MANAGING SOVEREIGN LOANS: AN ANALYTICAL FRAMEWORK WITH EMPIRICAL APPLICATIONS FOR LATIN AMERICAN COUNTRIES

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Abstract

The motivation for this thesis began with observations of the debate in the media over the implications of the debt crisis, who was to blame and possible solutions. The terminology used (liquidity, solvency, default, repudiation, arrears, etc.) was not considered to be helpful in critically analysing the situation. Indeed, this terminology was likely to create confusion when trying to understand the causes, consequences and alternatives for the debt crisis. What causes debt repayment problems? Why do borrower countries prefer to suspend debt repayments rather than simply repudiate debt? How have lenders coped with this situation? Is there any evidence of an improvement in the situation? For a reader interested and familiar with the debt literature, these questions are not new. What is important is to have an understanding of the possible remedies and be able to design a solution that might resolve the debt crisis in a timely manner rather than allow it to drag on indefinitely with all the costs that that would imply. This thesis explores these questions and shares the views of the advocates of debt relief as part of the solution to the debt problem.

In order to place the debt problem in context, the thesis begins with a brief historical account of the borrowing practices of Latin American countries since their independence from Spain. Default is not a new phenomenom. What is new is the source of lending (private banks and not bond holders) and the institutions involved (IMF and World Bank). This has implications for the way debt has been handled which we explore in chapter 1. In addition we review the efforts of researchers in modelling sovereign loans, explaining debt restructuring and searching for the determinants of debt repayment

problems. The complexities found when dealing with sovereign loans lie in their nature, or more simply, the lack of collateral.

In chapter 2, we take into consideration more explicitly the peculiar nature of sovereign loans and design a two period horizon pure "willingness to pay" model to explore its implications in the loan market equilibrium. If we assume sufficiently risk-averse borrowers and neither adverse selection nor moral hazard, we find that the competitive equilibrium is inefficient. We then reframe this basic model into a bilateral monopoly context and include some bargaining elements. We derive the elements of conflict, the Pareto negotiation locus and discuss possible bargaining solutions in the context of the static axiomatic approach.

The design of any solution to the debt crisis requires an understanding of what precipitates a borrower into arrears. Chapter 3 offers an empirical study of LACs during 1971-86 which aims to compare different empirical specifications and trace variables that might usefully be included in our statistical model. Using those results, in chapter 4, we test our empirical model which now includes economic indicators, "crude" political proxies and country heterogeneity fixed effects. Our findings suggest that they are relevant in the assessment of the causes of debt servicing problems.

Finally, in chapter 5, we consider the debate concerning "debt overhang" in Latin America. We also provide an account of how the debt problem has been managed and conclude that a prompt solution can not rely on "refinancing" nor on voluntary market debt reduction schemes.

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Chapter 1

SOVEREIGN LOANS: A REVIEW OF PAST LENDING EXPERIENCES AND SURVEY OF THE LITERATURE

1. Introduction

The history of sovereign lending teaches that a repeated pattern of enthusiatic lending and borrowing followed by nonrepayment and turmoil in the international financial market is not new. However, the wave of lending in the 1970s ended in financial distress with no clear views of how to restore succesfully normal conditions in both the borrower countries and the international banking system. In searching for a solution, researchers have analysed past lending experience and made analogies with the present situation. They have also modelled the behaviour of lenders and borrowers and have used econometric techniques to determine what factors precipitate a nonrepayment problem.

The aim of this chapter is to help in understanding the present debt crisis and the complexities encountered in trying to unravel it. We organise it as follows. Firstly, considering that the present debt crisis is to a large extent, but not exclusively, a Latin American affair, we review the historical experience of Latin America highlighting differences and similarities with actual lending practice. Secondly, we review the growing concern shown by debt analysts about the present crisis and its implications. Finally, we conclude by drawing some inferences to try to explain why "debt fatigue" persists.

2. Review of the Latin American Lending Experience

The history of international lending in Latin American countries (LACs) is as old as their independence from Spain in the 1820s and may be divided into two long periods, running roughly from the 1820s to the 1940s and from the 1940s to date. This division is appropriate because of the different lending practices involved. Bonded lending was the major source of finance until World War II and was then supplanted by direct loans from official creditors, multilateral agencies and commercial banks.

2.1. The Period Before World War II

Prior to the 1940s, the major long-term foreign investors were the United States and the United Kingdom. Capital export from America mainly took the form of direct investment. In contrast, British overseas investments were mainly in the form of foreign bonds and foreign lending.

From the days of South American independence up to the end of World War I, British imperial lending remained the most important source of capital. The international credit market had the following predominant characteristics (Sachs, 1982; Dale and Mattione, 1983; Higonnet, 1983):

a) Government borrowing was mainly financed by private bonds;

b) These bonds were, in general, issued at fixed rates of interest with long periods of maturity;

c) The role of banks was limited to being underwriters and promoters of bond issues but not lending their own funds to foreign governments;

d) Negotiations were carried out between the debtor country and private bondholders (or bondholder committees) without intervention of the creditor's government nor other official institution. This, perhaps, explains why private bondholders' retaliation was limited to (at most) threatening the borrowers with exclusion from new bond issues.

There were several international lending waves during this period. Lindert and Morton (1989) counted eight waves: the 1820s, including loans to most of the newly independent nations of Latin America; the 1850s; the late 1860s and early 1870s; the late 1880s; the years between 1904-14 and the late 1920s. Each wave ended with at least some occurrence of repayment breakdowns due to international trade depression, government budget crisis, investment failures, dishonesty, etc. Indeed, the credit record of Latin America can be summed up by a quote from Max Winckler (Foreign Bonds, 1933): "The fiscal history of Latin America ... is replete with instances of government defaults. Borrowing and default follows each other with almost perfect regularity. When payment is resumed, the past is easily forgotten and the new borrowing orgy ensues. This process started at the beginning of the past century and has continued down to the present day. It has taught us nothing".

Mexico[i] requested its first loan in 1822 and two years later, it obtained the first loan from London. The creditors were Goldschmidt House and Barclay, Herring, Richard & Co. They lent £4,800,000 in exchange for government bonds at 6% annual interest. After deductions (commissions and other charges), only £3,682,538 was delivered to

[i]For more details, see Bazant (1968) and Lindert and Morton (1989).

Mexico. Originally, the loans were supposed to be used in long run programmes with the purpose of increasing the country's welfare. However, the loans were used to finance military armament and equipment and to finance government expenditure.

Between 1826 and 1856, the Mexican government defaulted[2] six times (1827, 1832, 1838, 1846, 1847, 1854). During this period, renegotiations involved:

a) Consolidation of debt at lower interest rates (e.g. the debt was consolidated at 5% interest rate in October 1837);

b) Conversion of old debt into a new issue with partial debt forgiveness (e.g. in 1842, the amount of interest arrears was £608,122 from which £109,026 was forgiven and the remainder converted to debentures not subject to interest rates and payable when Mexico had excess cash);

c) New loans and new bond issues.

After a short period of financial health, the Mexican government was once again in arrears. The governments of Britain, France and Spain intervened and tried to seize control of the customs collections. New bonds were floated which were used in part to finance repayment of old debts. In 1867, Benito Juarez refused to honour all debts and all debt-receipt-customs agreements. Foreign lending to Mexico restarted under Porfirio Diaz in 1885 but stopped in 1911 with the Mexican Revolution. Thereafter, Mexico's credit rating was not restored until the lending wave of the 1970s.

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[2]Unless otherwise stated, we do not distinguish between technical default, formal default nor repudiation (see Mendelsohn, 1984). We use default in its broader meaning i.e. partial or total debt repayment suspension.

Defaults in Argentina have also been common[3]. The first Argentine foreign loan in 1824 was underwritten by the Baring Brothers, one of Britain's leading merchant and acceptance banks. Argentina soon defaulted on this loan and debt arrears were finally settled in 1857 with some write-down on the accrued interest. On a fairly large scale, Argentine securities (mostly government issues and government guaranteed railroad bonds) were sold in London between 1862-1875. Again, Argentina defaulted in 1876 and debt arrears were paid in the next five years with no write-down.

In the late 1880s lending wave, capital inflow to Argentina increased substantially with most of it in the form of portfolio investment. A large proportion of public sector borrowing was contracted by national and provincial government banks to fund private land acquisitions, residential and commercial construction, purchase of farm stock and equipment and working capital. In contrast to this rise in foreign borrowing, expansion in exports was moderate while import growth accelerated. The trade deficit averaged 16% of exports in 1881-1995 and increased to 49% in 1886-1890. The interest payment-to-export ratio reached 66% in 1889. Foreign borrowing was reaching unsustainable levels and by November 1890, Argentina suspended payments on its sterling debt. This time, the Baring Brothers were on the verge of bankruptcy and given the size of Baring's liabilities, the Bank of England and the British Treasury intervened.

In January 1891, an agreement was reached to provide a loan of

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[3]Felix (1987) analyses the debt crisis of the 1890s (in particular, the Argentinian lending experience) and the 1930s.

£15 million repayable after three years at a 6% interest rate. This new loan was secured with Argentine customs receipts and intended to help resume debt servicing and pay arrears on the railroad guarantees. At the same time, Argentina was expected to reduce its money stock by 15 million pesos in each of the next three years and at the end of the third year, resume debt servicing from exports. However in 1892-93, the government deficit increased and so did the money stock. Exports did not rise, imports increased and Argentina fell into arrears. A new agreement was reached in 1893. Argentina was allowed to suspend 30% of its annual interest payments for five years and all principal repayments for eight years. In the late 1890s, Argentina settled its accounts thanks to the improvement in its terms of trade and by the early 1900s, the beef boom strengthened Argentina's balance of payments and its securities were well accepted in the international financial markets.

The 1930s debt crisis followed a strong wave of foreign lending from the United States which had displaced Britain as the most prominent capital exporter. U.S. capital exports mostly took the form of portfolio investment directed heavily to Europe. Latin America's gross external debt was smaller than that of North America, Asia-Oceania and Europe. However, U.S. direct investment was mostly concentrated in Latin America.

