A MULTIVARIATE STATISTICAL APPROACH TO SOVEREIGN RISK

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Dedicated to:

My parents who encouraged me all the time.

Dr. Abdulrazzak Charbaji for his beneficail advices.

Dr. Tarek Mikdashi for his great help.

My manager Mr. Riad Tabara

Mr. Said Kreidieh for his Data help.

The B.C.C Staff.

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CHAPTER I

INTRODUCTION

A. GENERAL BACKGROUND

"The debt crisis has been giving bankers sleepless nights for eight years now. But how many could have imagined that a **war** would be fought over foreign debt? Megalomania aside, that is why Saddam Husein invaded Kuwait -to allow him to repudiate $50 billion- $60 billion of debt lent by the gulf states during the Iran-Iraq war. The loans from Kuwait, we are told, will now be treated as grants -In other words, they won't be paid."[1]

Debt-servicing difficulties on the part of borrowing countries are not a recent development in history. "For historical precedent of sovereign lending by private banks, we have to go back to the fifteenth and sixteenth centuries. In 1494, the Medici bank collapsed after a long period of decline. Sovereign loans had been made to the Pope, the duke of Milan, Charles of Burgunedy, Edward the fourth of England, all of whom repudiated their debts.

In the sixteenth century, the Fugger Bank was highly exposed in sovereign lending to Hubsburg

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[1]- 'Under The Gun' , Euromoney (Special IMF/WORLD BANK Issue), (September 1990) p5.

emperors but in 1650 the bank had to write off this debt."[2] Later on, commercial banks from the industrial countries were eager to lend money to the developing nations, noting that " until 1913, western commercial banks played no role in lending to developing nations. Their contribution remained a minor one until the emergence of the Euromarket in the 1960s and the rapid growth of these market in the 1970s."[3]

In the 1970s, the developed countries governments couldn't supply enough foreign assistance to developing countries, so governments increasingly turned to Commercial Banks - which they presumed would be the least intrusive source of funds, compared to Transitional Corporations or Multilateral Institutions such as the World Bank and the International Monetary fund, which frequently attach restrictions or policy conditioned to their loans.

The question an observer must ask is whether the developing countries were borrowing for purposes other than development. The rapid rise in the short term external debt of developing countries by the end

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2. Shelagh, A. Heffernan, Sovereign Risk Analysis (London: Allen and Unwin publishers, ltd. 1986) P.26

3. Ibid, p.26.

of the 1970s and 1980s may suggest that developing nations were borrowing to finance their current account deficit. Many observers have attributed the increase of high-risk loans to to poor screening and evaluation by enthusiastic lenders who have been behind the rapid increase of high risk lending to LDCs.[4]

In discussing debt crisis in the 1980s, two major crisis can be observed : (1) The Latin American debt crisis, and (2) The African debt crisis. Both had the same and high ratio of external debt/GNP because their GNP was also of the same proportion. It is worth to note that the Latin American nations' debt was mainly from commercial banks, while the African nations' debt was public. Hence the Latin nations' debts bears higher interest rates.

In 1988, the African public debt was $230 billion, while the Latin American was more than $500 billion. The debt service ratio in both regions was greater than 40% taking into consideration that a common rule of thumb about debt servicing considers 25% of country's export earnings t be the cut-off. Moreover, the average ratio of total debt to

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4. Wenlee, Ting, Multinational Risk Assessment And Management (New York: Quarum Books, 1988),P.153.

exports is around 170% in developing countries while it is 275% in Latin America and 415% in African countries. [5]

The U.N. estimates total outstanding debt of developing nations of $13 trillions at the end of 1989 with an annual interest obligations on this debt total of $100 billion. [6]

The **Kuwaiti crisis** today, is expected to have a bad effect on the oil prices and the world economy. Conceivably, oil price could reach as high as $45, which is more than enough to cause both crippling recession with a widespread joblessness, and ruinous inflation throughout the industrial world. The Gulf crisis is going to have a bad effect on developing countries. What worsened the situation is the fact that the impact of oil prices on external indebtedness is an issue that has not been resolved in the empirical literature.

B. WHY COUNTRIES INCUR DEBTS ?

It was thought that gradual development of the

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[5]. The U.N department of public information, The World Economy, (Washington, D.C,: March 1990), p.21.

[6]. The U.N department of public Information, Debt: a Crisis For Development, (Washington, D.C,:March 1990),P.21.

poorer countries would narrow the gap between them and the more developed countries, but the opposite was the case.

Leaders of many developing countries name the 1980s as the Lost Decade due to criterion such as growth rates, poverty levels, nutrition, health & education , and debt. Hence the social cost of reform policies had been painful.

1. The flow of foreign funds in the form of loans rather than grants was desired for developing countries to achieve their growth targets. This concept lead to debt accumulation in the enormous growth of less developed countries' external debt, associated with significant outflows of annual debt payments.

"Infrastructural demands in the developing far eastern countries and the money required for the reconstruction of eastern europe will put massive new demands on the international capital markets."[7] So, country development was the motive of borrowing such as building roads, dams & water system, boosting agricultural production, developing local manufacturing capacity; and trying to ameliorate poverty by expanding health services, education, and

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7. Brady, Simon, ' The A-Z Of Global Borrowing' A Supplement To Euromoney, (Aug 1990), P.23.

public transportation; For example, "the health budget of most government fell in African, Latin American, and third Asian nations and the numbers of poor people are rising throughout the world."[8]

The decelerating economic growth and social decay of many developing countries are not the only symptoms of disorder in the world economy. The symptoms affected the developing countries the sharpest, but the developed nations were not immune.

The U.N. reported that the debt servicing burden has combined with the general fall-off in external financing to bring about a net transfer of financial resources of the developing countries; this amount reached $32.5 billions in 1988 alone for a cumulative total over six years of nearly $115 billions. [9] This operation is labeled as Capital Flight. "I.M.F estimates That $3 billions went out of Africa between 1974 & 1985."[10]

2. The rising interest rates triggered a world wide recession and drove up the cost of borrowing on a world's scale. Moreover, the fall in commodity prices lead to a decrease in export value for

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[8]-The U.N. department of public Information, Debt: A Crisis For Development, (Washington, D.C.,: March 1990), P.9.

[9]-Ibid, P.4.

[10]-Ibid, P.17.

exporting countries; " Africa's 1988 export commodity price was just 54% of its 1980 level."[11]

3. The environmental deterioration, such as spreading deserts, soil erosion, toxic waste dumping and the depletion of the earth's Ozone Layer, underline the close links between economic activity and the environment. The international community is being increasingly aware that the world's environment is being seriously degraded both by the waste and production techniques of the wealthy nations, and by the developing world's poverty which drives people to cut and even trees, and over farm fragile soils in their quest for immediate survival.

4. Inflation in LDCs alleviated its debt service burden leading to more pressure on their foreign exchange reserves. Thus, most countries put strategies to manage their foreign Balance of Payments to meet their obligations, and many had their debt obligations deferred or rearranged.

B. WORLD WIDE PROBLEMS.

The decrease of the indebted countries' ability to import has reduced the manufacturers and service providers export orders; hence, companies find their

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[11]. Ibid, P.4.

markets shrink in the long term leading to reduced production and thus cuts in jobs. A recent study by the overseas Development Council estimates that "860,000 jobs were lost in the U.S. due to poor performance of U.S. exports to Latin America in 1987."[12] The environmental problems are very clear as mentioned before. The Drug problem is mainly aroused when impoverished peasants find Opium Poppies and Coca the only strategy to produce the most remunerating crop.

The debt crisis for indebted countries could be seen from three conceptions as to the nature of the problem. 'It was first characterized as a Financial Crisis - a temporary cash flow squeeze that could be dealt with by short term loans to bridge the fund gap. Then, when balance of payments problem persisted for several years, it became an Economic Crisis - one that could be cured by a major revamping of debtors' economies. As many developing countries' economies remained stagnant and as the debt burden was still growing, the problem was viewed as a Political Crisis threatening political and social stability in a large number of countries, and requiring concerted, comprehensive action by the international

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[12]-Ibid, P.29.

community as a whole.'"

The common challenge seems to be more political rather than intellectual. What ideas exists?

Creditor nations group debtor nations into groups such as: low-income, middle income, highly indebted, sub-saharian Africa, etc. . Creditor countries refer the reasons for debt crisis to the debtor countries' domestic economic policies. But there had been reluctance on the creditor side to draw boarder linkages, i.e., to view the debt crisis in relation to other international factors, such as capital flight or terms of trade, that were determined to the developing world.

So what alternative solutions a creditor country could offer?

a- Debt forgiveness: Its advocates had two grounds:(1) Ethics,i.e., only the average person is paying the costs of the loans.(2) Economics; nations have already repaid their debts through excessive interest charges, capital flight, etc., added together.

But of course, such arguments are rejected by both creditor governments and Banks alike. Since, such transactions would appear as a loss in their ledgers. Moreover, indebted countries had a

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*. Ibid, P.18.

contractual obligation to fulfil, if begged forgiveness they would ruin their creditworthiness reputation.

b- Rescheduling : In september 1990, the Euromoney magazine reported that Chile obtained a commitment from its bank creditors to maintain minimum lines of credit to finance the country's foreign trade. The actual amount varied with each bank, depending on their exposure at the time of rescheduling. The total amount was over $1.5 billion and it paid the banks an annual commitment fee of 1/8 to keep these lines open. [13]

Rescheduling was the only option during the early years of the debt crisis. Rescheduling includes renegotiations on repayments schedule, maturity periods, and some times interest rates. The Governments' debtors were grouped in the 'Paris Club', and the commercial banks' debtors were grouped in the 'London Club' - "are most often described as 'Ad-hoc Informal meetings' of the major creditors."[14] Many of the Latin American negotiations arose from difficulties encountered in Servicing short- and medium-term commercial debt. Resheduling

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13. 'Chile', Euromoney Special supplement, (Sept. 1990), p.10

14. Frank, Charles R., and William R. Cline, "Measurement Of Debt Servicing Capacity:An Application Of Discriminant Analysis," Journal Of International Economics, vol. 1 1971, p.327.

of payments are a move to five years period, combined with some restrictions on the volume of commercial borrowing could significantly reduce the amount of debt service.

