)
D	.418	.426
Predictive Accuracy of the Model at P*=.5	.848	.848
Errors (%):		
Type I	15.2	11.9
Type II	-	5Ø.Ø
Predictive Accuracy of the Model at:		
a) .44<P*<.45	.848	
b) .52<P*<.67		.891
Errors (%):		
Type I	13.6	11.4
Type II	5Ø.Ø	Ø.Ø

Table 32. Final Estimates of Logit Models IVA and IVB
Large Debtors - Latin America

Variable	Models IVA & IVB
Intercept	Ø.442
	(Ø.21)
GRO	-Ø.349
	(5.65)
RSM	-Ø.1Ø2
	(4.56)
Observations	5Ø
Reschedulings	9
Model Chi-Square (df)	2Ø.39 (2)
D	.59Ø
Predictive Accuracy of the Model at P*=.5	.83Ø
Errors (%):	
Type I	7.3
Type II	33.3
Predictive Accuracy of the Model at .64<P*<.65	.88Ø
Errors (%):	
Type I	11.1
Type II	2Ø.Ø

Table 33. Final Estimates of Logit Models VA & VB
Small Debtors - Latin America

Variable	Model VA	Model VB
Intercept	-3.662	-6.893
	(11.59)	(8.90)
INX	1.143	-
	(3.24)	
NDX	-	0.014
		(5.74)
AMZ	-	0.171
		(3.44)
Observations	49	49
Reschedulings	5	5
Model Chi-Square (df)	3.25 (1)	10.10 (2)
D	.196	.435
Predictive Accuracy of the Model at P*=.5	.898	.920
Errors (%):		
Type I	10.2	8.3
Type II	-	0.0
Predictive Accuracy of the Model at:		
a) .43<P*<.87	.898	
b) .49<P*<.87		.920
Errors (%):		
Type I	10.2	8.3
Type II	-	0.0

Table 34. Correlation Matrix of Significant Variables in Models IVA and IVB with the Variable III

	Intercept	GRO	RSM	III
Intercept	1.000			
GRO	-0.665	1.000		
RSM	-0.929	0.587	1.000	
III	-0.991	0.703	0.879	1.000

Table 35. Summary Results

Model	Obs.	Resch.	Model Chi-Square	(df)	D	Predictive Accuracy Min. Error	P*=.5
IA	190	26	37.61	(4)	.442	.863	.847
IAA	190	26	41.88	(5)	.458	.874	.863
IB	190	26	38.52	(3)	.463	.895	.889
IBB	190	26	48.04	(5)	.501	.905	.895
IIA	110	14	33.28	(3)	.570	.900	.891
IIAA	110	14	35.71	(3)	.595	.910	.880
IIB	110	14	40.19	(2)	.657	.918	.900
IIBB	110	14	43.87	(3)	.672	.936	.936
IIIA	80	12	17.14	(4)	.365	.880	.880
IIIAA	80	12	17.14	(4)	.365	.880	.880
IIIB	80	12	10.03	(2)	.299	.880	.867
IVA/B	50	9	20.39	(2)	.590	.880	.830
VA	49	5	3.25	(1)	.196	.898	.898
VB	49	5	10.10	(2)	.435	.920	.920

Table 36. Comparison of Type I and Type II Errors Among Models IA, IB, and IIA with Cline's Models C, D, and L

Model	Type I	Type II
IA	13.8	Ø.Ø
C	9.1	13.Ø
IB	9.1	28.6
D	13.6	16.1
IIA	7.1	36.4
L	21.4	2.6

Table 37. Probability Intervals Associated with the Minimum Total Errors Rule for Predicting Debt Reschedulings

Model	Interval
IA	.71<P*<.83
IAA	.63<P*<.65
IB	.39<P*<.42
IBB	.46<P*<.51
IIA	.37<P*<.41
IIAA	.61<P*<.69
IIB	.54<P*<.57
IIBB	.47<P*<.89
IIIA	.41<P*<.56
IIIB	.41<P*<.45
IVA/B	.64<P*<.65
VA	.43<P*<1.00
VB	.49<P*<.87