The 1930s depression brought for all borrowers, and Latin America in particular, a decline in business activity and government revenue, a deterioration in the terms of trade and reduction of export volume and cuts in international lending. Defaults started in January 1931 with Bolivia followed by Peru, Chile, Brazil, Colombia and Costa Rica. Uruguay and El Salvador defualted in 1932, while Panama and Cuba did

so in 1933. By the end of 1935, fourteen Latin American countries were in default (see table 1).

This experience of widespread default provides an important source of information on the causes and consequences of default. Was default triggered only by the effects of the Great Depression? Were defaulters punished?

In fact, Eichengreen and Portes (1985) tested a variant of the model suggested by Eaton and Gersovitz (1981) for a sample of world-wide borrowers. After applying ordinary least squares to annual cross section data for 1930-38, they found a significant and negative association between the level of indebtedness and income growth. This, they argue, might indicate credit rationing after 1930. Export instability and the degree of openness had the correct signs but were not significant. Eichengreen and Portes also explored the causes of default (as measured by the proportion of a country's debt in default) during 1934-38. They found that the tendency towards default was positively associated with the debt/income ratio, the extent of deterioration in the terms of trade and the percentage increase in the government budget deficit. They also included two dummy variables, one for Australia and another for Latin America. The significant and negative coefficient of the Australian dummy was interpreted as resulting from Australia's cultural and political ties with Britain. In contrast, the Latin America dummy although negative, was not significant and suggested that the economic variables (included in their regression) explained reasonably well the default tendency of these countries.

Using a sample of five Latin American countries (Argentina,

Table 1

Default and Rescheduling of
Latin American Government Debts to Foreign Creditors since 1820

	Privately Held Bonds, 1820-1929	Privately Held Bonds, 1930s	Loans, Mainly Official, 1940-79	Privately Held Loans, 1980-86
Argentina	Yes	Yes	Yes	Yes
Bolivia	Yes	Yes		Yes
Brazil	Yes	Yes	Yes	Yes
Chile	Yes	Yes	Yes	Yes
Colombia	Yes	Yes		
Costa Rica	Yes	Yes		Yes
Dominican Rep.	Yes			Yes
Ecuador	Yes	Yes		Yes
El Salvador	Yes	Yes		
Guatemala	Yes	Yes		
Haiti			Yes	
Honduras	Yes			Yes
Mexico	Yes	Yes		Yes
Nicaragua	Yes			Yes
Panama		Yes		Yes
Paraguay	Yes	Yes		
Peru	Yes	Yes	Yes	Yes
Uruguay	Yes	Yes	Yes	Yes
Venezuela	Yes		Yes	Yes

Source: Lindert and Morton (1989)

Notes : Yes indicates that a rescheduling and/or a default occurred in the specific period; a blank space indicates that none of these events occurred.

Bolivia, Chile, Colombia and Peru), Jorgensen and Sachs (1988) assessed the cost of default in the 1930s. They estimated the extent of default (i.e. the reduced debt servicing after suspension of debt payments) and the level of debt forgiveness implied in the renegotiations of debt contracts. These, in turn, gave them an approximation of the amount actually repaid (after default and renegotiations) and a proxy for the direct component of default cost. Future access to credit markets is considered the indirect component of default cost. Jorgensen and Sachs concluded that both components of the cost of default were low. The debt burden of defaulting countries was eased by the concessional nature of the settlements (extended maturities, reduced interest rates and although the principal was not cancelled, unpaid interest was not capitalised) and by the debtors' practice of secret debt repurchase of their own debts at deep discounts. Similar to Lindert and Morton (1989) and Eichengreen (1989), they suggested that the return of these countries to the capital market in the 1950s did not show any systematic signs of discrimination between defaulters and non-defaulters.

2.2. The Period After the 1940s

The outcome of the 1930s depression and the reconstruction of the countries involved in World War II restricted the access of developing countries to the private capital market. As a result international and government organisations played an increasingly important role in developing country borrowing.

Two major international institutions were created in this period:

the World Bank and the IMF. The World Bank was charged with providing financial assistance for both the reconstruction of Europe and fostering the development of emerging nations. The first objective was achieved by the Marshall Plan because the World Bank could not provide adequate resources for the reconstruction. Thereafter, it has traditionally concentrated on financing infrastructure and structural adjustments as well as providing funds to improve health and education in developing countries.

The IMF's early role was of securing the fixed exchange rate system and multilateral convertibility. In addition, the IMF was charged with the provision of medium term finance (3 to 5 years and ocassionally up to ten years) to assist countries with temporary balance of payments difficulties. Members countries suscribed according to their means and they can draw an initial tranche of their entitlement with no conditions. Further drawings (i.e. higher tranches) require a commitment to implement stabilisation programmes designed by the IMF in order to achieve control of their current account deficits and make them eligible for market borrowing.

The Paris Club is the main mechanism through which official debt is rescheduled. Its first meeting was in 1956 to reschedule Argentina's multilateral debt. In spite of the importance of the Paris Club, it is not possible to consider it as an institution since it is not a permanent body. The Paris Club meets only when default is imminent and there is a need to agree guidelines for rescheduling of all official loans and private loans which have an official export credit insurance[4].

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[4] Kisic, Danino and Morales (1985) analyse the history of the Paris

During the 1950s, bilateral and multilateral institutions played a negligible role in Latin America. Capital flows took place mainly in the form of private direct investment by multinational corporations. In 1950, almost half of the U.S. foreign direct investment was directed to LDCs and 38% of it was concentrated in Latin America. However, in the period 1950-79, the LDCs (and LACs) share decreased while the flows to developed countries showed an increasing trend (see table 2). This shift may be explained not only by the willingness of the U.S.A. to expand investment once economic reconstruction was under way, but also because in LDCs (LACs in particular) the issue of foreign control and dependence became very controversial and sensitive[5].

The 1960s were characterised by the importance of official flows. Table 3 shows the high participation of multilateral and bilateral institutions in providing external resources to Latin America. They provided an average of 60% and 40% of the external net inflows during 1961-65 and 1966-70 respectively but only 25% in the period 1971-75.

The Eurocurrency market, or Euromarket for short, operating since the mid-1950s was not a source for LDC loans during the 1960s. Most of the credits obtained were drawn by industrialised countries. Loans from the Euromarket were more available to LDCs in the late 1960s with Brazil and Mexico as obvious candidates because of their relatively high levels of growth and development.

Club and provide details about the mechanics of its negotiations.

[5]Kindelberger (1984) and Lall (1974) addressed the controversial issue of private foreign direct investment in LDCs. For details about LACs sensitivity to foreign direct investment, see Thorp (1985), Bitar (1985), Grifith-Jones (1984) and Diaz Alejandro (1970).

Table 2

United States of America Direct Investment Position Abroad 1950-82
(percentages)

	Developed Countries	Developing Countries	Others	Latin America share in total LDC
1950	48.3	48.7	3.0	37.7
1957	55.1	40.5	4.4	31.4
1960	60.6	34.9	4.5	23.5
1966	68.1	26.8	5.1	25.4
1970	68.7	16.6	14.7	14.7
1972	71.3	24.8	3.9	13.8
1974	75.3	18.0	6.7	13.3
1976	73.3	21.4	5.3	12.5
1978	74.5	23.1	2.4	12.3
1979	74.2	23.8	4.0	12.1
1980	73.5	24.7	1.8	12.3
1981	73.1	24.8	2.1	13.3
1982	73.7	24.0	2.3	14.1

Source: "Selected Data on U.S. Direct Investment Abroad",
U.S. Department of Commerce Bureau of Economic Analysis,
Washington, 1982.

Table 3

Structure of Net Inflow of External Resources

in Latin America[1] 1961-1975

(annual averages in percentages)

	Net Public Inflow[2]	Net Private Inflow[3]
1961-65	60.2	39.8
1966-70	40.1	59.9
1961-70	47.6	52.4
1971-75	25.2	74.8
1973	20.2	79.8
1974	26.5	73.5
1975	23.3	76.7
1976	19.6	80.4
1977	12.0	88.0
1978	7.3	92.7
1979	9.6	90.4

Source: International Bank of Development (IBD)

Notes : [1]Includes member countries of the IBD.

[2]Includes bilateral and multilateral official loans.

[3]Includes supplier credits, banks loans, bonds and direct investment.

In spite of some reschedulings of official and private loans, there were no serious indications of debt difficulties during the 1960s. By the early 1970s, neither international official loans nor foreign direct investment were able to meet the capital requirements of LDCs. There was a call for the revival of private capital markets to complement in the short run, and replace in the long run, some or most of the official lending (Kindleberger, 1981).

During the 1970s the supply of funds into the Euromarket grew rapidly, fed by capital surpluses from OPEC countries. Euro-syndicated loans[6] (priced at "floating" interest rates i.e. Libor plus spread) became an important source of finance to the LDCs. In contrast, the international bond market (which charged fixed interest rates) was reserved for "first class" borrowers i.e. developed countries (see tables 4 and 5).

The 1973-74 oil shock was accompanied by world wide inflation and recession. The large supply of funds also helped to drive real interest rates down and commercial banks turned their attention to emerging industrial nations among the developing countries. After 1975, spreads on Euroloans to LDCs and OECD countries dropped and, although the former was still higher, the gap between them reached a minimum in 1979. The share of LDCs (and LACs) in the Euroloan market showed an upward tendency, also peaking in 1979 (see table 5). Plan (1989) suggests that the spreads in 1979 did not reflect sufficiently the different creditworthiness of various countries but was instead, a

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[6]For a discussion of commercial bank and syndicated lending, see Donaldson (1985).