For many, rescheduling has become a ritual with no real end in significance.

c- New lending: In 1985, the US treasury secretary, James Baker, suggested a strategy to overcome the debt crisis by increasing Commercial Banking lending and funding from multilateral financial institutions such as the IMF and the World Bank, who put new programs for indebted, and poor countries, but were constrained by inadequate resources. Creditors often preferred renegotiations and rescheduling at prevailing market rate.

In June 1988, The Toronto Economic Summit of the seven richest industrialized nations agreed on rescheduling official debt of low-income African countries within a framework that allows official creditors to choose among: 1- concessional interest rates usually on shorter maturities; 2- longer repayment periods at commercial rates; 3- partial write-offs of debt-service obligations during the consolidation period; or 4- a combination of these options.[15]

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[15]. Wheeler, Joseph C., Development Co-operation, (O.E.C.D. March 1990), p.9.

This was followed by the "Brady Plan" in 1989, also, a U.S. treasury secretary. The plan encouraged banks for voluntary debt reduction employing financial market tools such as, debt-equity swaps, bond issues and other commercial mechanisms, supported by guarantees and enhanced financing through the IMF and the World Bank. The plan was welcomed, but the response was tempered and asked whether it was a case of too little, too late.

Overtime, commercial banks followed new strategies with highly indebted countries. "Many have revolved around the concept of Market-Based, 'Voluntary debt reduction' by the Commercial Banks"[16] using financial tools such as : (1)Debt-equity swaps, i.e, if there exist a foreign corporation interested in investing in the indebted country, it can buy its loans at a discount on the secondary market and cash them from the Central Bank for local currency. (2)Debt Buybacks, i.e, countries would buy its outstanding loans from the secondary market. Using such techniques, debt could be reduced significantly. Chile bought its debts around 30% through debt equity swaps. But equity swaps provide a negative economic side effect since debtor countries

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[16].The United Nations department of public Information, The World Economy, (March 1990), p.28.

would tend to print money in exchange , hence increasing inflation.

Other indebted countries offered banks a variety of newfinancial instruments, including collateralized notes and bonds, exchanged for old bank debt at a discount. The new paper is more liquid than the old debt and is often eligible for use in debt-equity conversion schemes. Chile might also ask to purchase more of its debt in the secondary market. In the last two years, it has bought about $440 million of face value debt for around $250 million with bank's permission.[17]

Yugoslavia had followed three separate strategies that "reduced its debt from over $22 billion to $16.5 billion: First, it successfully rescheduled its debts; Second, it has exposed innovative methods of retiring debt primarily through debt swaps, and Third, it has diversified its exports."[18]

As for Argentina, it is looking for debt-conversion opportunities, but on a case-by-case basis. It doesn't have an aggressive policy toward debt conversion because Argentina's central bank

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[17]. 'Chile', Euromoney Special supplement, (Sept. 1990), p.7

[18]. 'Yugoslavia', Euromoney Special supplement (Sept 1990), p.17.

cannot issue local currency bonds, since no body would buy them, and any new currency printings wouldhave an immediate inflationary impact. Its debt papers is the most heavily-discounted in the secondary market; recently recovering from below 11% to about 14% of face value.[19]

In 1988, Nigeria reached an agreement with the London Club to reschedule $5.6 billion. These debts were rescheduled over a 20-year period including a three years grace period. It also converted over $70 million of debt. The programme exchanges Nigeria's foreign debt in the form of promissory notes for local currency which was used to purchase equity in designated domestic enterprises. As at the end of december 1989, the total value of debt converted so far stood at $306.7 million, by which the debt was thus reduced. The short-term debt was converted at varying discounts from 40%-51%.[20]

Mexico, which is the most active borrower reopened the international capital market to Latin America in June 1989, and has been issuing debt

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[19]. 'Argentina', Euromoney Special supplement, (Sept 1990), p.12.

[20]. 'The A-Z Of Global Borrowing', A Supplement To Euromoney, (Aug 1990), p.104.

consistently since. It also resumed an official debt-equity swaps programme in July. The old programme was suspended in 1987 because the government deemed it too inflationary. The deal was a $100 million, five years Eurobonds for Banco Nacional de Comercio Exterior (Bancomext) sold by Merril Lynch. Bancomext's first bond issue, launched in June 1989 at a price of 88.45, is now trading at about 98.5. The reasons was that demand is exceeding supply.[21]

If debtor countries obtained the minimum level of debt relief they could spin out their vicious circle and grow out of their debt problems.

d- Privatization: A policy followed by indebted countries to decrease its burden. The main aim of the design and implementation of domestic policies is to improve confidence in the economy.

The success of the privatization programme is both an indicator of strong investor interest in the country, and government's intention to pull out all stops to turn the economy around. The privatization has produced tremendous budgetary savings in subsidies.

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21. 'Under The Gun' , Euromoney (Special IMF/WORLD BANK Issue), (September 1990), p.155

But many ask if there were political risk in re-nationalization, hence asking for arbitrary compensatory terms; will there be corruption? The danger is minimal due to the fact that governments have tried their way and failed, thus realizing the only solution.

Privatization requires international consultants and the British Model is certainly the guiding light for any one going for privatization. In March, Greece had cost the exchequer Dr600 billion in 1989 and would cost another Dr120 billion this year, if nothing were done. These out goings are among the highest in the O.E.C.D area in terms of GDP; state grants and interest rate subsidies amount to as much as two thirds of the value of approved investment projects-or 3% of GDP. National companies have been auctioned off, others have reversed their debt, either through compulsory increase of capital provided by their shareholders, chiefly the state-owned banks or through conversion of debt to equity. Only companies in the defense field are required to remain under control .[22]

The Argentina phone company split into two private companies. The latter consortium, led by

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[22]·Greece, Euromoney Special supplement,(Sept 1990), p.12.

Telefonica & Citibank, agreed to pay $114 million in cash and $2.72 billion in debt papers for 60% of what is now being reorganized as Telco-South. The other group, led by Bell Atlantic & Mantrust, agreed to pay $100 million cash and $12.308 billion in debt paper for 60% of what is now called Telco-North. The public work ministry signed an agreement with private companies to take over the development of 28 marginal oil fields and nearly ten thousand kilometers of national roads projected to bring in $250 million in exploration rights. The exploration rights will generate activity and would produce a stream of foreign exchange earnings and government revenue.[23]

The privatization programme takes-in two methods: The first is a link with the debt conversion programme where a company is privatized through private placement, and the second is effectively asset stripping for those companies without a future.

D. Developed Countries' Debt

But that doesn't mean that developed countries do

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[23]. 'Argentina', Euromoney Special supplement (Sept 1990), p.6.

[24]. 'The A-Z Of Global Borrowing', A Supplement To Euromoney, (Aug 1990), p.12.

not have debt problems. In 1988, Australia had a gross foreign debt of $108.1 billion; in 1989 it increased to $117.2 billion; and the debt service ratio had increased from 15.9% to 17.7%. Also it has a current account deficit of $10.891 billion (1988), and $16.364 billion (1989). Moreover, its GDP growth forecast is between zero and 2%.[24]

"Canada's projected deficit is expected to be $28.5 billion as at december 1990. The federal debt is now so large that each percentage point increase in interest rates widens the deficit by about $1.7 billion, and the total federal government debt stood at $ 307.2 billion or 46.2% of GDP at the end of 1989; Its public debt charges as a share of budgetary expenditures have increased from 18.7% in 1984-1985 to an estimated 27% in 1989-90"[25]

As for the United States, "there are signs that the growth of external debt may be stabilizing. Although net interest payments will continue to swell in coming years, the U.S. current account has progressively narrowed. The transformation of the U.S. to a debtor nation was paralleled by an explosion of debt internally. For example, the total debt of non-financial sectors expanded at an average

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[25].Ibid, p.20.

annual rate of 12.3% from 1983 through 1987. Debt expansion subsequently slowed,however,to 9.2% in 1988, 8.1% in 1989, and so far this year has decelerated further to 6.8% pace."[26]

France, also, had a "budget deficit of FFR 100 billion in 1989 i.e., 1.6% of GDP plus high interest rates and unemployment rate of 9.4% in 1989 equivalent to 2.5 million unemployed."[27]

E. The Eastern Bloc

At the end of 1989, the eastern bloc countries had convertible currency external debt of $116.8 billion of which half of it owed to commercial banks. Poland has the highest convertible debt in the region-$40.4 billion at the end of 1989, equivalent to 470% of export of goods and services. Interest payments ,if they are paid, would total 42% of exports of goods and services.[28]

As for Hungary, its "hard currency debt stood at $19.7 billion at the end of 1984, 77% owed to commercial banks. Debt amounted to 223% of convertible currency export earnings, and reserves of $1.4 billion over just 1.4 months of convertible currency imports.[29]

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[26].Ibid, p.23.
[27].Ibid, p.43.
[28].Ibid, p.70.
[29].Ibid, p.74.