Table 38. Predicted Probabilities

Model	Country	1976	1977	1978	1979	1980	1981	1982
IIBB	Argentina	.060*	.004	.109	.005	.031	.821	.995*
VB	Bolivia	n.a.	n.a.	.438	.247	.169	.183*	.136
IIBB	Brazil	.005	.051	.246	.069	.054	.604	.925*
IBB	Burma	n.a.	.014	.068	.050	.020	.058	.285
IIBB	Chile	n.a.	n.a.	.022	.004	.002	.035	.999*
IIBB	Colombia	n.a.	n.a.	.002	.001	.001	.011	.135
VB	Costa Rica	n.a.	n.a.	.289	.495	.066	.039	.354*
VB	Dom. Rep.	n.a.	n.a.	.110	.090	.044	.039	.108
IIBB	Ecuador	n.a.	n.a.	.010	.011	.016	.157	.595*
IIBB	Egypt	.046	.031	.283	.094	.015	.171	.415
VB	El Salvador	n.a.	n.a.	.005	.004	.012	.018	.022
IBB	Gabon	n.a.	.359	.419*	.356	n.a.	n.a.	n.a.
IBB	Ghana	n.a.	.055	.014	.015	.061	.121	.076
IIBB	Indonesia	.001	.003	.017	.001	.001	.001	.032
VB	Jamaica	n.a.	n.a.	.190*	.035	.048	.069*	.087
IIBB	Malaysia	n.a.	.000	.001	.000	.000	.001	.002
IIBB	Mexico	.205	.479	.214	.006	.007	.018	.780*
VB	Nicargua	n.a.	n.a.	.023	.026	.188	.300	.868*
IIBB	Nigeria	.000	.000	.097	.001	.001	.085	.085
VB	Panama	n.a.	n.a.	.036	.035	.016	.013	.013
VB	Paraguay	n.a.	n.a.	.009	.009	.008	.010	.010
IIBB	Peru	.100*	.436	.761*	.026	.017	.149	.420*
IIBB	Philippines	.002	.003	.020	.007	.006	.042	.400*
IIBB	South Korea	.000	.000	.001	.001	.018	.002	.011
IBB	Sierra Leone	n.a.	.031*	.063	.071	.125*	.154	.266
IIBB	Thailand	n.a.	.001	.001	.001	.000	.001	.015
IBB	Togo	n.a.	.037	.035	.124*	.227	n.a.	n.a.
VB	Trin. & Tob.	n.a.	n.a.	n.a.	.001	.001	.019	.001
IIBB	Turkey	.004	.204	.601*	.653*	.606*	.065	.076*
VB	Uruguay	n.a.	n.a.	.012	.014	.016	.013	.061
IIBB	Venezuela	.000	.001	.015	.028	.024	.037	.134
IIBB	Yugoslavia	n.a.	.000	.003	.001	.002	.008	.030
IBB	Zaire	n.a.	.411*	.282	.162*	.079	.896*	.112

n.a. Not Available

Table 39. Parameter Estimates of Equation 6.9
Sixteen Largest Debtors

Country	b(0)	b(1)	b(2)
Brazil	-2.56	6.77	0.34
	(-2.23)	(2.09)	(0.03)
Argentina	-6.91	3087.93	-526505.47
	(-0.39)	(0.35)	(0.08)
Chile	-1.59	7.27	-16.98
	(-1.47)	(0.42)	(-0.55)
Venezuela	-7.60	121.90	50.56
	(-6.81)	(5.50)	(1.43)
Peru	-2.32	19.58	-50.43
	(-4.47)	(3.42)	(-2.44)
Colombia	-7.22	507.05	-211.85
	(-5.73)	(4.70)	(-1.61)
Mexico	-1.60	7.91	-16.76
	(-2.08)	(1.22)	(1.10)
Indonesia	-4.83	-54.75	-80.78
	(-5.96)	(-0.22)	(-0.27)
Philippines	-7.43	155.01	85.86
	(-3.57)	(3.98)	(0.62)
Egypt	-1.34	1.70	-4.92
	(-2.00)	(0.44)	(-0.59)
Nigeria	-3.20	0.05	-16.33
	(-4.88)	(0.00)	(-0.25)
South Korea	-5.64	-49.09	59.46
	(-7.01)	(-0.26)	(1.01)
Turkey	-0.89	0.36	0.40
	(-0.85)	(0.20)	(0.23)
Yugoslavia	-5.14	154.50	-449.16
	(-6.74)	(0.61)	(-0.56)
Thailand	-7.53	2717.98	-2717.98
	(-1.14)	(0.41)	(-0.41)
Malaysia	-7.31	405.80	-9890.34
	(-8.95)	(0.38)	(0.00)

a. Numbers in parentheses are asymptotic "t" statistics.

Table 40. Final Parameter Estimates of Equation 6.9

Country	b(0)	b(1)	b(2)
Brazil	-2.54	6.77	-
	(-2.79)	(2.24)	
Venezuela	-6.76	131.58	-
	(-8.16)	(5.64)	
Peru	-2.32	19.58	-50.43
	(-4.47)	(3.42)	(-2.44)
Colombia	-10.93	825.07	-
	(-6.10)	(5.06)	
Philippines	-7.43	167.13	-
	(-3.82)	(3.61)	

a. Numbers in parentheses are asymptotic "t" statistics.

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