Table 4

International Bond Market[1] and Main Borrowers 1976-83
(percentages)

	1976	1977	1978	1979	1980	1981	1982	1983
Eurobonds	44.3	52.3	41.2	45.7	57.2	59.7	66.2	64.1
Foreign bonds outside U.S.A.	23.2	25.8	41.9	43.3	34.6	26.1	26.2	30.1
Foreign bonds in the U.S.A.	32.5	21.9	16.2	11.0	8.2	14.2	7.6	5.8
Total bond issues (millions U.S. dollars)	32669	33976	34279	40990	41920	52985	78042	75669
Main Borrowers:								
Industrial Countries[2]	74.0	69.9	72.2	77.4	77.7	77.1	80.7	79.0
Developing Countries	5.5	10.4	13.0	7.9	6.3	9.2	6.5	3.3
Latin America	2.3	7.5	7.6	5.1	4.7	6.9	3.2	0.1
Centrally Planned Economies	0.2	0.7	0.1	0.2	0.2	0.2	0.1	0.1
International Organizations[3]	20.3	19.0	14.1	14.5	15.8	13.5	12.7	17.6

Source: "World Financial Markets", Morgan Guaranty, January 1984.

Notes : [1]New issues with a maturity of three years or more.

[2]Includes multinational organizations.

[3]Includes regional development organizations.

Table 5

Distribution of Eurocurrency Bank Credits[1] by Borrowers 1976-83
(percentages)

	1976	1977	1978	1979	1980	1981	1982	1983
Industrial Countries[2]	39.0	41.2	41.3	32.9	50.5	64.6	50.0	51.9
Developing Countries	52.1	50.2	53.2	57.9	45.3	33.9	48.7	44.7
Latin America	30.0	23.7	30.4	34.0	31.1	22.6	31.5	20.8
Centrally Planned Economies	8.7	8.1	5.3	8.9	3.6	1.3	0.9	1.6
International Organizations[3]	0.2	0.5	0.2	0.3	0.6	0.2	0.2	1.8
Memorandum Item: Total Eurocurrency Bank Credits (million U.S. dollars)	28849	41766	70179	82812	77392	133379	84905	73899

Source: "World Financial Markets", Morgan Guaranty, January 1984.

Notes : [1]Credits with a maturity of one year or more, publicly announced in millions of U.S. dollars.

[2]Includes multinational organizations.

[3]Includes regional development organizations.

symptom of increased bank competition[7].

Initially, developing countries borrowed to finance their current account deficits and cope with the recession. For example, Brazil, a major oil importer, financed the higher oil prices through external borrowing. However, the availability of foreign credits soon led to increases in debt. The Mexican debt grew faster when it became an oil exporter. The Southern Cone of Latin America embarked on trade and financial liberalisation programmes and found, at that time, that it was more advantageous to borrow from abroad since real domestic interest rates exceeded real Libor rates (Diaz Alejandro, 1985; Calvo, 1986; Edwards & Edwards, 1987).

A brief description of the international debt trends during the 1970s helps to provide a picture of the pre-crisis period. According to World Bank estimates, more than 75% of the long term debt outstanding owed by LDCs falls in the category of sovereign debt (i.e. public and publicly guaranteed) with a higher dependence on loans from private creditorsthan from official lenders.

The distribution of debt in LDCs is highly skewed (see table 6 and 7). More than 40% is debt owed by Latin America and the Caribbean (LACCs from now on) which also have a high debt burden as suggested by the debt/GNP and debt/export ratios. Within the LACCs, the debt owed by sovereign borrowers is more than three times larger than the

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[7]Devlin (1989) argues that the attractiveness of the unregulated Euromarket and the reduction in information costs by the appearance of syndicated loans induced large entry of new banks in the international credit market and hence, vigorous competition among all banks.

Table 6

LDC Long Term External Debt[1] by Type of Borrowers and Lenders 1976-83
(million of U.S. dollars and percentages)

	Total Debt	Borrowers		Creditors from Public Borrowers	
	Outstanding	Public[2]	Private[3]	Official[4]	Private[5]
	(million U.S.)	(%)	(%)	(%)	(%)
1973	109240.9	76.6	23.4	61.8	38.2
1974	135400.3	76.7	23.3	59.1	40.9
1975	161539.1	77.8	22.2	57.0	43.0
1976	194586.7	79.6	20.4	54.0	46.0
1977	239515.6	80.6	19.4	51.7	48.3
1978	301152.2	82.0	18.0	48.8	51.2
1979	355082.4	88.3	17.7	46.7	53.3
1980	411539.3	82.4	17.6	47.0	53.0
1981	470094.8	80.4	19.6	46.0	54.0
1982	525585.7	81.3	18.7	44.8	55.2
1983	597646.7	82.9	17.1	42.3	57.7

Source: World Bank Debt Tables (1982-83, 1983-84, 1984-85).

Notes : [1]Includes only disbursed long term debt.

[2]Refers to public and publicly guarantee loans.

[3]Refers to private non guarantee loans.

[4]Multilateral and bilateral official creditors.

[5]Includes bonds, commercial bank credits and other private loans.

Table 7

Latin America and The Caribbean Public Long Term External Debt 1972-83
(percentages)

	Share in LDC Total Debt	Share in LDC Public Debt	LACCs Public Debt by Type of Creditor		Share of major LAC Borrowers[i] in LACC Public Debt
			Official	Private	
1973	40.2	33.0	41.8	58.2	57.6
1974	42.3	35.7	38.2	61.8	60.5
1975	41.9	35.9	36.3	63.7	63.2
1976	42.4	37.7	31.2	68.8	64.9
1977	41.9	37.9	38.3	71.7	62.6
1978	42.2	38.5	26.9	74.1	65.6
1979	41.9	38.5	23.6	76.4	65.0
1980	41.6	37.8	23.8	76.2	65.0
1981	43.9	39.0	23.4	76.6	66.1
1982	44.6	40.4	22.7	77.3	67.3
1983	47.2	43.9	20.5	79.5	68.7

Source: World Bank Debt Tables (1982-83, 1983-84, 1984-85).

Notes : [i]Argentina, Brazil and Mexico.

private non-guaranteed debt and from 1974 onwards, private creditors are the most important source of loans. The share of official creditors has decreased from 46% in 1973 to 24% in 1980 while the share of private creditors increased from 54% to 76%. Moreover, Argentina, Brazil and Mexico are the major borrowers, accounting on average for about 60% of all the LACCs indebtedness. Also for these major borrowers, private loans are the most important source of finance.

The risk to banks from foreign lending increased substantially. During 1975-77, U.S. bank claims to LDCs grew at the rate of 28% per annum (Devlin, 1989). U.S. commercial bank exposure (as a percentage of their primary capital) to Eastern Europe and non-oil LDCs increased from 132% in 1977 to 163% in 1981 while the exposure of the nine largest U.S. banks rose from 188% to 240%. At the end of 1982, the exposure of the nine largest U.S. banks to the five largest LAC borrowers ranged from 108% to 263% (Cline, 1984 and table 8). This reflects the potential vulnerability of U.S. commercial banks to debt-servicing difficulties.

There is a vast literature on the causes of the 1982 debt crisis (Diaz Alejandro, 1983, 1984; Cline, 1984; Dornbusch 1983, 1984; Allsopp and Joshi, 1985; Bianchi ed., 1985; Thorp and Whitehead ed., 1987 among others). The increase in the price of oil for oil-importing LDCs, the need to finance new oil discoveries in oil-exporting LDCs, the sharp rise in real Libor during 1981-82, the 1980-82 global recession which substantially reduced exports and caused a deterioration in the terms of trade are counted as the most important external causes of the 1982 debt crisis. Dornbusch paid

Table 8

Exposure as Percentage of Capital, Major U.S. Banks, end-1982

	ARGEN	BRAZIL	MEXICO	VENEZ	CHILE	TOTAL[1]	Capital[2] in million US
Citicorp	18.2	73.5	54.6	18.2	10.0	174.5	5989
Bank of America	10.2	47.9	52.1	41.7	6.3	158.2	4799
Chase Manhattan	21.3	56.9	40.0	24.0	11.8	154.0	4221
Morgan Guaranty	24.4	54.3	34.8	17.5	9.7	140.7	3107
Manufacturers Hanover	47.5	77.7	66.7	42.4	28.4	262.8	2592
Chemical	14.9	52.0	60.0	28.0	14.8	169.7	2499
Continental Illinois	17.8	22.9	32.4	21.6	12.8	107.5	2143
Bankers Trust	13.2	46.2	46.2	25.1	10.6	141.2	1895
First National Chicago	14.5	40.6	50.1	17.4	11.6	134.2	1725

Source: Extracted from "International Debt: Systematic Risk and Policy Response", Cline (1984).

Notes : [1]Exposure in Argentina, Brazil, Mexico, Chile and Venezuela.

[2]Primary capital (shareholders equity, subordinated notes and reserves against possible loan losses).

special attention to the role played by the U.S.A. in the 1980-82 recession through its inflation-stabilisation program and policy mix of tight money and easy fiscal policy.

Government budget deficits played an important role in Brazilian and Mexican indebtedness while overvaluation of the currency is crucial in explaining the Argentinian and Chilean debt situation. In general, budget deficits, overvaluation of the currency, capital flight[8] and current account deficits have to be counted as the domestic sources of Latin American repayment difficulties.

On August 12 1982, the Mexican Finance Minister Silva Herzog announced that they could no longer make payments on their external debt. This event marked the start of succesive rounds of reschedulings (of official and bank loans) particularly in Latin America. It has also changed the role of the IMF and World Bank. In the 1980s, despite numerous criticisms[9], the IMF has assumed a more active role by recommending stabilisation programmes as a necessary precondition for rescheduling private and official loans. The participation of the World Bank (and IMF) in Paris Club meetings involves monitoring debt restructuring agreements.

In spite of the numerous reschedulings and the 1985 Baker Plan, the debt situation has not improved for Latin American borrowers and commercial bank lenders have provisioned large reserve loan losses.

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[8]For a study relating capital flight and external indebtedness, see Lessard and Williamson eds. (1987).

[9]An account of these crticisms in relation to Latin America can be found in Pastor Jr (1987).

Because of the persistence of the debt crisis, the Brady Plan was launched in 1989 and the IMF and the World Bank have been assigned new tasks. That is, to support and encourage the debt reduction process. We analyse the response to the debt crisis and its possible solutions in our final chapter.

3. International Debt Literature

The vast literature generated from the present debt crisis encompasses developments in debt management. The crux of the debt dilemma is twofold: stability of the international financial system and the welfare of developing countries.