F. Need For The Study

Many studies have been done on the analysis of sovereign risk, such as Frank and Cline (1971), Feder and Just (1977), Mayo and Barret (1978), Just and Ross (1981), Taffler and Abassi (1982,1984),Cline (1984), and Kharas (1984). However, there was no attempt to explore empirically the causes of the Gulf War.

G. Purpose of The Study

Based on review of literature and variables mentioned in chapter II, Simple Discriminant function will be applied to identify the characteristics of a country which might have a probability to default in servicing its debt obligation. In addition to this analysis the purpose of this study is to find an **index** or **indicator** of the likelihood that a certain country will experience debt servicing difficulties. The indicator should be relatively simple, and should have a higher degree of predictability.

H. Statement Of The Problem

What is the quality of the post-sample predictions generated by the selected multivariate statistical model for sovereign risk analysis.

CHAPTER II

REVIEW OF LITERATURE

A. INTRODUCTION

It is only in recent years that the theoretical literature of Sovereign Risk has begun to pay its significant attention. This chapter will provide a back ground to sovereign risk so that the following chapters could be understood.

B. Subjective Analysis

Before the 1980s, most forecasting of debt service capacity (DSC) had relied on subjective evaluation of related factors. That is, the analysis of the likelihood of rescheduling was necessarily performed on the basis of subjective, nonquantifiable perceptions. Though, it was felt that such assessments should be supplemented by data-based indicators.

Many international banks adopted creditworthiness systems where a host of relevant statistics were considered. These indicators were assigned a score, and a subjective weighting of the scores was used as debt servicing capacity index. Banks desired to rate countries according to its riskiness of default. Hence, some banks developed checklists system consisting of quantifiable variables on which countries are rated.

A system used by First National Bank Of Boston described by Thorneblade, "contains a large number of relevant indicators with respect to each of which countries are ranked one through n, hence, ordering country risk by getting a simple average of the scores on the various indicators."[1] A major deficiency is the absence of any weighing scheme; i.e., all indicators were assumed of equal importance.

Another less objective system employed by the Bank Of Monterial was that risk analysis consists basically of two parts. "The first part tries to quantify the maximum possible loss in each of the years after the proposal loan is granted, and the second part is a detailed analysis of political and economic characteristics including the evaluation of the likelihood of the different types of debt-servicing problem, and the probable time of occurrence."[2] But the system was widely subjective, requiring staff with wide experience and scarce skills.

C. Country Reporting

Every creditor studies the situation of a

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[1]. McDonald, Donogh, "Debt Capacity and Developing country Borrowing: A Survey of Literature." IMF Staff Papers, (Aug. 19820), p.617.

[2]. Ibid, p.617

borrowing country requesting a sovereign loan, hence requiring a country report. The country report writer submits an informed report that helps the credit committee to make its decisions regarding the supply of sovereign loan.

When a borrowing country approaches a creditor usually a bank - for sovereign lending, they ask their country report writers to produce a "Country Spread Sheet" and an economic survey on the borrowing country. Each bank has its own spread sheet, with different components. A typical spread sheet is shown in table (I).

The spread sheet employs variables that aims at three indications: the size of the economy, the real growth rate of the economy, and the inflationary indicators.

Part(A) explains domestic indicators that provide information on domestic economic policies and objectives. Such indicators are:

- Real GDP growth rate & GDP per capita : give information on how well the population was doing in terms of standard of living.
- Share of Investment in National Income: A country with a declining share must be a source of concern, i.e., external capital is not used solely for investment but also for consumption.

TABLE ONE

A 'typical' country spread sheet (continued)

NAME OF COUNTRY

Currency US$ Billion	Annual Figures	Quarterly Figures
A. DOMESTIC ECONOMIC INDICATORS		
1. Size of Economy		
1.1. Population (millions)		
1.2. Population Growth (%)		
1.3. GDP ($ billions)		
1.4. GDP per head ($)		
2. Growth of Economy (at Constant Prices)		
2.1. GDP Growth %		
2.2. GDP per head growth %		
2.3. Unemployment (%)		
3. Inflationary Indicators		
3.1. Consumer Price Index Growth %		
3.2. Money Supply Growth %		
3.3 Budget Deficit ( ) or Surplus as % of GDP		
4. Exchange Rate		
4.1. Exchange Rate to US$ (End Year)		
B. BALANCE OF PAYMENTS		
1. Export of Goods		
of which % (a)		
(b)		
(c)		
2. Import of goods		
3. TRADE BALANCE		
4. Exports of Invisibles and Services		
5. Imports of Invisibles and Services		
6. INVISIBLES BALANCE		
7. NET TRANSFERS		
8. CURRENT BALANCE (B3 + B6 + B7)		
9. Long Term Capital (plus Investment Flows)		
10. Short Term Capital		
11. CAPITAL ACCOUNT (B8 + B10)		
12. CURRENT AND CAPITAL BALANCE (B8 + B11)		
13. ERRORS AND OMISSIONS		
14. CHANGE IN RESERVES (B12 + B13)		

NAME OF COUNTRY

Currency US$ Billion	Annual Figures	Quarterly Figures
C. FOREIGN ASSETS (END PERIOD)		
1. International Reserves		
2. Unutilised IMF Credit		
3. Other Foreign Assets		
4 TOTAL		
D DEBT STRUCTURE (END PERIOD)		
1 External Debt		
(a) of which Public Debt		
(b) Private Debt		
(c) and of which Under 1 Year		
(d) Over 1 Year		
3		
4.		
E GROSS NEW DEBT		
1 International Loans – Public		
2. – Private		
3. TOTAL		
F DEBT INDICATORS		
1 Debt Service Payments		
2. Total Exports (B1 – B4)		
3 Debt Service Ratio (F1 x 100 ÷ F2)		
4 Debt % GDP (D1 x 100 ÷ A1.3)		
5 Debt % Exports (D1 x 100 ÷ F2)		
6 Foreign Assets % External Debt (C5 x 100 ÷ D1)		
7 ditto % Short Term Debt (C5 x 100 ÷ D1c)		
8 ditto % Imports (C5 x 100 ÷ (B2 – B5))		

- Consumer Price Index: provides an idea about inflation, i.e., if the growth rate in money supply is greater than the growth rate in GNP.
- The Budget Deficit as a percentage of GNP: is an important indicator regarding the degree of expansionery fiscal policy in the economy.
- Finally, The Unemployment Rate: gives a measure of the degree of potential unrest.

Part (B) presents items of the Balance Of Payments. Items 1 to 6 measure the Degree of Openness of the economy, the degree to which an economy is dependent on the world trade and its subjectivity to world economic shocks. A good shape economy would, of course, have its exports greater than its imports. Items 7 to 12 represent the External Indicators that provide indications on the vulnerability of the economy to change in the fortunes of the world economy.

The next part of the spread sheet is divided into four parts: Foreign Assets (C); Debt Structure (D); Gross New Debt (E); Debt Indicators (F). These parts indicate the "Creditworthiness" of the borrowing country. This section of the spread sheet would report the following:

- The Growth rate in External Public or Publicly Guaranteed Disbursed Debt Outstanding. This may be

obtained from the World Bank's World Debt Tables (WDT) and the International Monetary Fund (IFS).

- The Percentage Change in The Terms Of Trade (TOT) and LIBOR. These two variables give an idea about the ability of the country to service its external debt "A serious deterioration on the TOT at a time when interest rate are rising rapidly will make the servicing of debt more difficult."[3]

- The Percentage of Disbursed Debt Subject to Variable Rates Of Interest. Countries with low proportions of external debt subject to variable rate of interest were protected from the severe rise in interest rate during the 1970s, such as India and Isreal.

- Debt Related Ratios. Such as :

1- The Debt Service Ratio and The Ratio of External Debt to Exports. The DSR tends to identify sudden short term problems, while the other is an indicator of problems over a long term.

2- Capital Inflows as a Percentage of Debt Service. It provides information on short-trem and long-term capital inflows that do not relate to the debt-servicing requirement of the country.

3- The Ratio of Reserves to Imports of goods and

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[3].Heffernan, Shelagh A, Sovereign Risk Analysis (London, 1986), p.133.

services. It provides an indication of the short-term liquidity problems.

C. Statistical Models:

1- Discriminant Analysis

A more satisfactory method would contain relevant indicators using weights based on statistical analysis of data generated by borrowing countries.

The first study following such an approach was the discriminant analysis reported by **Frank** and **Cline** (1971). "The data included 13 rescheduling cases in 8 countries and 132 non-rescheduling in 18 countries."[4] Frank and Cline found that out of 8 variables only three variables - The debt service ratio, the amortization ratio, and the ratio of imports to reserves - were statistically significant. Their results were "17 type **II** errors and 1 type **I** error. They found a two variable linear discriminant function with the DSR and A/R as the explanatory variables to be the best function. They did use their final estimating equation to make predictions to future rescheduling"[5]

Taffler and Abassi (1984) also employed the discriminant model to analyse sovereign risk.

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[4].Ibid, p.44
[5].Ibid, p.44

"Annual observations from 95 countries for 42 economic variables were collected. Their final linear discriminant function contained only 4 explanatory variables that had the right sign and were statistically significant. Of the four variables, they found that debt/exports and commitment per capita were more important as contributors to the model's performance than the other two monetary variables: the inflation rate, and the ratio of domestic credit to GDP."[6]

It was the only study that found that the commitment per capita variable statistically significant. The type **I** and type **II** errors were 10% and 8.9% of their respective population. The predictive ability of the model was tested using a five year period, 1970 to 1983.