Concerns about the rapid increase in external obligations during the 1970s resulted in a large number of analytical papers which have already been surveyed by McDonald (1982). Another set of papers attempted to discuss aspects of developing country finance and debt and these have also been surveyed by Eaton and Taylor (1984). An interesting examination of multi-period models of foreign borrowing is provided by Glick and Kharas (1986). Country risk and its implications for modelling the credit market are discussed in the excellent paper by Eaton et. al. (1986). In addition, a review of the statistical approach to country risk can be found in Saini and Bates (1984), Heffernan (1986) and Lanoi (1986). Therefore, we are faced with the fact of little originality in trying to add another survey. Instead, we rely on the previous surveys, select some models to illustrate the efforts made by researchers in analysing sovereign loan contracts and finally, attempt a brief updating.

3.1. Theoretical Models

In trying to explain the causes of the present debt crisis and provide insights into borrowers' debt capacity and debt sustainability, researchers have focussed on macroeconomic models and tried to determine the stable and unstable debt paths. The general approach to this problem is through macroeconomic accounting identities (e.g. balance of payments, current account, savings-investment gap, etc.) and then working out the implied dynamics through the use of other macroeconomic relations.

Dornbusch (1984) identifies the main causes of the debt crisis starting from a debt accumulation equation $D_t=(1+i_t)D_{t-1}-NX$ where D is the dollar value of the outstanding debt, i is the nominal value of the interest rate on the outstanding debt and NX is the non-interest component (measured in U.S. dollars) of the current account. This can then easily be transformed into a debt-export equation $x_t=kx_{t-1}-n_t$ where $k=(1+i_t)/(1+g)$, x is the debt/export ratio, g is the nominal (dollar) growth of exports and n is the NX/exports ratio. Since an ever-increasing debt/export ratio describes a situation which is not viable, the history of the debt problem can be summarised in terms of this debt/export equation. Borrowing during the 1970s made the accumulated debt (x_{t-1}) large, the oil shocks and overvalued exchange rates made n_t negative and the increase in real interest rates followed by the world recession adversely affected the non-interest current account and thus, the debt/export ratio.

From a similar basis, Congdon (1985) illustrates the problem faced by borrowers. He starts with a current account identity $dD=T+rD$, where d stands for change, D is the amount of debt, T is the

trade deficit, r is the interest rate on debt and rD is the service balance. Financial stability requires a constant debt-to-export ratio (D/X=a) so the steady state is characterised by dD=adX=T+rD. By dividing thorugh by X and letting g be the growth of exports (dX/X), then the equation describing the steady state is a(g-r)=T/X. Therefore, g>r implies T/X>0 and the borrower is able to run a trade deficit. Conversely, if g<r, the borrower has to be able to run a trade surplus to achieve stability.

A more sophisticated version is presented by Cohen (1985). He derives an index of solvency which is associated with the minimum level of debt repayment when the real lending interest rate exceeds the country's growth rate. Whatever is not repaid is refinanced by the lender so the index satisfies the solvency ("transversality") requirement i.e. debt grows strictly at a slower pace than the interest rate. He proceeds to estimate his solvency index for a number of countries dividing the future into two sub-periods from 1983-1995 and from 1996 onwards. By making some forecasts about rate of growth of exports and the effective lending rate, he arrives at the conclusion that, with the exception of Brazil, Argentina, Sudan and Ivory Coast, all other debtor nations (including those in Latin America, the region with highest repayment needs) require to dedicate at most 13% of their exports to debt service in order to remain solvent. For Brazil, Argentina, Sudan and Ivory Coast, the figures are 15%, 16.4%, 22.8% and 15% respectively.

Multi-period models have also been used to analyse the determinants of developing country long-run creditworthiness. For example, Kharas (1984) builds a model where investment and (via the production function) output are determined endogenously with debt. In

his model, the government borrows from abroad to invest and therefore increase the rate of growth of output. He finds that if the initial capital stock is high and the marginal propensity to save out of physical capital is sufficiently larger than the lending interest rate (hence, the growth of new borrowing is less than the interest rate), then the debt/output ratio will be bounded. Otherwise, accumulating further debt can put the economy on a path characterised by an ever-increasing debt/output ratio. A unique saddle path is derived where both capital and debt are growing suggesting that foreign loans are succesfully used only if (after some time) the growth of domestic capital increases faster than the external debt. In other words, long-run creditworthiness is associated with the path of ever-expanding capital stock.

Given the distinction between creditworthy and uncreditworthy paths, the Kharas model associates reschedulings with the likelihood of being shifted from one region to another. He calculates the critical capital stock which is sufficient to maintain creditworthiness at any level of expected gross capital inflow and existing outstanding debt. The comparison between this critical capital stock and the actual capital stock is taken as an indication of country exposure.

The simplicity of the approach and the direct implications for government policy are the major attractions of this type of macro-framework. However, there are inevitable shortcomings. Firstly, there is an absence of sovereign risk. Borrowers are implicitly assumed not to have any incentives to default and engage in activities that signal such behaviour. Debt crises arise only as a consequence of uncertainty about the future and lenders should always

be willing to restructure the debt. Secondly, given that the lenders' behaviour is taken as optimal, there is no attempt to address the issue of overlending and, therefore, most of the burden of the adjustment has to be borne by the borrower.

A different set of models tries to provide microfoundations to the international credit market and at the same time incorporates the potential risk of debt repudiation embodied in sovereign loans.

In general, models of this kind are framed in the following way. The borrowers' behaviour is based on intertemporal utility maximisation and in choosing whether to repay or repudiate, they compare the burden imposed by current debt service obligations with the welfare loss due to penalties. Lenders understand that borrowers will make such comparisons and do not lend more than the borrowers are likely to find in their interest to repay. Key issues here are how to proxy penalties (when loans do not have a physical collateral) and the shape of the supply of loans.

Jaffe and Russell (1976) describe the characteristics of the loan market in situations where the borrowers' willingness to pay is questioned. The spirit of this model seems to be embodied in most models of international debt with risk of repudiation. Assuming an exogenous and arbitrary default penalty, they consider a two-period model with "honest" and "dishonest" borrowers. Honest borrowers will always repay but dishonest borrowers will default if the penalty is less than repayment. Competitive lenders can not distinguish between borrowers so they will provide loans ensuring that the debt service is less than the penalty. This condition establishes a debt ceiling. Since there is an inverse relation between the proportion of repaid

loans and both the lending rate and the amount borrowed, if the credit ceiling binds then less loans are forthcoming when the interest rate is high.

The characteristics of the credit market implied by the Jaffe and Russell model are: the supply of loans exhibits a backward bending portion, credit rationing can emerge in equilibrium, lenders and borrowers can both gain from using information on total debt and the threat of repudiation cuts lending short. Although the Jaffe and Russell model is designed in the context of a domestic credit market, its features are generally shared by most of the models of international debt with risk of repudiation (Eaton and Taylor, 1986).

Eaton and Gersovitz (1981) make a seminal contribution to the sovereign debt literature by constructing a model with endogenous default penalty. A borrower country which repudiates its debts faces permanent exclusion from the private credit market. The benefits of default grow with the size of the outstanding debt. The costs are determined endogenously according to the variability and growth rate of the country borrower's income and its own characteristics (risk tendency, discount rate, etc.) which in turn affect its future demand for loans. Lenders know the nature of the borrowers and perceive the borrowers' disutility from exclusion of the credit market. This allows them to supply loans only if the cost of default exceeds the benefits. Thus, the credit ceiling is also endogenously determined.

Kletzer (1984) sets up a model with similar characteristics to that of Eaton and Gersovitz and explores the characteristics of loan contracts when creditors have alternative information about the borrowers' total debt service obligations. He concludes that a loan

contract with observability of concurrent indebtedeness is a constrained Pareto-optimum that can not be dominated by an equilibrium without observability of concurrent indebtedeness.

Why do borrowers not repudiate? Why are they so keen to maintain their access to the credit market? Repudiation removes the possibility of smoothing consumption over time in the case of low income, makes it impossible to exploit future investment opportunities when there are not enough savings and finally, considering that banks intermediate in international trade transactions, repudiation might cause international trade disruptions.

In the event of repudiation, will lenders impose the penalty? How do we explain the following chain of events that characterise the 1980s: arreas, default, renegotiation, and perhaps new loans?

Krugman (1985) develops a model with uncertain punishment cost. He suggests that although a defaulting country faces the possibility of serious penalties, the expected cost of these penalties does not seem to be sufficiently large to induce repayment. In a two-period model with initial indebtedness, the penalty takes the form of a known credit cut and a fixed cost which is unknown for lenders and borrowers when the repayment-defaulting decisions are made. This uncertainty cost may be interpreted as a measure of all actual uncertainties, say future export growth, terms of trade and political events.

Repayment of the old debt in the first period leads to a new loan and the repayment-defaulting decision is taken in the second period. Under these circumstances, it is possible to configure a loan market with non-repayment risk in the second period. It is evident that

default in the first period might be avoided if new lending exceeds debt service. In other words, it might be in the interest of existing creditors to postpone debt servicing and avoid an immediate default. This action would preserve the option of being repaid in the second period. This, Krugman says, underlies the rationale of debt rescheduling.

Similar to Sachs (1982, 1984), rescheduling in Krugman's model might be interpreted as reflecting a time inconsistency problem. Ex-ante, lenders would like to be able to commit themselves to imposing the sanctions if the country does not repay its debt; but ex-post such action is not optimal so that they refrain from doing so and prefer to renegotiate instead of losing all their claims. Consequently the ex-ante threat of sanctions is not credible.

Another appealing way of explaining rescheduling is proposed by Grossman and Van Huyck (1985). They apply the concept of reputational equilibrium and focus on debt as a contingent claim. In their model, the borrower's objective function is to maximise utility of current consumption and the expected present discount value of future utility from consumption conditional on information available today. Actual consumption equals total national income less current debt servicing. National income has two components: a deterministic part and a stochastic part. The deterministic part represents the return from the proceeds of investing (last period's borrowing) in a concave risk-free productive technology. The stochastic part may reflect external threat or internal discontent. This allows them to distinguish between inexcusable (repudiation) and excusable (partial repayment due to bad states of the nature) defaults. Moral hazard and problems of insolvency are absent from the outset since they assume a

risk-free productive technology and symmetric information (the state of nature is equally uncertain ex-ante and equally verifiable by both lenders and borrowers).

Lenders are assumed to be risk neutral so they equate the expected value of debt servicing in the next period (conditional on all information available today) to the alternative risk-free return on the current amount lent to the borrower. In addition, it is assumed that lenders form their expectations rationally and that they know the utility function of the borrower. The country borrows for investment purposes, and through the expected servicing function (which depends on the probability of the state of nature) pass some risks to the lenders. Borrowers can only affect lenders' expectations and their decision to lend now and in the future through their reputation which links current debt service and expectations of future debt servicing.

Under these circumstances, the country borrowers' intertemporal problem is to choose the amount of debt and the actual and future debt servicing plan so as to maximise expected utility subject to their life budget constraint, the supply price of loans and the lenders' belief about their trustworthiness. The reputational equilibrium maximises the borrowers' expected utility, provides efficient risk shifting and validates the lenders' expectations about the borrowers' choice of debt servicing plan. The solution is time consistent because the chosen debt servicing plan is proved to yield the highest expected level of utility.

The above approach is interesting because it interprets sovereign debts as contingent claims where loans are used to finance investment

as well as a device to facilitate effficient risk shifting. According to the model, excusable default does not preclude continued access to loans while inexcusable default leads to a credit cut.

Since the onset of the debt crisis, the market has seen successive reschedulings and also the development of a thin but active (secondary) market for selling and swapping commercial bank loan claims on developing countries. These events prompted researchers to analyse how an optimal rescheduling should proceed.

Gennotte et al. (1986) also emphasise the contingent claim aspects of sovereign loans. Motivated by the determination of optimal rescheduling policies and to a lesser extent by the unreliability of secondary-market-debt valuation, they design a methodology for valuing debt claims. The value of these claims is given by the discounted stream of expected future debt service payments and thus, depends on the magnitude and risk characteristics of the promised payments. Therefore, they suggest that (from the lender's point of view) the optimal rescheduling policy (maturities, fees, spreads) is the one that maximises the value of this claim subject to both the borrower's option of repudiating and the regulations imposed on lending exposure.

The country borrower owns assets (measured by its current reserves and its stream of future foreign exchange revenues) and owes a stream of promised repayments. Given that the possibility of repudiation drives a wedge between the face and market value of the debt, the strategy of the country borrower is to maximise the difference between the value of its assets and the market value of the debt. If the country repudiates, it suffers a penalty in proportion to its assets; hence repudiation is an option only if the penalties

imposed for non-repayment are less than the market value of its claims. Since the incentives for repudiation are strong when the country is heavily indebted in relation to its wealth, a rescheduling postponing repayments until the country's wealth recovers might remove the incentive to repudiate and at the same time maximise the amount recovered by the lender. Notice that the value of the debt is determined by the stream of promised future repayments which in turn depends on the underlying assets and the rescheduling policy adopted.

Trading in the secondary market has increased in recent years while prices of secondary market debt have been in continuous decline. These trends reveal both unsuccesful rescheduling practices and increasing expectations that the debt would not be repaid in full. On the one hand, commercial bank lenders started to get out of the crisis by decreasing their loan exposure relative to primary capital and also increasing their loss provisions (Sachs and Huizinga, 1987). Selling debt at a huge discount signals their view that there is little likelihood of the debt being repaid in full. On the other hand, developing countries are in a similar (or worse) situation compared to when the debt crisis started. Moreover, LDCs might be suffering from what Krugman (1988a) labelled a "debt overhang" problem. That is, the presence of an "inherited" debt which is larger than the expected present value of a country's maximum future resource transfers.

These aspects led to an active debate about the costs and benefits of debt relief and, at the same time, encouraged welfare comparisons between different market-based debt-reduction schemes.

The stream of payments from a country borrower is affected by its debt burden. This debt burden distorts its incentives to perform well

since most of the benefits of good performance will go to its creditors rather than to itself. Therefore, debt reduction provides incentives to debtor countries to make adjustment efforts (for example, increase investment) which will improve the welfare of both country borrowers and lenders. Borrower countries are said to be on the wrong side of the "Debt Relief Laffer Curve" (DRLC) when creditors increase expected payments by forgiving part of the country's debt (Krugman, 1988a, 1988b).

The "pro-incentive" of debt relief is analysed by Corden (1988). He suggests that debt relief might have positive and negative effects. In some cases, future debt service obligations would increase investment (now) and this could be interpreted as an increase in the (current) adjustment effort. If that is so, debt relief provides disincentive effects.

Assume that a country borrower always meets its service obligations up to the limit of its "capacity to pay". In other words, if, say, its minimum level of consumption is not granted when repayment is due, then the only option for the country is to default. If this is the case, Corden argues that sufficient debt relief (today) might persuade the country to invest (today) and prevent creditors facing a default (tomorrow). He stresses that this positive effect depends on giving a meaningful concept to a country's "capacity to pay".

Comparisons between different market-based reduction schemes have also been a focus of concern. Krugman (1988b) argues that straight debt forgiveness and market-based debt reduction schemes (such as debt buybacks, securitization and debt-equity swaps) are similar in the

sense that they reduce the debt overhang. More precisely, such schemes will benefit both creditors and debtors if the debtor is on the wrong side of the DRLC and hence the adjustment-incentive effects are sufficiently important.

Other papers (for example, Helpman, 1989; Froot, 1989) also supported the potential efficiency gains from debt reduction operations. In particular, Froot compares the outcomes of different market-based reduction schemes (buybacks, exit bonds and pure debt relief) but also considers the different sources of funds used to retire old debt (i.e. the creditors themselves, exogenous foreign aid, the debtor's future income and the debtor's current endowment). If the debtor country is on the wrong side of the DRLC, Froot shows that the creditor's preferred market-based scheme is a buyback financed by aid, followed by a buyback out of current resources or a buyback out of future receipts or exit bonds. The debtor's preferred scheme is either a buyback out of aid or a buyback out of future receipts. Most important, Froot shows that countries that are liquidity constrained are more likely to be on the wrong side of the DRLC and that for them, a package containing partial debt forgiveness and new lending is optimal.

Despite the merits of debt relief, we have not seen substantial debt forgiveness in practice. Krugman (1988b) warns about the difficulties encountered in making these schemes work. Debtor countries are normally prohibited from repurchasing their own debt at a discount because the use of international reserves for a buyback might impair the country's ability to repay the remaining debt. Classification of existing debt as "senior" debt also avoids the problem of moral hazard (buying debt at a discount could be a "reward"

for not repaying before). Securitization might work if the new debt (bond) issued by the country is made senior to the existing debt and, at the same time, there is confidence that this new debt will be repaid. Debt-equity swaps might worsen a country's foreign reserves through "round tripping", aggravate its fiscal position through the need for domestic borrowing and might led to inflationary pressures via money creation.

The increase in the secondary market price of the Bolivian debt after the buyback announcement led some commentators to question the extent of benefits that debt relief schemes would provide. Debt repurchase pushes the price of debt up and might harm debtors if the the average value of the remaining debt is larger than its marginal value (Bulow and Rogoff, 1988). In other words, debt repurchase would do very little to ease the debt burden if (after the repurchase) the secondary market price goes up and the remaining debt is large. However, if the country can negotiate a large proportion of its debt with the participation of all its creditors, then the debtor country might benefit not only from the debt reduction per se but also from its return to the international credit market (Sachs 1988).

Moral hazard may also obstruct debt forgiveness. A country borrower might misrepresent its private information in order to gain more debt relief. For example, once at the debt relief negotiation table, the debtor country might argue that there is no more scope for "belt-tightening" so a large debt write-off is required to increase investment. This issue is addressed by Froot et. al. (1989). They suggest that debt contracts should be made contingent on the "ability

to pay" of debtor countries to remove this disincentive effect[10]. The type of indexing would depend on the nature of the uncertainty faced by the lender and borrower. More precisely, if the uncertainty is about a variable that the lender and borrower can observe equally (say, future commodity price), then commodity price indexing is better. However, if there is uncertainty about some attributes of the borrower, debt contracts should be linked not only to variables outside the control of the borrower but also to variables under his control (for example, output).

The complexities of the international debt crisis lie, in our understanding, in the nature of the credit relations between lenders and sovereign borrowers and in the identification of both the incentives for borrowers to repay and the incentives for lenders to continue supplying new loans. This, in turn, might explain the delays in reaching a satisfactory solution to the debt crisis.

3.2. Estimating Country Risk

There are two main ways of assessing country risk. The so called non-statistical rating, is done by identifying key variables reflecting lending risk and weighting them so as to obtain a score for each country. This method of rating is widely used by financial journals and magazines. It is also quite common within the international banking institutions[11]. The statistical rating, widely

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[10]Contingent debt contracts to mitigate the moral hazard problem are also discussed in Genotte (1986), Krugman (1988) and Anderson et al.(1989).

[11]Heffernan et al. (1985) conducted a survey of 122 international

used among academics, is much more sophisticated and is based on the application of principal component, discriminant, probit and logit techniques.

The different criteria involved in these two methods of estimating country risk make comparisons difficult. Within the statistical rating, comparisons are also limited by the definitions of the variables used, country samples and time periods considered when applying the estimates. For these reasons, we prefer to devote our attention to describing how non-statistical ratings are produced and give a brief account of the problems encountered in assessing country risk using statistical techniques. Later, in chapter 3, we present (in the form of an applied survey) a comprehensive revision of the empirical work carried out in attempting to assess the determinants of debt arrears.

Nevertheless, it is worth pointing out that the non-statistical rating incorporates political risk variables while the statistical rating has concentrated more on economic indicators. The reason for this lies in the intrinsic nature of the political variables i.e. they are difficult to select, quantify and measure. However, some efforts have been made in trying to include them in statistical models (for example, Burton and Inoue, 1985; Citron and Nickelsburg, 1987 and Berg and Sachs, 1988).