Sargen employed the same technique as **Frank** and **Cline**, with a main difference in the inclusion of monetary indicators such as the inflation rate, the growth rate of money supply, the deviations from purchasing power parity, and the growth rate of exports. "This inclusion is relevant to the extent that poor economic management lies behind debt crisis. His final discriminant rule includes the interest rate, the growth rate of money supply,

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[6]. Ibid, p.45.

deviations for purchasing power parity, debt service ratio, and the growth rate of exports. While his type I and II error rates are not as low as those Frank and Cline. They are not directly comparable, since Sargen covers a larger sample period."[7]

'While the use of discriminant analysis has been a major contribution to the development of the literature in this area, its use is subject to reservations. Although discriminant analysis was designed for discrete dependent variable analysis, it assumes that the existence of distinct classes of countries with discriminant rule being used to assign countries to one of possible classes. So, the weakness of discriminant analysis is the absence of any behavioral underpinning.'"

2- Logit Analysis

Logit analysis differs from discriminant analysis in the sense that it doesn't classify countries into classes based on the values of certain economic variables. The logit approach assumes that the combined effects of certain economic variables will

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[7].Sargen, Nicolas, "Economic Indicators and Country Risk Appraisal", Economic Review, (Fall 1977), p.23.

". McDonald, Donogh, "Debt Capacity and Developing country Borrowing: A Survey of Literature." IMF Staff Papers, (Aug. 1982), p.621.

serve to push the country from being in the no rescheduling group to being in the rescheduling group or vice versa.

Logit analysis deal with cases of Binary (on/off) Events, where the event is a dependent variable. Examples of the problem include using data to estimate the probability of whether or not to take a certain degree course. In sovereign risk analysis, the binary classification for the country is whether or not a country reschedules - data are used to estimate this probability.

Feder and **Just** (1982) utilized logit analysis to relate a set of economic indicators to the probability of debt rescheduling. This model was designed to relate choice probability to a model of behavior to the underlying attributes of the alternatives and decision maker; thus, it seems more appropriate for analyzing debt-service problems.

Moreover, they consider the following variables which proved to be statistically significant: "the ratio of debt service to exports per capita GNP, ratio of imports to reserves, average rate of export growth, and the ratio of capital inflows to debt service. With a cut-off rate of 40%, the in-sample error rate were approximately 5% for type **I** error, and 2.5% for type

II errors."[8]

In 1981, Feder, Just, and Ross continued this work with a principal adjustment in the definition of the dependent variables. They added the list of renegotiation cases with some instances of serious arrears taken from the World Bank files. They also, excluded renegotiations that were identified as having occurred in circumstances of no great economic stingency and that were primarily a means of giving aid. The list of explanatory variables was also altered. For a cut-off probability of 10%, error rates of type I and type II errors were both 8%.[9]

Another study of logit analysis was done by U.S. Export-Import Bank (1978). The Mayo-Barret estimates use export-import bank data and a different set of economic indicators; including percentage change in the Consumer Price Index, Investment/GDP ratio, Imports/GDP ratio, and the ratio of outstanding debt to exports. The attempt at innovation was to relate the probabilities of default within the succeeding

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8. Fedder, Gershon,"A Study of Debt Servicing Capacity Applying Logit Analysis", Journal of Development Economics, Vol.4. (March 1877), p.34.

9. "Projecting Debt Servicing Capacity of Developing Countries", Journal of Financial and Quantitative Analysis, Vol.16. (December 1981), p.661-662.

five years to the explanatory variables.[10]

In 1984, Cline made a study on the supply and demand of sovereign loans using logit analysis. He began by identifying the variables that affect the supply and demand for rescheduling. On the Demand side of rescheduling, Cline identified the DSR, Foreign reserves/imports, Per capita economic growth, Per capita income, and the Current account deficit/exports of goods and services. As for the supply side, he employed the DSR, Net debt/exports of goods and services, Amortization/debt, Per capita income, Domestic savings/GNP, Export growth rate, and world credit supply.

Cline believed that the supply of rescheduling can be estimated by observing the behavior of the developed economies' supply curve of the foreign credit. He argued that any variable that reduces the supply curve of foreign credit increases the probability that a disequilibrium will arise in the international credit markets, this is because the foreign credit supply curve is being shifted to the left. This increased probability of a disequilibrium will increase the probability of rescheduling.

'Cline argued that the more the supply of credit

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[10]. Mayo, Alice, and Anthony Barret, An Early Warning Model for Assessing Developing-Country Risk, Ch.12, (N,Y 1978), p.83.

is, the higher the rate of amortization to debt because total debt will be lower. Hence, this variable and the probability of rescheduling are inversely related. But this arguement contrasted Frank and Cline (1971) use of this variable on the demand side of rescheduling. Frank and Cline argued that the higher the ratio, the lower the probability of rescheduling, because the average maturity of debt was lower. Cline's arguement seemed more intuitively appealing, but the arguement holds at a constant DSR.'"

From Cline's review of the supply and demand of sovereign loans, he estimated one reduced form equation for the probability of rescheduling, rather than separate equations for demand and supply.

What is needed is a more general framework of sovereign lending and borrowing which can be used to identify the key determinants of the demand and supply of sovereign loans. Only then will it be possible to identify the factors contributing to the riskiness of a sovereign loan.

Many other authors admit that the explanatory variables in the preceding discriminant and logit

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". Heffernan, Shelagh A, Sovereign Risk Analysis (London, 1986), p.40.

analysis were introduced in a very ad-hoc way. Thus the studies based on no underlying theory of why a country follows this course of action or not. Hence some variables would be hard to interpret.

3. Consumption Model

In 1980, Feder presented another model which considers an income specification for consumption and expresses the target in terms of Gross National Product (GNP). This model shows that if the marginal product of capital exceeds the marginal cost of borrowing, problems of debt sustainability do not arise. If the investment ratio required by the target growth rate is less than the marginal savings rate, debt will eventually begin to decline and the country will become a creditor.

In the next group of models, this study will show how economic characteristics can lead to the consumption plans that are excessive, relative to income.

4. NeoClassical growth models

The Harrod-Domer model emphasizes that external finance is always seen as a source of increased resources for investment, and, hence, growth. It was

the first attempt to put the role of external finance in a growth model framework. Their direct focus has been on how debt situations evolved over time.

In 1981, **Kharas** adopted the Harrod-Domer framework but it focused on situations in which foreign borrowing was carried out by the government to assist in financing domestic expenditure plans. Hence, "for a debt situation to be sustainable, it is necessary that the tax base should be expanded quickly enough to allow the government to service its debt. Thus, low private savings behavior can be a source of debt problems in situations in which governments face such fiscal constraints.[11]

Other studies have models that follow a similar theme but with a flexible neoclassical production structure. In **Katz**(1982), it can be seen how fiscal constraints and low savings behavior can be a source of debt problems and how they can exacerbate the impact of external shocks, such as deterioration in the terms of finance.

"Other studies showed that with low savings rate, consumption can exceed income, therefore giving rise to the possibility of debt problem independent of the

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[11]. Kharas, Homi, "The Analysis of long run Creditworthiness: Theory and Practice", World Bank Domestic Finance study No. 73, (July 1981), p.7.

efficiency of investment."[12]

5. Non-Optimizing Neoclassical Growth Models

Non-optimizing neoclassical growth models emphasizes the analysis of debt dynamics in conditions that do not give rise to explosive debt situations. "Katz constructed a one-sector model with a second imported good and examined how the economy, and in particular debt, responds to changes in the terms of trade."[13]

Fischer and Frenkel analysed the dynamics of debt in two-sector non-optimizing model. The focus here is to see how the path of the economy relates to parameter values and initial conditions, and what circumstances will generate scenarios that are consistent with stage theories of the balance of payments. It is interesting to note, such that the sector producing capital goods is more labor intensive than that producing consumption goods, that explosive debt situations do not arise: consumption is a function of income, and there is no credit rationing in the international financial markets.[14]

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12. McDonald, Donogh, "Debt Capacity and Developing country Borrowing: A Survey of Literature." IMF Staff Papers, (aug. 1982), p.608.

13. Ibid, p.609

14. Fischer, Stanely, and Jacob Frenkel, "Investment: The Two-Sector Model and Trade in Debt and Capacity Goods", Journal of International Economics, Vol.2, (August 1972), p.212.

Now, how much a country should borrow? Bardhan (1967) and Hamada (1969) gave examples of such models. "An intertemporal utility function is maximized in the framework of a one sector neo-classical growth model. The optimal path for the economy is derived for a specified supply function of external finance. In the steady state, the marginal cost of foreign borrowing will be equated to the marginal productivity of capital giving the intersection point of which the optimal quality of debt."[15]

Numerous variations of these models exist in the literature. Hausson, Feder, and Just look at how borrower strategy affects borrowing costs through "CreditWorthiness" effects.

McCabe and Sibley model an economy subject to export revenue variability, and show how such a model gives a negative relationship between domestic savings and external finance, when exports decrease, savings decrease and foreign borrowing increase and vice versa.[16]

6. Debt Capacity Model

Foreign exchange shortages, also, can seriously

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[15]. McDonald, Donogh, "Debt Capacity and Developing country Borrowing: A Survey of Literature." IMF Staff Papers, (Aug. 1982), p.609.

[16]. McCabe,James L., and David, S.Sibley, "Optimal Foereign Debt Accumulation With Export Revenue Uncertainty", International Economic Review, Vol.17, (October 76), p.681.

inhibit development programs. In this context, attention was focused on the external performance of the economy in relation to the debt service claims on it. If an economy were subjected to a liquidity squeeze, external finance is not forthcoming to enable it to get over temporary difficulties. One answer would be that when short-run factors have been responsible for debt-servicing difficulties, they often have been brought on by poor economic management.

The relationship between debt developments and export performance should be closely monitored. The country's borrowing indicator is the ratio of borrowing to exports, that is consistent with same long-term limit on the debt service ratio. So the growth of debt should be in parallel to growth of exports.