Note as well that both ratings provide insights about default

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banks in London in 1984. They found that banks used more than one method (statistical models, external appraisal service, spread sheets, etc.) when assessing country risk but most of them rely in their own "house economist" generation of country reports.

risk. However, the statistical rating may also give some insights about repudiation risk through subjective judgments on the wide range of variables used in the analysis. The statistical rating is concerned with the probability of rescheduling and not with the probability of repudiation. In the last three decades, very few countries have repudiated their debts but many of them have rescheduled their debts especially in the 1980s. Rescheduling is intrepreted in a wide sense i.e. countries that have rescheduled or are in the process of doing so and, even more interesting, countries that might seek rescheduling in the near future. This suggests that the main concern is not the probability of rescheduling per se but the probability that a country might fall into debt arrears (Heffernan, 1986; Saini and Bates, 1984).

3.2.1. Non-Statistical Rating

The most common country rankings are provided by Euromoney, the Institutional Investor and the International Country Risk Guide. We will treat them separately because their methodologies are different.

Euromoney ratings date from 1969 and were initially based on the average (weighted by level of loans and maturity) spread of a country active in the Eurocurrency market in a given year. The higher the average weighted spread, the riskier the country. Since mid-1982, Euromoney has widened its criteria and changed the way its rankings were computed. For example, in 1984, a weight of 50% was assigned to ease of access to all international markets (bond markets, floating rate notes, Euroloans, etc.), 30% weight was given to the terms (maturity and spread) obtained by the borrower country in a syndicated

loan, and 20% weight to trade finance related aspects.

The Institutional Investor ranks countries on the basis of a survey. Banks are asked to grade country's creditworthiness from 0 to 100. The lower the score obtained by a country, the higher is its probability of default. These responses are then weighted mainly according to each bank's loan exposure and some criteria (not revealed) related to scoring technique.

The shortcomings of the Euromoney and Institutional Investor scorings are well pointed out by Heffernan (1985). In the Euromoney ranking:

a) If the average spread over LIBOR changes in a particular year, then the rating will be biased in favour of the countries that borrowed before such a change;

b) Spread and maturities are not independent as the rankings suggest;

c) The rankings implicitly assume that lenders always adjust for higher risk by increasing the spread. This neglects the fact that, at some point, further increases in the spread would increase the average riskiness of the portfolio and thus, would lower their expected returns.

With repect to the Institutional Investor scoring:

a) The country grading relies on the bankers' individual judgement. If they are heavily exposed to one country, then they might not make a fair judgement since the information would subsequently be available to the public;

b) Banks might have better quality information for countries where they are heavily exposed and their expertise does not necessarily cover all countries.

The International Country Risk Guide ranks a country on the basis of a composite score and on the assumption that political risk and transfer risks are equally important (Krayenbuehl, 1985). The three main components for the evaluation are: political (50%), financial (25%), and economic (25%) risk. The total score for political risk is 100 and considers aspects such as political leadership. Financial risks are related, for example, to debt reschedulings and the maximum score is 50. Economic risks also score up to 50 and take into consideration problems like inflation. Of course, the absolute levels of the scores are unimportant as far as the rankings are concerned; what is important is the relative variability of the scores.

Perhaps assigning half of the total weight to political variables is excessive. Delays in repayment are more often attributed to economic and financial related variables than, say, to frequent revolutions. In addition, if political and financial risk are interrelated then the real weight to economic risk is reduced.

It is also interesting to describe how individual banks assess country risk. The case of Lloyds Bank[12] will be illustrated. The criteria used to assess country risk come from a risk-reward matrix, its own country risk analysis and a country-specific fact sheet (Johnson, 1985).

The risk-reward matrix is a weighted measure of bank exposure which takes into consideration:

a) The type of borrower (reward is higher for private loans than for

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[12]At the end of 1984, Lloyds Bank was (after Midland Bank) the second largest British lender to Latin America.

government loans);
b) The size of the loan (retail loans tend to have higher spreads and thus higher rewards than wholesale loans);
c) The geographical destination of the loan (foreign lending, as opposed to domestic lending, is supposed to be more risky because of the bank's better knowledge of the domestic market).

The country risk analysis is composed of judgemental and statistical considerations, scoring up to 100 each. Judgemental aspects are based on the country's fact sheet and a weight of 20% is assigned to domestic economic policy (e.g. coherence of policy, business climate); 30% to external economic policy (e.g. debt management, handling of liquidity crisis, investment policy); 25% to political characteristics (e.g. international position, type of government and durability); and 25% to political stability (e.g. risk of local war, political and social tension). Statistical measures include a variety of indicators (debt/GNP, GNP per capita, etc.) which are given equal weight. In addition, future scenarios are constructed based on a "strong" and "weak" solvency condition (which are linked to the debt/export ratio) using similar methodology to that of Congdon (1985) and Cohen (1986).

An interesting aspect of the Lloyds Bank approach is the effort placed in distinguishing between the type of borrower and lender, suggesting that this relation will affect the risk assessment.

In sum, the main advantage of the non-statistical assessment of country risk lies in the variety of aspects considered in the analysis. This helps to provide a country-by-country case study. However, its major disadvantage is its dependence on subjective

opinions made by the institutions involved in performing the assessments. The statistical (or quantitative) approach to country risk estimation is less subjective but has its own problems and limitations.

3.2.2. Statistical Rating

Saini and Bates (1984) identify the problems encountered by the statistical country risk approach and in discussing them, we rely on their work. These problems are related to the choice of the dependent variable, data availability, statistical techniques, model specification and ability to forecast.

If we are attempting an explanation of the causes of debt arrears, then what is the most adequate definition of the dependent variable? If rescheduling is interpreted as a way of renegotiating debt which has not been serviced, then the date of signature could indicate the time when a country was in repayment difficulties. However, delays occur between the time when the rescheduling is requested and its signature. Countries might have suspended debt payments sometime before the formal rescheduling is agreed and might still be in arrears while the process of renegotiation goes on. Feder and Just (1977, p.30), aware of this limitation, propose "...for cases where a rescheduling agreement was arranged after servicing difficulties were really apparent, a default is assumed to have taken place in the years in which significant arrears occurred".

Although the Feder and Just definition has been frequently used,

it has some drawbacks. Without data on country arrears[13], it is difficult to assess when a country is experiencing debt difficulties. Also it does not consider other types of loans (like bridge loans, higher tranche IMF loans) which might be substitutes for formal reschedulings and might be indicating repayment problems. Saini and Bates (1977) distinguish voluntary (transfers for development purposes) from involuntary (bridge loans, loans to avoid default) transfers and include only the latter in their dependent variable. Feder et. al. (1981) suggest additional refinements. They counted the year when the rescheduling was requested, years of serious debt arrears irrespective of whether a rescheduling was taking place and years when rescheduling was prompted by shortages of foreign exchange.

The lack of data availability can be solved in different ways: estimating missing data, reducing the sample of countries under study, using different coverage period for countries and using proxies for missing variables (Frank and Cline, 1971; Dhonte, 1975; Feder and Just, 1977; Feder et al. 1981; Kharas (1984) among others). Besides the problem of data availability and incomplete series, there is an additional problem in the interpretation of the variables because either the data presentation differs accross countries or there have been changes in the methodology over time.

Researchers have used different statistical techniques (principal components, discriminant analysis, probit and logit) when attempting to determine the causes of debt servicing problems.

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[13] The World Bank has recently published data on interest arrears in their 1990-91 edition of World Debt Tables.

Dhonte (1975) uses principal components to find groups of independent variables which will help to differentiate countries in relation to their debt involvement. From a chosen list of explanatory variables, the idea is to select subsets or components (i.e. linear independent combinations) and then obtain correlation coefficients by relating these components to the dependent variables. A drawback of this technique is that it is often difficult to ascribe clear economic or political meanings to each of the components; also there might be some problems in interpreting the relation between the dependent variables and the components.

Discriminant analysis has been used to determine the linear combinations (of indicators or variables) which best discriminate between two groups of countries (those having repayment difficulty problems and those that are not). One of the limitations of this method is the determination of the importance of individual explanatory variables. The "t" statistics generally used in linear regression analysis can not be used because the discriminant coefficients are not unique due to violations of the normality assumption. Frank and Cline (1977), although recognising this problem, still use "t" tests to exclude some variables from their model. Feder and Just (1977, p.26) in justifying the use of logit technique, pointed out another limitation of the discriminant technique "...while discriminant analysis assumes two completely different populations, the logit approach assumes a discrete event takes place after the combined effect of certain economic variables reaches some threshold level. The latter approach is especially suitable when several observations (of both default and non default years) for a given country are included ... it makes more sense to claim that, in a specific period, the country was pushed beyond this

critical level, leading to rescheduling, than to claim that a country suddenly became a member of another species..."

Probit and logit regressions have often been used in the analysis of the determinants of debt arrears (Feder and Just, 1977; Saini and Bates, 1978; Feder et.al. 1981; Kharas, 1984; Cline, 1984, McFadden et. al., 1985 among other researchers). The difference between them lies in the assumed probability distribution for the errors. Probit assumes a normal error distribution while logit posits a logistic distribution which resembles the normal distribution except for the extreme ends (i.e. fatter tails). Amemiya (1981) and Maddala (1985) show that in the case of univariate dichotomous models, the probit and logit models usually give similar results and it is difficult to distinguish between them statistically except in cases where the data is heavily concentrated in the tails due to the characteristics of the problem under study. However, they also warn that in the case of multivariate and multi-response models, logit and probit differ substantially and the choice will depend on how the joint or conditional probabilities of two or more discrete dependent variables are specified.

Schmidt (1984) analyses the relative merits of different statistical methods applied in the estimation of the probability of default. He concludes that logit analysis provided the best results and that (subject to the availability of recent data) it could also be useful in the search for early warning signals of debt difficulties.

Saini and Bates (1984) summarise the general weakenesses in the specification of models applied in assessing country risk:

a) The selection of independent variables excludes social and

political factors which may give rise to repayment problems;
b) There is a lack of analysis of the role of supply conditions and lenders' perception of the creditworthiness of the borrower;
c) Models should account for structural shifts of the parameters over time and also for the heterogeneous nature of the countries involved in the samples.