But what if the country can't borrow in the international financial market, this require a more concern regarding liquidity management. "Such countries have been most involved in commercially supplied external finance have had above average GDP and export growth rates."[17]

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[17]. Liemone, John E., "The growth of commercial banking lending to non-oil LDCs: Some analytical Issues", A Seminar presented on 25-30 of November, 1977), p.13.

capacity: fluctuating variables (exports, capital), offsetting variables (reserves, compensatory finance), and rigid variables (interest payments, amortization payments, and essential imports). The focus was on the following variables: amortization, interest, and exports-in the form of debt service ratio. But this model ignores the overall balance of payments and the terms under which countries refinance maturing debts.[18]

7. The Equilibrium Model

Equilibrium is defined by the intersection of the interest rate facing the country and the volume of aggregate indebtedness that together solve simultaneously the demand and the supply for credit. Such an equilibrium should be defined by given government policies. Once we trace the supply schedule, we can plot the corresponding demand schedule.

Nash equilibrium in loan contracts is the competitive equilibrium for the model under each assumption. Equilibrium will occur when no new loans can be offered which achieves non-negative expected profits, contingent upon the lender's information about total indebtedness, and is preferred by a

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[18]. McDonald, Donogh, "Debt Capacity and Developing country Borrowing: A Survey of Literature." IMF Staff Papers, (Aug. 1982), p.616.

borrower to the contracts offered.

This study will present this model under two assumptions. First of these, creditors are unable to observe the total amount of loans contracted by any debtor in a given period, they only know the amounts of loans they provide each borrower. Second, creditors observe the total lending to any borrower each period.

If the lender can't observe the total borrowing by a debtor each period, then the loan contracts can specify the interest rates and the size of the loan and not the total indebtedness of the borrower. Hence a lender can only know the probability of repayment when a borrower's excess demand for loans is non-positive at the market rate of interest.

"The demand curve for loans is derived by maximizing expected utility with respect both the probability of repayment and the quantity of loans for each period prior to a default, taking the rate of interest as given. So, the borrower will prefer to receive this size loan during every period until a state of nature is realized for which default is optimal at the given rate of interest to receiving a larger loan resulting in a higher optimal probability

of default and receipt of no future loans."[19]

Since default is possible, debtors will desire to borrow an amount of a given rate of interest which implies that the expected marginal utility of last unit of capital borrowed overstates of the world for which repayment occur is negative, hence, borrowers demand more capital than they would if default were impossible and if demand were satisfied, capital will be employed beyond the point of equality of its marginal productivity and marginal cost.

What if the lender can observe total indebtedness? if the lender can observe the total indebtedness at each period, "then loan contracts specifying the rate of interest to be paid as a function of total current borrowing are possible. Hence, competitive borrowers will only offer contracts with a non-negative expected profits. A competitive equilibrium will occur when no further can be offered to borrowers which achieves a non-negative expected profits and is chosen by the borrower over another contract already offered."[20]

The existence of a competitive equilibrium with observability of total non-current borrowing can be

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[19]. Aizenman, Joshua, "Country Risk, Incomplete Information and Taxes on International Borrowing", The Economic Journal, (March 1989), p.293.

[20]. Ibid, p.296

proven for model preferences over the probability of repayment and ranking contracts using the expected utility of contracts with the optimal choice of default behavior. "Thus the resulting function is continuous for continuous felicity and production functions, although capacity of these functions doesn't assure concavity of expected utility with optimal behavior."[21]

Because an equilibrium with observability is a contract which maximizes expected utility over the subset of contracts which expected profits are non-negative, "it cannot be Pareto-Dominated by an equilibrium without observability is a constrained optimum for both lenders and borrowers. That is, debtors make their optimal choice between repayments and default under the equilibrium loan contract in each state of nature. This is made ex post after the state is revealed."[22]

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[21]. Ibid, p.296.
[22]. Ibid, p.298.

CHAPTER III

PROCEDURE AND METHODOLOGY

This chapter will present the procedures and methodology that will be used in this study. It includes three sections: the population selected, the measurement of variables, and the conceptual framework for analyzing the data.

A. Population.

The population of this study consists of 75 countries with their corresponding available data for the year 1988. The main data sources about each country are the International Financial Statistics (IFS), Euromoney, and the Balance Of Payments (BOP). (See appendix A)

B. The selected variables and Their Measurements.

The data used in this study are mainly extracted from the IFS, Euromoney, and BOP annual statistics. Hence, 32 relevant variables could be extracted from the available data sources.

Not only variables mentioned in chapter II are considered, but also other variables not mentioned in chapter II are also included on logical basis.

Log and Sin transformation is applied to ratio variables to improve normality.

The variables are:

1. Gross National Product (GNP): (Euromoney Aug. 1990), It is an indicator of both economic development and social advancements of a country. It is Gross Domestic Product (GDP) plus Net Factor Income From Abroad.

2. GDP at constant prices: (IFS, 1988), It indicates the economic performance of a country. It is exports less: imports, private consumption, government consumption, gross fixed capital formation, and increase in stocks.

3. GDP per capita: (Euromoney Sept.1990), it is GDP divided by the population of the country, so that wealth distribution is indicated.

4. Exports of goods and services: (As in a.)

5. Imports of goods and services: (As in a.)

6. Current Account Balance: (As in a.), It is equal to the trade balance plus the balance on other goods, services, and income; private unrequited transfers; and official unrequited transfers.

7. Trade Balance: (as in b.), It is equal to merchandise exports f.o.b. minus merchandise imports f.o.b.

8. Capital Account: (as in b.)

9. Total debt: (as in a.), It includes public long-term debt, private nonguaranteed long-term debt, the use of IMF credit, and the estimated short-term debt.

10. Public/Publicly Guaranteed Debt: (as in a.), it is external debt of a public debtor plus obligations of a private debtor that is guaranteed for repayment by a public entity.

11. Private Nonguaranteed Debt: (as in a.), It is an external obligation of a private debtor not guaranteed by a public entity.

12. Debt Outstanding and Disbursed: (World Debt Tables 88-89), It is the total outstanding debt at the end of year.

13. Disbursements: (as in 1.), They are drawings on loan commitments during the year specified.

14. Principle Payments: (as in 1.)

15. Net flows: (as in 1.), are disbursements minus principal repayments

16. Interest Payments: (as in 1.), Interest may be in foreign currencies, goods or services in the year specified.

17. Total Debt Service: (as in 1.), It is principal plus interest payments.

18. Total reserves: (as in a. & b.)

19. Terms of Trade: (as in b.), are index numbers

computed from the export and import unit value index.

20. Interest Arrears: (as in a.)

21. Principal Rescheduled: (as in a.)

22. Interest Rescheduled: (as in a.)

23. Consumer Price Index percentage change: (as in a.), It is used as an indicator for inflation, and it reflects changes in the cost of acquiring a fixed basket of goods and services by the average consumer.

24. Money percentage change - M1: (as in b.), It is the percentage change in money supply i.e., M1.

25. Investment as percentage of GDP: (as in b.), It is the percentage share of investment in GDP at current market prices. Investment comprises Gross fixed capital formation and increase in stocks.

26. Errors and Omissions: (from the B.O.P)

27. Net Transfers: (as in z.)

28. Population: (Wheeler, December 1990)

29. Unemployment: (United Nations monthly statistical Bulletin, Aug.90)

30. Human Development Index: (U.N. WORLD DEVELOPMENT/ MAY, 1990), It is composed of three measures: Life Expectancy, Literacy, and Purchasing Power. This index was calculated on the basis of 1987 data for the first time in 1990.

31. Country Risk Ranking: (Euromoney september 1989), It includes three indicators:(1) Analytical

Indicators 40%; of which 15% political risk,10% economic risk,and 15% economic indicators;(2) Credit Indicators 20%; of which 15% payment record, and 5% ease of rescheduling; and (3) Market Indicators 40%; of which 15% to access to bond market, 10% to sell down on short-term paper, and 15% to access to, and discount available on.

32. Country risk rating: (as in ae.), same measures as country ranking but on a scale from 0-100. It helps in screening potential target countries based on yes or no type of decision.

"A one year lag is specified in this study on the assumption that D.S. payment interruption in year t occurs after decisions made near the end of year t-1"[1] this arguement stand for variables 12, 13, 14, 15, 16, and 17.

Ratios to be used also as variables:

Debt Service Ratio (DSR): it is principal payment plus interest divided by exports. It is a cashflow concept indicating the proportion of export-generated foreign exchange earnings taken up by D-S payments. Hence, countries with low DSR show greater tendency to default , and vise versa.

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[1]·Frank, Charles R., and William R. Cline, 'Measurement of Debt Service Capacity', Journal of International Economics, 1971, p.331.

Capital Inflows to D.S.: It is an indicator to the ability of a country to service its debt through inflow of direct investments, grants, transfer payments, and new loans.

Ratio of Imports to Reserves: Reserves include foreign exchange, gold, Special Drawing Rights (SDRs), and reserve position with the International Monetary Fund (IMF). It measures the country's ability to finance its short-term trade.

Amortization Ratio: A low value for this indicator suggests that a country has long-term debt liabilities. Hence, no short-term flexibility in reducing D.S. which leads to a bad reputation.

Ratio of DSR to Reserves: It is an indication of a country's short-term ability to meet its external obligations from its international reserves.

Ratio of DSR to GNP : IT measures the proportion of a country's total production of goods and services that goes toward D.S. payments.

Ratio of Reserves to GNP: This ratio gives an indication of liquidity.

Ratio of Current Account to exports ratio: It provides an indication of the country's new borrowing requirements in a given year.