Fortunately, as we will see in chapters 3 and 4, recent work has taken the above criticims seriously. For example: the paper by Berg and Sachs (1988) provides an interesting way of including social and political variables; Eaton and Gersovitz (1981) take seriously the interrelation between demand and supply in the sovereign credit market; and McFadden et. al. (1985) and Hajivassiliou (1987) consider the problems raised by pooled samples.

The ability to predict debt repayment problems depends not only on how the model is specified, but also on the ability to forecast the value of the explanatory variables. Not only does incomplete data preclude statistical projections but also some variables (like inflation, money growth, exchange rates) are difficult to project especially in situations where borrower countries are going through unsucessful stabilisation programmes.

4. Conclusions

The past has taught us that default and disruption in the credit market are not new phenomena. What is new is the different nature of the participants in the credit market and the way debt is now managed.

Bond holders lending at fixed interest rates have been replaced by multilateral agencies lending at concessional rates and these, in turn, have been replaced by private commercial banks lending at floating interest rates. The fact that bond holders were scattered made it difficult to renegotiate agreements in the event of repayment difficulties. In constrast, syndicated bank lending facilitates those renegotiations to prevent outright default but also makes borrowers more exposed to lending interest rate fluctuations.

In the past, the losses incurred by bond holders as a result of default meant that, for some time, country borrowers could not access the credit market. Whether sanctions were conscientiously imposed by lenders or were just a consequence of the effects of the 1930s depression and World War II is still a puzzle. Negotiations for arrears settlements took place after a default and contained substantial debt relief.

From the late 1940s onwards, creditors and debtors meet when there is a serious outright default risk. The IMF participates in these meetings as an "arbiter" whose responsibility is to design and evaluate stabilization programmes for the economic recovery of the borrower country. The Paris Club serves as a forum to establish the general conditions for these agreements. Final agreements are reached on a bilateral basis. Defaults in the early 1980s have also been followed by credit cuts. These credit cuts seem to result mainly from the reaction of commercial banks who attempted to limit their heavy exposure on developing country loans, and to a lesser extent to the 1980-82 world recession. Outright defaults are not a characteristic of the 1980s, but "technical" defaults and reschedulings are. At the onset of the debt crisis, the vulnerability of the international

financial system to considerable debt servicing disruption might explain the banks' preference for reschedulings with no elements of debt relief.

The debt-related literature explores the nature and interaction of lenders and borrowers when collateral can not be used as a guarantee for repayment and penalties are needed to enforce repayment. Penalties, in general, are modelled as permanent exclusion from the credit market. Rescheduling is welfare improving because the sanctions are not imposed and lenders keep the option of being paid in the future. This explains, at least partially, why debt reschedulings have been at the top of the bankers' agenda. However, researchers pointed out that continuous reschedulings are not sustainable because they weaken the credibility of sanctions. One solution would be the granting of debt relief linked to an appropriate debt restructuring.

If one of the reasons put forward by bankers for not granting a straight debt write-down was the need to preserve "discipline" among borrowers, the actual practice of successive reschedulings (with no elements of debt relief) has not helped them to achieve this.

Reschedulings proved to be unsuccessful in restoring borrowers' capacity to pay and bankers have increased their debt loss provisions. An active secondary debt market has emerged signalling lack of confidence that the debt will be repaid in full. This market has provided a menu of different options to achieve debt relief, for example buybacks, securitization and debt-equity swaps.

Researchers have debated the cost and benefits of these voluntary debt reduction schemes. They have suggested that for countries with

debt overhang problems, these transactions can offer potential welfare gains for borrowers and lenders. However, there is still considerable controversy about the extent of debt relief that this market can provide.

As a final observation on why "debt fatigue" persists we can, perhaps, conclude this chapter by quoting Dornbusch (1984, p.533): "...Today debts are continuing to be serviced and the burden of making that possible has been placed by the international financial system, with the assistance of the IMF, squarely on the debtors. ... One might argue (or even believe) that this is essential to maintain order in the international financial system, but that of course raises the question of in whose interest the system works. For many who are paying the bill now there have been few benefits before and there are no obvious ones down the road."

Chapter 2

International Sovereign Loans: Some Theoretical Insights

1. Introduction

Cross border loans to sovereign borrowers (i.e. country governments) have an inherent risk attached derived from the lack of collateral to guarantee such loans and immunity from the legal process. In this context, the "sovereign risk hypothesis" is based upon the idea of debt transformation and interest rate risk, but not on complete loss risk since countries can not be liquidated or disappear like private firms (Kettle and Magnus, 1986; Cuddington and Smith, 1985; Plan, 1985; Sachs, 1984; Friedman, 1983; Sachs and Cohen, 1982). In the case of an individual agent (i.e. firm, corporation) bankruptcy reflects negative net worth. Laws are provided to define this condition and creditors are compensated in accordance with the agent's remaining assets[i].

Sovereign risk refers to the possibility that the government can choose not to adhere to past commitments with foreign creditors and can change domestic policies or laws in a way that severely reduces the real value of foreign loans to creditors. Lenders can not obtain legal remedies for breach of contract since contracts per se are not

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[i]Bulow and Shoven (1978) suggest that whether a firm chooses to continue operating or cease operations depends on several variables besides its net worth position and the legal costs associated with bankruptcy. In general, a longer debt structure, an asset portfolio with a higher percentage of cash or liquid assets and a more variable future return will increase the circumstances under which a firm will continue operating.

enforceable. A country's ability to pay its debt is thus no guarantee that creditors will be repaid. Specifically, it is the borrowing government's willingness to repay that is critical to sovereign lending and unless private creditors are willing to coerce debtor governments into repayment, there is no explicit legal mechanism that can be used to avoid debt repudiation. This does not of course imply default will always occur; private creditors do have some ways of penalising defaulting debtors to ensure repayment.

Kaletsky (1985) asserts that sanctions may take two forms: Firstly, legal sanctions such as attachment of assets, assets seizure, etc. The cases of Iran (1980) and Argentina (1982) where external asset freezing for political reasons was imposed by the American and British government respectively, show the plausibility of imposing these types of sanctions. Another example, this time debt related, is the 1986 Peruvian experience of announcing maximum debt related payments of 10% of export earnings and converting international reserves into 700 tonnes of gold which were transfered from Swiss banks to the vaults of the Peruvian Central Bank ("The Guardian", 26/02/86). Secondly, there is the possibility of non-judicial sanctions, that is retaliation in financial and trading flows (cuts in trade credits and other credit lines, trade boycott, trade embargo, tariff barriers, etc.)

From this list, the only type of potential sanction that private creditors can implement directly is a credit cut. Trade retaliation, seizure of assets, etc. need the intervention of the lender's government and may induce adverse reaction from the international community.

The aim of this chapter is to analyse the implications of sovereign risk using a simple two-period model, so as to shed light upon the behaviour of the international loan market and highlight that the intrinsic nature of the loan (i.e. sovereign) creates market inefficiencies.

As suggested before, in the absence of penalty cost, repudiation would always be optimal for the borrower. Thus, lenders in anticipation of the borrowers' decision, will not lend in the first place. This is the classical chain store paradox of Selten (1978). Translating it to the context of sovereign international lending, the obvious (and counterfactual) implication is that neither borrowers nor lenders exist.

Modelling the form of repudiation punishment remains very controversial and an active area of research[2]. We will assume (a la Krugman, 1985) that a borrower who repudiates his debts will face permanent exclusion from the credit market (imposed directly by the lenders) and a stochastic repudiation penalty which takes the form of a loss of a fraction λ of the borrower's country output. This stochastic penalty may be interpreted as trade retaliation, international disruption, financial panic, seizure of assets, etc. and may cause harm to the borrower country if imposed[3]. The punishment threat is made credible because borrowers recognise that lenders

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[2]See among others, Sachs and Cohen (1982), Eaton and Gersovitz (1981) and Gosh (1985) for a discussion on this issue.

[3]The model presented in this paper does not allow for international trade. However, it is possible to think about a borrower maximising utility defined on consumption subject to C=Y-I-G-X+M budget constraint.

(supported by their governments) are unwilling to forgive past debts at least in the immediate future[4].

The reason for making the indirect penalty the only uncertain variable is twofold. On the one hand, we want to emphasise "pure" repudiation incentives (unwillingness to service the debt) and not "involuntary" repudiation (willingness but inability to service the debt) or in the Grossman and Van Huyck (1985) terminology, inexcusable and excusable default. Secondly, given a finite horizon model, the possibility of punishment makes the terminal decisions non trivial.

The model possesses similar features to the one presented in Sachs (1982) and Kletzer (1985). It differs from the first mainly in the treatment of the penalty cost and from the second, in that it does not rely on information asymmetries to derive ex ante competitive loan contracts which are characterised by credit rationing. Imperfect information (moral hazard, adverse selection and incomplete information) will just add to the market inefficiencies. In addition, we reset the model in a bilateral monopoly context and include elements of bargaining in the international sovereign loan market.

The chapter is organised as follows. Section 2 sets out the assumptions of our basic model, section 3 analyses the competitive market equilibrium while section 4 deals with the bilateral monopoly

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[4]Lindert and Morton (1989) argue that most of the countries which defaulted on their debts in the 1930s were not consistently punished. Faithful and unfaithful repayers suffered from credit contraction caused by the worldwide crises. In the last fifty years, China, Cuba and North Korea have repudiated their debts and have faced isolation from western international markets. Nicaragua in 1980 took the punishment threat seriously and has chosen not to repudiate.

market equilibrium. Section 5 presents some applications and provides some insights on debt restructuring. Finally, the last section presents the conclusions.

2. Assumptions of the Model

The following assumptions characterise borrowers and lenders:

1. The representative borrower lives two periods and inherits a debt ($D=D_1+D_2$) which must be repaid in the following two periods according to a loan contract signed by his predecessor.