Ratio of External Debt (EDT) to GNP: External debt equals to public/publicly guaranteed debt plus

private nonguaranteed debt. It is an indication of the size of a country's debt seen within a broader prospective of its total production of goods and services.

Ratio of EDT to reserves: This ratio is an indicator of the country's ability to provide liquid assets to meet its cummulated debt obligation.

Ratio of EDT to Exports: It measures a country's foreign exchange earnings against its accumulated foreign indebtedness.

Ratio of Exports to GNP: A high value of this ratio would lead to decrease the need for painful domestic adjustments, associating a large export sector with a low probability of rescheduling.

Ratio of Imports to GNP: A low ratio of Imports to GNP would indicate that a country is more likely to be able to withstand temporary import cuts.

C.Conceptual Framework For Analyzing The Data.

1- In order to know the relevant variables , the mean and variance of each variable will be computed.

2- To improve normality, Log and Sin transformation will be applied to ratios.

3- This research is going to use two statistical techniques to answer research questions posted in chapter I :

i. What are the major characteristics of the defaulting country?

ii. What are the major indicators for such default?

a. Percentage Analysis, as descriptive technique will be used to determine the major characteristics of the countries included in the study. (See appendix .A.)

b. Discriminant Analysis, as an analysis technique, will be used to determine the relative importance of the variables discriminating between countries with external debt but didn't reschedule their principal payment, and countries with external debt but rescheduled their principal payment.

The population, variables, and framework mentioned above and the results of this study will be shown in the following chapter entitled "Findings Of The Study".

CHAPTER IV

FINDINGS OF THE STUDY

The findings of this study, which employed a cross-sectional data for the year 1988, will be presented and discussed herein, under three major sections.

The first section describes the major characteristics of the selected countries. The second section analyzes the assumptions of normality and homogeneity of variance. The third section discusses the major findings of the discriminant analysis.

A. Major Characteristics Of The Selected Sample

The following discriminating variables characterizes the selected sample:

1. Gross National Product (GNP)
2. Population
3. Debt Service Ratio (DSR)
4. Ratio Of Imports to Reserves (IMP/RES)
5. Disbursements
6. Net Flows
7. Ratio Of External Debt to G.N.P. (EDT/GNP)
8. Ratio Of Exports to G.N.P. (EXP/GNP)
9. Ratio Of Imports to G.N.P. (IMP/GNP)
10. Ratio of External Debt to Reserves(EDT/RES)

1. G.N.P.

In determining the basic distributional characteristics of each of the variables in the study table (I) shows the economic activities of these countries revealing the dramatic broad range between the very poor country with a minimum GNP value of 25 and another country with a maximum GNP value of 372193. The median value for GNP 4462 indicates that

TABLE I

A DISTRIBUTION OF THE SELECTED GROUP OF COUNTRIES BY THEIR G.N.P (US$ MIL.)

G.N.P	F	%
25 =< GNP = 25207.325	58	77.30
25207.325< GNP =372193	17	22.70
	75	100.00

STATISTICS		
MEAN	MINIMUM	MAXIMUM
25207.325	25.000	372193.000
MEDIAN	KURTOSIS	SKEWNESS
4462.000	19.152	4.113

at most 50% of the countries have GNP of 442 and below. The measure of skewness 4.113 shows that most

of the countries (73.3%) are clustered to the right of the mean (25207.325). The measure of kurtosis (19.152) reveals that the GNP distribution is more peaked (narrow) that would be true for the normal curve.

2. Population

The population indicates the productivity savings, and consumption of a certain country.

TABLE II

A DISTRIBUTION OF THE SELECTED GROUP OF COUNTRIES BY THEIR POPULATION (MIL.)

POPULATION	F	%
0.11 =< POP = 43.635	63	84.00
43.635 < POP = 1084	12	16.00
	75	100.00

STATISTICS		
MEAN	MINIMUM	MAXIMUM
43.635	0.110	1083.890
MEDIAN	KURTOSIS	SKEWNESS
6.920	34.969	5.833

Table (II) presents the country distribution by their population with a range from a minimum of 0.11

to a maximum of 1084. The median value 6.92 indicates that at most 50% of the countries have a population of 6.92 and below. The population skewness (5.833) shows that 84% of the selected sample are distributed to the right of the mean (43.635). The kurtosis (34.969) is highly peaked with respect to the normal curve.

In comparing both the GNP and Population It could be concluded that the population of the selected sample is a consuming one rather than a productive one, hence, indicating poorness.

3. Debt Service Ratio

The rationale behind a country's debt service capacity is that an increase in DSR indicates increased vulnerability to foreign exchange crisis, hence, the higher the DSR, the greater is the relative burden on import reduction for a given shortfall in foreign exchange.

Table **(III)** shows that the selected sample lies in a wide range of a minimum of .02 and a max of 54.83. The median (0.16) indicates that 50% of the countries selected have a DSR above 16%. The skewness of the DSR(8.647) shows that 97.3% of the selected sample are clustered to the left of the mean (92.7%). The kurtosis is highly peaked (74.844) in comparison to the normal curve.

TABLE III

A DISTRIBUTION OF THE SELECTED GROUP OF COUNTRIES BY THEIR D S.R

D . S . R .	F	%
0.02 =< DSR = 00.927	73	97.30
0.927 < DSR = 54.83	2	2.60
	75	100.00

STATISTICS		
MEAN	MINIMUM	MAXIMUM
0.927	0.020	53.830
MEDIAN	KURTOSIS	SKEWNESS
0.160	74.844	8.647

4. Ratio of Imports to Reserves

Imports cause a negative flow of foreign exchange, a major part of international reserves. Hence, a high ratio of IMP/RES. indicates trouble.

Table (IV) indicates that the selected countries have a rang of IMP/RES ratio of a minimum of 0.68 and a maximum of 155.31. The median (4.83) shows that 50% of the selected countries are have an IMP/RES ratio of more than 4.83. Its skewness (4.323) reveals that 82.7% of the sample are distributed to the left of the mean (12.47). Its kurtosis (20.87) shows that it is highly peaked which is true for the normal

curve.

TABLE IV

A DISTRIBUTION OF THE SELECTED GROUP

OF COUNTRIES B THEIR IMP /RES

IMP / RES	F	%
1.00 =< I/R = 1.24	62	76.00
1.24 < I/R = 2.00	13	24.00
	75	100.00

STATISTICS		
MEAN	MINIMUM	MAXIMUM
12.471	0.680	155.310
MEDIAN	KURTOSIS	SKEWNESS
4.830	20.870	4.323

5. Disbursements

An increase in disbursements means that total debt is increasing, thus, as debt increases, the burden of debt servicing increases.

TABLE (V) Presents the disbursements of the selected sample showing that it has a range of a minimum of 0.52 and a maximum of 8550 with a median of 265 . Its skewness (2.675) shows that 76% of the selected sample lie to the left of the sample mean (959.599). The kurtosis (7.09) is logically peaked

with respect to the normal distribution curve.

TABLE V

A DISTRIBUTION OF THE SELECTED GROUP

OF COUNTRIES BY THEIR DISBURSEMENTS(IN MIL.$)

DISBURSEMENTS	F	%
0.52 =< DISB = 959.599	57	76.00
959.599 < DISB = 8550	18	24.00
	75	100.00

STATISTICS		
MEAN	MINIMUM	MAXIMUM
959.599	0.520	8550.000
MEDIAN	KURTOSIS	SKEWNESS
265.000	7.090	2.675

6. Net Flows

Net flows are considered the main source of foreign exchange currency for a country, hence improving the chances for a proper debt servicing and self development.

Table (VI) shows that the selected sample have a range between 8703 and 4217. It has a median of 96 and a negatively skewness to the right (-3.701) hence, 34.7% of the countries have above average of (194.049) net flows. The kurtosis (31.698) is highly peaked, that's true for the normal

distribution curve.

TABLE VI

A DISTRIBUTION OF THE SELECTED GROUP

OF COUNTRIES BY THEIR NET FLOWS (IN MIL.$)

NET FLOWS	F	%
-8703=< N.F =194.049	49	65.30
194.049 < N.F = 4217	26	34.70
	75	100.00

STATISTICS		
MEAN	MINIMUM	MAXIMUM
194.049	-8703.000	4217.000
MEDIAN	KURTOSIS	SKEWNESS
96.000	31.798	-3.701

7. Ratio Of External Debt To GNP

A healthy economy tends to have a low EDT/GNP. As a country's productivity increases, foreign exchange currencies increases, hence, the debt servicing process is more smooth.

Table (VII) presents the wide range between a minimum EDT/GNP ratio of 0.05 and a maximum of 485.92 which reveals the dramatic high indebtedness of the selected countries. The selected sample have a median of 0.53 but with a skewness of 8.665 which indicates that 98.7% of the sample are clustered to the left of

the mean (7.221). The measure of kurtosis (74.979) shows that the ratio of EDT/GNP distribution is very highly peaked which is very logical with respect to the normal distribution curve.

TABLE VII

A DISTRIBUTION OF THE SELECTED GROUP

OF COUNTRIES BY THEIR EDT / GNP

EDT / GNP	F	%
0.05 =< E/G = 7.221	74	98.70
7.221 < E/G = 485.92	1	1.30
	75	100.00

STATISTICS		
MEAN	MINIMUM	MAXIMUM
7.221	0.050	485.920
MEDIAN	KURTOSIS	SKEWNESS
0.530	74.979	8.658

8. Ratio Of Exports TO GNP

The EXP/GNP ratio indicates how much exports contribute to the GNP, hence, indicating the type of economy of the country. Thus, a low EXP/GNP ratio means that the economy is not productive enough to increase its exports leading to an increase in foreign currency but tends to be more dependent on imports.

TABLE VIII

A DISTRIBUTION OF THE SELECTED GROUP

OF COUNTRIES BY THEIR EXP / GNP

EXP / GNP	F	%
0.06 =< E/G = 1.413	44	58.70
1.413 < E/G = 1.550	31	41.30
	75	100.00

STATISTICS		
MEAN	MINIMUM	MAXIMUM
0.380	0.060	1.550
MEDIAN	KURTOSIS	SKEWNESS
0.280	3.279	1.569

Table VII shows the close range among the selected countries in respect to the EXP/GNP ratio with a minimum of 0.06 and a maximum of 1.55, This reveals that the economies of the selected countries are closely alike. The skewness 1.569 reveals that the sample is approximately normal,The measure of kurtosis (3.279) shows that the distribution is slightly higher than the normal distribution curve.

9. Ratio Of IMPORTS to GNP

A country with a high imports of intermediate inputs relative to GNP will find its production much

more seriously threatened by in ability to import them. In sum, the higher the IMP/GNP ratio, the more likely a country is to default.

The sample selected in this study tends to have a less productive economy relative to its population.

Table (IX) reveals the close range between the selected sample of a minimum 0.11 and a maximum of 1.3 which also indicates the similar type of economy among the selected group sample. The sample have a

TABLE IX

A DISTRIBUTION OF THE SELECTED GROUP OF COUNTRIES BY THEIR IMP / GNP

IMP / GNP	F	%
0.110=< I/G = 0.471	46	61.30
0.471 < E/G = 1.300	29	38.70
	75	100.00

STATISTICS		
MEAN	MINIMUM	MAXIMUM
0.471	0.110	1.300
MEDIAN	KURTOSIS	SKEWNESS
0.380	0.492	1.046

median of 0.38 of IMP/GNP ratio with a skewness of

1.046 which means that 61.3% of the sample are distributed to the left of the mean (0.471). The kurtosis (0.492) shows that the sample distribution is slightly above the normal distribution.

10.Ratio of External Debt To Reserves.

External debt is an out flow for a country, while reserves including transfers, mainly in foreign currency, is considered the main source of inflow. Hence, a high EDT/RES. ratio signals that a country would be unable to service its debt indicating a default situation.

TABLE X

A DISTRIBUTION OF THE SELECTED GROUP

OF COUNTRIES BY THEIR EDT / RES

EDT / RES	F	%
0.22 =< E/R = 176.855	72	96.00
176.86< E/R = 11254.67	3	4.00
	75	100.00

STATISTICS		
MEAN	MINIMUM	MAXIMUM
176.855	0.220	111254.670
MEDIAN	KURTOSIS	SKEWNESS
8.730	74.466	8.616

Table (X) shows the wide range that the selected sample lie-in with a minimum of 0.22 and a maximum of 11254.67. the median of the sample is 8.730 with skewness of 8.616. which indicates that 96% of the population are clustered to the left of the mean (176.855). Hence, the high kurtosis (74.466) is quite logically peaked with respect to the normal distribution curve.

Table XI

The range, variance, skewness, and kurtosis of the significant variables before the Log and Sin transformation

Variables	Mean	Variance	skewness	kurtosis
D S R	0.93	39.83	8.65	74.84
IMP / RES	12.47	583.85	4.32	20.00
Net Flows	194.05	1680332.95	-3.70	31.70
Populatn	43.64	24210.76	43.97	5.83
Disburs.	959.60	2886634.88	2.67	7.09
EDT / GNP	7.22	3313.93	8.66	74.98
IMP / GNP	0.47	0.08	1.05	0.49
EXP / GNP	0.38	0.08	1.57	3.28
EDT / RES	176.85	1686533.60	8.62	74.47

B. Assumptions Of Normality and Homogeneity Of Variance

The effectiveness of groupings for discriminant analysis and the accuracy of the classification that result from applying discriminant analysis are sensitive to the assumption that the predictive variables constitute a multivariate normal population.

Log and Sin transformation are applied to variables to deal with the skewness and kurtosis. Table (XI) and table (XII) show the mean, variance, skewness, and Kurtosis for the discriminating variables before and after transformation.

Table XII

The range, variance, skewness, and kurtosis of the significant variables after the Log and Sin transformation

Variables	Mean	Variance	skewness	kurtosis
D S R	0.17	0.04	-1.66	19.48
IMP / RES	-0.05	0.56	0.12	-1.62
Net Flows	0.06	0.52	-0.08	-1.58
Populatn	0.10	0.52	-0.29	-1.47
Disburs.	-0.14	0.52	0.27	-1.50
EDT / GNP	0.52	0.07	-0.41	1.16
IMP / GNP	-0.40	0.07	0.01	-0.70
EXP / GNP	0.35	0.05	0.87	0.01
EDT / RES	-0.05	0.51	0.16	-1.47

By inspecting tables (XI) and (XII), it is evident that after the Log and Sin transformation, the transformed variables have a better mean and variance. Their measures of skewness and kurtosis became also better. Therefore, ten variables have been adopted for the study.

C. Discriminant Analysis

The chief concern of this study is to classify the sample countries into two groups. Hence, since there are only two groupings, only one discriminant function is possible.

Table (XIII)

Standardized Canonical Discriminant

Function Coefficients.

	FUNC 1
G N P	0.20882
D S R	0.29368
IMP /RES.	0.26551
NET FLOWS	0.43426
POPULATION	0.50476
DISBURS.	-0.60088
EDT / GNP	-0.55905
IMP / GNP	0.81709
EXP / GNP	-1.05443
EDT / RES	-0.55905

Standardized coefficients of this function and the significant canonical correlation are shown in table **(XIII)**.

Since the magnitudes of the standardized coefficients are indicators of the relative importance of variables, the variables with large coefficients contributes more to the overall discriminant function as shown in table **(XIII)**.

Table XIV

Canonical discriminant Function

FCN	EIGEN VALUE	PCT OF VARIANCE	CUM PCT	CANONICAL CORR.
1*	0.85	100	100	.678
AFTER WILK'S				
FCN	LAMBDA	CHISQUARE	DF	SIG.
1	0.54	41.87	10	.0000
* marks the 1 canonical discriminant function in the analysis.				

Table **(XIV)** reports the eign value and associated canonical correlation denoting the relative ability of the function to separate the selected population into two groups. The low value for the wilk's lambda is associated with significant chi-square indicating that great discriminating power exists in the discriminated variables.

Table (XV) presents the actual predicted group membership.

Table (XV)

Actual Predicted Group Membership

Case Number	Actual Group		Highest Group	Probability P(D/G)	P(G/D)	2nd Highest Group	P(G/D)	Discr. Scores.
1	2		2	.5502	.6603	1	.3397	-.0851
2	2		2	.4517	.5916	1	.4084	.0701
3	2		2	.2360	.9828	1	.0172	-1.8677
4	2		2	.3988	.5492	1	.4508	.1612
5	2		2	.5327	.6490	1	.3510	-.0587
6	2	**	1	.3845	.5370	2	.4630	.3437
7	1		1	.2203	.9840	2	.0160	2.4391
8	2		2	.1512	.9892	1	.0108	-2.1177
9	2		2	.5996	.6904	1	.3096	-.1575
10	2		2	.5203	.9533	1	.0467	-1.3254
11	1		1	.8701	.8157	2	.1843	1.0498
12	1		1	.2497	.9817	2	.0183	2.3645
13	2		2	.1427	.9898	1	.0102	-2.1484
14	2		2	.8211	.7972	1	.2028	-.4564
15	2	**	1	.8804	.8892	2	.1108	1.3640
16	1		1	.1433	.9898	2	.0102	2.6770
17	2	**	1	.6300	.9377	2	.0623	1.6951
18	1		1	.5073	.9550	2	.0450	1.8766
19	2		2	.8690	.8153	1	.1847	-.5177
20	1		1	.9091	.8293	2	.1707	1.0992
21	1		1	.8712	.8161	2	.1839	1.0513

Table (XV) (CONT.)

Actual Predicted Group Membership

Case Number	Actual Group		Highest Group	P(D/G)	P(G/D)	2nd Group	P(G/D)	Discr Scores
22	1		1	.6309	.9375	2	.0625	1.6938
23	2		2	.8097	.9050	1	.0950	-.9234
24	2	**	1	.5399	.6537	2	.3463	.6005
25	1		1	.5539	.9488	2	.0512	1.8054
26	1		1	.8180	.9032	2	.0968	1.4435
27	2		2	.9825	.8527	1	.1473	-.6606
28	2		2	.9997	.8577	1	.1423	-.6821
29	1		1	.7527	.9164	2	.0836	1.5285
30	1		1	.7769	.7790	2	.2210	.9300
31	2		2	.6789	.9297	1	.0703	-1.0966
32	2		2	.6127	.9403	1	.0597	-1.1888
33	2		2	.3216	.9753	1	.0247	-1.6738
34	2		2	.3937	.9682	1	.0318	-1.5355
35	1		1	.4846	.9578	2	.0422	1.9123
36	2		2	.4178	.5649	1	.4351	.1277
37	2	**	1	.9339	.8760	2	.1240	1.2964
38	2		2	.0610	.9953	1	.0047	-2.5558
39	2		2	.9308	.8767	1	.1233	-.7693
40	1		1	.6209	.7026	2	.2974	.7189
41	2		2	.1817	.9870	1	.0130	-2.0180
42	1		1	.2555	.9812	2	.0188	2.3506
43	2		2	.6296	.7074	1	.2926	-.2003

Table (XV) (CONT.)

Actual Predicted Group Membership

Case Number	Actual Group	Highest Group	P(D/G)	P(G/D)	2nd Highest Group	P(G/D)	Discr. Scores
44	1	1	.7403	.7629	2	.2371	.8819
45	1	1	.3880	.5401	2	.4599	.3502
46	2	2	.9429	.8736	1	.1264	-.7541
47	1	1	.1898	.9864	2	.0136	2.5245
48	1	1	.9550	.8443	2	.1557	1.1570
49	2	2	.6741	.7311	1	.2689	-.2620
50	2	2	.5314	.6481	1	.3519	-.0568
51	2	2	.9984	.8583	1	.1417	-.6846
52	2	2	.3907	.5424	1	.4576	.1757
53	2	2	.1730	.9876	1	.0124	-2.0452
54	2	2	.8207	.7970	1	.2030	-.4559
55	1	1	.6896	.7389	2	.2611	.8141
56	2	2	.7424	.7639	1	.2361	-.3539
57	2	2	.3863	.9689	1	.0311	-1.5488
58	2	2	.9555	.8703	1	.1297	-.7384
59	2	2	.3054	.9768	1	.0232	-1.7074
60	2	2	.9413	.8399	1	.1601	-.6089
61	2	2	.1623	.9884	1	.0116	-2.0799
62	2	2	.7659	.7743	1	.2257	-.3849
63	2	2	.3265	.9749	1	.0251	-1.6638
64	1	1	.7330	.7596	2	.2404	.8723
65	1	1	.5162	.6380	2	.3620	.5643

Table (XV) (CONT.)

Actual Predicted Group Membership

Case Number	Actual Group		Highest Group	P(D/G)	P(G/D)	2nd Highest Group	P(G/D)	Discr Scores
66	2		2	.6281	.9380	1	.0620	-1.1670
67	2		2	.7091	.7484	1	.2516	-.3094
68	1		1	.4246	.5704	2	.4296	.4149
69	1	**	2	.8359	.8029	1	.1971	-.4755
70	2		2	.7863	.9098	1	.0902	-.9537
71	1		1	.7156	.7515	2	.2485	.8491
72	2		2	.2114	.9847	1	.0153	-1.9322
73	1	**	2	.1758	.9874	1	.0126	-2.0362
74	2	**	1	.9481	.8421	2	.1579	1.1484
75	1		1	.4889	.9573	2	.0427	1.9055

TABLE (XVI)
CLASSIFICATION RESULTS

Actual Group	No. of Cases	Predicted Group Memrship	
		1	2
1	27	92.6%	7.4%
2	48	12.5%	87.5%

Percent of "grouped" cases correctly classified: 89.33%.

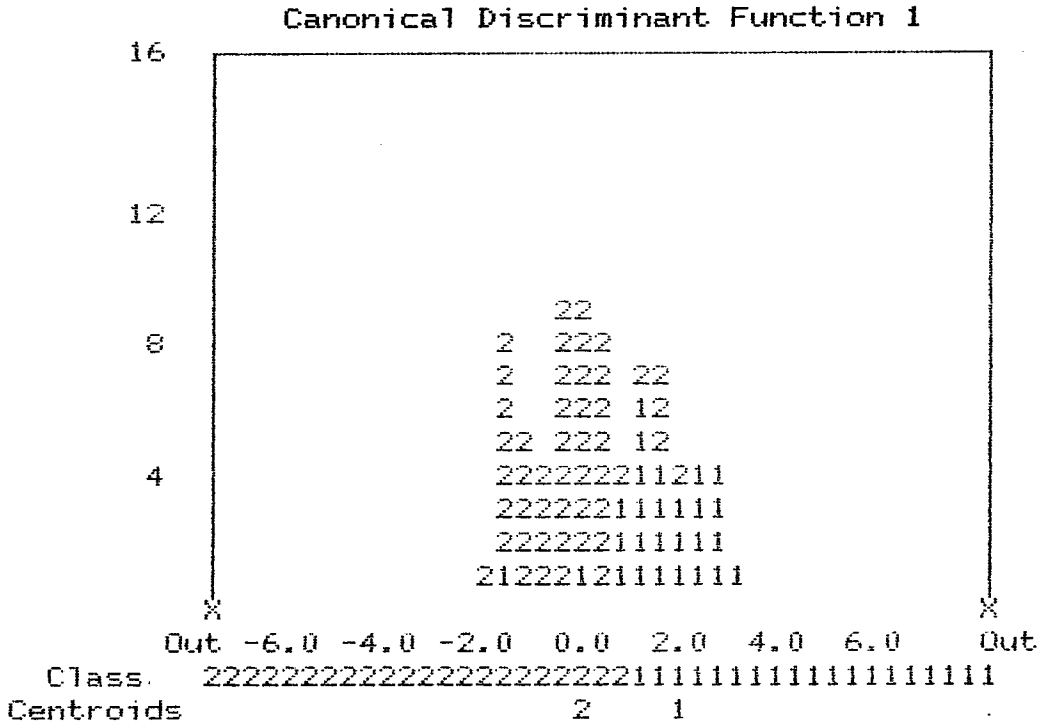
CLASSIFICATION PROCESSING SUMMARY
75 CASES WERE PROCESSED.
0 CASES WERE EXCLUDED
FOR MISSING OR OUT-OF-RANGE GROUP CODES.
75 CASES HAD AT LEAST ONE MISSING
DISCRIMINATING VARIABLE.
75 CASES WERE USED FOR PRINTED OUTPUT.

Table (XVI) presents the classification results. The classification matrix confirms that 89.33% of the countries are correctly classified.

Graph (I) displays the separation of the two groups.

GRAPH (I)

SEPARATION OF THE TWO GROUPS



The findings of this study are used in the last chapter to answer the research questions and to give some implications and recommendations.

CHAPTER V

SUMMARY AND CONCLUSIONS

A. Summary of the Answers to the Research Questions

This research tries to identify the major characteristics based on variable and ratio analysis of the selected sample of countries. Moreover, it tries to identify descriptive indicators of the likelihood that a certain country might experience debt servicing difficulties, and to classify them into two separate groups using discriminant analysis. Finally, a simple discriminant function is drawn to relate the dependent factor, principal rescheduled, and the other relevant independent variables.

The major characteristics of the selected countries based on 10 significant variables used in this research implies that the majority of the countries (73.3%) have a GNP below average (25207) 84% have population below 43.635 million. Where as 76% have disbursements between 0.52 and 959.6 million U.S.$.

Nearly ninty-seven percent of the sample have a DSR between 2% and 92%, 76% of the selected countries have an Imports to Reserves ratio between 100% and 124%, and 96% of the selected countries have a ratio of EDT/RES between 22% and 17685.5%

which indicates short-term default situations.

Approximately 65% of the selected countries have negative net flows between -8703 and 194 mil. U.S.$. But this study shows that these flows are mainly consumed and not saved as it will be seen.

More than 98% of the countries have a ratio of External debt to GNP average of 722.1%, 39% have a ratio of Imports to GNP above average of 47.1%, and 59% of the countries have an Exports to GNP ratio below average (141.3%).

From the above mentioned indicators, the selected countries have a good chance to undergo a debt servicing default and hence, seek rescheduling.

Another conclusion could be drawn is that the countries have a consuming economy than a productive one with respect to its population.

B. Implications

This study has a major achievement in adjusting the variables used in order to achieve normality and correct classification.

This study includes a considerable sample of countries in the sense that creditors would like to know the creditworthiness of its applicant for a loan. Hence, any country not included in this study could be classified into one of these two groups

mentioned in the analysis.

C. Recommendations

other countries couldn't be included in this study due to lack of data concerning the relevant variables indicated by this study. Hence, this study could be reconducted including other countries, especially developed countries, if data were available.

The political aspect was noticed by this study by employing the country risk rating and ranking, but was not taken in the analysis due to the lack of observations.

Variables such as, GDP per capita, Terms of Trade, and Consumer Price Index, were not included in the analysis also due to the unavailability of data. If such variables were available, additional results and characteristics could be noted.

The conclusion drawn from this study could be applied to different countries. Besides, it could be applied to the Gulf countries and to the European countries.

Finally, this advanced study in country risk analysis could be used as a predictive power for estimating country's strength, characteristics, economic policies, and creditworthiness.

APPENDIX .A.

POPULATION

ALGERIA	ARGENTINA	BAHAMAS
BANGLADESH	BARBADOS	BENIN
BOLIVIA	BOTSWANA	BURUNDI
CAMEROON	CENTR AFR.REP	CHILE
CHINA	COLOMBIA	COMOROS
CONGO	COSTA RICA	COTE D'IVOIRE
CYPRUS	DOMINICIAN REP.	ECUADOR
EGYPT	EL SALVADOR	ETHIOPIA
GABON	GAMBIA	GHANA
GRENADA	GUATEMALA	GUINEA BISSAU
GUYANA	HAITI	INDIA
INDONESIA	JAMAICA	JORDAN
KENYA	SOUTH KOREA	LESOTHO
MALAWI	MALAYSIA	MALI
MAURITIUS	MEXICO	MOROCCO
NEPAL	NICARAGUA	NIGER
NIGERIA	PAKISTAN	PANAMA
PAPUA NEW GUINEA	PARAGUAY	PERU
PHILIPPINES	RWANDA	SAO TOME
SEYCHELLES	SOLOMON ISLANDS	SRI LANKA
SWAZILAND	SYRIA	THAILAND

TOGO	TRINIDAD&TOB.	TUNISIA
TURKEY	UGANDA	URUGUAY
VANUATA	VENEZUELA	WESTERN SAMOA
YEMEN ARAB REP.	YEMEN PDR	ZAIRE

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