2. If the borrower does not repudiate in t=1, he gets a new loan L. At the end of the second period he chooses between servicing the debt (interest and principal corresponding to D_2 and L) or repudiating.

The repayment of the inherited debt and the supply of new loans are intended to capture the idea of borrowers' "good will" and lenders' confidence in the borrowers' behaviour i.e. a grasp of reputation without having to introduce valid but complicated issues.

3. Loans can only be used for purposes of additional consumption i.e. the borrower can consume more today only at the expense of having to repay in the future. This use of funds has a double effect on the borrower: it gives him an incentive to service the debt and to obtain a new loan but a disincentive for repayment in t=2.

4. Let λ_t (the fraction of the borrower's output that is forfeited in period t (t=1,2) if he defaults) be a random variable which takes any value in the continuum [0,1]. Let $g(\lambda_t)$ be the density function of λ_t and assume it is continuous and differentiable. Also, let λ_t^* be the fraction of the borrower's output loss which will make him indifferent between repaying and repudiating.

5. There is symmetric information between borrowers and lenders concerning the value of λ_t to be realised. The sequence of information and decisions is as follows: At t=1, λ_1 (but not λ_2) is revealed and the borrower decides whether to repay or repudiate. If he decides to repudiate, he bears the penalties and makes no further decision of repudiating or repaying. If the borrower repays in t=1, he still has the chance of repudiating in t=2. Once again, λ_2 is revealed before he decides whether to repay or repudiate in t=2.

6. Income in both periods, Y_t, is certain and after debt servicing (principal plus interest) is at least as great as the minimal consumption necessary for the survival of the representative borrower. This assumption ensures ability to pay.

7. Output is not storable, so current output can only be used for the purposes of consumption and servicing the debt. The abcsense of savings and investment from the model is purely for simplicity.

8. The lending interest rate on past and new loans is known but can differ across periods. Let r_t denote the lending interest rate charged in t=1,2.

9. The representative borrower maximises an additively separable utility function defined on consumption. This objective function is of the Eaton and Gersovitz (1981) type:

In t=1, the borrower's objective function is:

$$U = u_1(C_1) + \beta Eu_2(C_2)$$

subject to his budget constraint (which depends on his decision to repay or repudiate)

where $\beta = 1/(1+\rho)$ is the discount factor, ρ is the rate of time preference and E is the expectation operator.

10. Lenders acquire deposits at a non-stochastic competitively-determined interest rate $\bar{r}$. They are risk neutral and

maximise expected discounted profits.

3. Competitive Market Equilibrium

3.1. Borrower Behaviour

The borrower's opportunity set changes depending on what he decides in the first and second period. The borrower solves the following problem:

$$\text{Max } U = u_1(C_1) + \beta E u_2(C_2)$$

subject to:

If the borrower repudiates in t=1: $C_t = Y_t(1-\lambda_t)$ $\quad t=1,2.$

If the borrower repays in t=1 but repudiates in t=2:

$$C_1 = Y_1 + L - (1+r_1)D_1 \text{ and } C_2 = Y_2(1-\lambda_2).$$

If the borrower always services his debts:

$$C_1 = Y_1 + L - (1+r_1)D_1 \text{ and } C_2 = Y_2 - (1+r_2(L+\bar{D}_2))$$

where $\bar{D}_2 = (1+r_1)D_2$

The borrower's problem is solved backwards because what happens in t=2 is contingent on what he decides in t=1.

If the borrower repudiates in t=1, he will not face any repudiation-repayment decision in t=2. In this case, his expected utility is:

$$EU\Big|_{\lambda_1(\lambda_1^*)} = u_1[Y_1(1-\lambda_1)] + \beta \int_0^1 u_2[Y_2(1-\lambda_2)]g(\lambda_2)d\lambda_2 \qquad (1)$$

If the borrower services his debts in t=1, then he has to decide between repudiating or servicing his debts in t=2. The borrower's problem as viewed in t=1 and conditional on debt servicing in t=1 is:

$$\underset{L,\lambda_2^*}{\text{Max}}\ EU\big|_{\lambda_1\rangle\lambda_1^*} = u_1[Y_1+L-(1+r_1)D_1]+\beta\left[\int_0^{\lambda_2^*} u_2[Y_2(1-\lambda_2)]g(\lambda_2)d\lambda_2 + \int_{\lambda_2^*}^{1} u_2[Y_2-(1+r_2)(L+\bar{D}_2)]g(\lambda_2)d\lambda_2\right] \qquad (2)$$

The first order conditions for this problem are:

$$u_1'[Y_1+L-(1+r_1)D_1]-\beta(1+r_2)\int_{\lambda_2^*}^{1} u_2'[Y_2-(1+r_2)(L+\bar{D}_2)]g(\lambda_2)d\lambda_2=0 \qquad (3a)$$

$$\beta\left[u_2'[Y_2(1-\lambda_2^*)]g(\lambda_2^*)-\int_{\lambda_2^*}^{1} u_2'[Y_2-(1+r_2)(L+\bar{D}_2)]g(\lambda_2^*)\right]=0 \qquad (3b)$$

Equation (3b) then implies:

$$\lambda_2^*=(1+r_2)(\bar{D}_2+L)/Y_2 \qquad (4)$$

which is the debt service (including amortisation) output ratio. It defines the level of punishment that exactly pays off debt obligations. Then the borrower repudiates if and only if $\lambda_2\langle\lambda_2^*$. The corresponding probability of repudiating in t=2 may then be written as $P_2=G(\lambda_2^*)$ where G(.) is the cumulative distribution function of g(.). It can be easily checked that $\delta P_2/\delta r_2$, $\delta P_2/\delta L$, $\delta P_2/\bar{D}_2\rangle 0$ and $\delta P_2/\delta Y_2\langle 0$. That is, the higher the debt service (amortisation and interest) to output ratio, the higher the probability of repudiating. For a given output, it also captures the double channel (new loans and past debts) through which an increase in r_2 affects interest debt burden and in consequence, repayment prospects. This sheds some light

on one of the causes of the 1982 debt crisis i.e. higher real interest rates which increased the service payment substantially.

Equation (3a) gives us the familiar expression

$$u_1'(C_1)=\beta(1+r_2)(1-P_2)E\left[u_2'(C_2|_{\lambda_2}\rangle\lambda_2^*)\right],\quad u_1'=\delta u_1/\delta C_1,\quad u_2'=\delta u_2/\delta C_2 \qquad (5)$$

i.e. the marginal utility from borrowing in t=1 equals the discounted (by the rate of time preference) marginal utility from repayment in t=2.

From equations (1), (2) and (4), we can readily note that in like manner the borrower will be indifferent between repaying and repudiating at the beginning of t=1 if $\lambda_1=\lambda_1^*=[(1+r_1)D_1-L]/Y_1$ which can be interpreted as the net outflow-to-output ratio. As before, the probability of repudiating in t=1 may be written as $G(\lambda_1^*)$. Once more, $\delta P_1/\delta r_1$, $\delta P_1/\delta D_1\rangle 0$ and $\delta P_1/\delta L$, $\delta P_2/\delta Y_2\langle 0$. Ceteris paribus, an increase in L may decrease the probability of repudiating in period t=1. This result is interesting because lenders might lend $L=(1+r_1)D_1$ in t=1, avoid non repayment and have the hope of being repaid in full in the next period. This helps to understand the rationale for the "financing" debt strategy followed right after the debt crisis.

If the borrower has not repudiated in t=1, his demand for loans is found by solving implicitly for L from FOCs

$$L^*=L(Y_1,\ Y_2,\ r_1,\ r_2,\ D_1,\ \bar{D}_2) \qquad (6)$$

Substitution of (6) into (2) gives the maximum expected value function

$$EU^*|_{\lambda_1}\rangle\lambda_1^* = U^*(L^*,\ r_2;\ Y_1,\ Y_2,\ r_1,\ D_1,\ \bar{D}_2) \qquad (7)$$

which by assumption is continuous and differentiable.

The expected isoutility contours derived from (7) are, in (L, r_2) space, monotonically increasing up to L^* and monotonically decreasing thereafter. This is readily shown by setting $E\,U\big|_{\lambda_1 \rangle \lambda_1^*}$ equal to some constant value and totally differentiating (2) holding Y_1, Y_2, D_1, $\bar{D}_2$ and r_1 constant.

$$\left.\frac{dL}{dr_2}\right|_{EU\big|_{\lambda_1 \rangle \lambda_1^*}} = \frac{\beta(L+\bar{D}_2)(1-P_2)E\left[u_2'(C_2\big|_{\lambda_2 \rangle \lambda_2^*})\right]}{u_1'(C_1) - \beta(1+r_2)(1-P_2)E\left[u_2'(C_2\big|_{\lambda_2 \rangle \lambda_2^*})\right]} \tag{8}$$

so $\left.\frac{dL}{dr_2}\right|_{\substack{\bar{U} \\ L<L^*}} > 0$, $\left.\frac{dL}{dr_2}\right|_{\substack{\bar{U} \\ L=L^*}} = \infty$, and $\left.\frac{dL}{dr_2}\right|_{\substack{\bar{U} \\ L>L^*}} < 0$

Note that for any given L, the effect of changes in r_2 on $EU\big|_{\lambda_1 \rangle \lambda_1^*}$ is unambiguously negative i.e. $\left.\frac{\delta EU}{\delta r_2}\right|_{\lambda_1 \rangle \lambda_1^*} < 0$; but for any given r_2, the effect of changes in the level of loans is ambiguous i.e. $\left.\frac{\delta EU}{\delta L}\right|_{\lambda_1 \rangle \lambda_1^*} \gtrless 0$ if $L \lessgtr L^*$. Intuitively, a decrease in interest rates always benefits him; however, an increase in the volume of loans (over borrowing over lending) may hurt him because the disutility from servicing the debt in t=2 could more than offset the utility gained from having the loan in t=1.

Proposition 1

The borrower's demand for loans in (L, r_2) space will be downward sloping if he is sufficiently risk averse so as to outweigh the change in the probability of repudiating due to an increase in the lending

interest rate. That is,

$$\frac{dL^{*}}{dr_2} < 0 \qquad \text{if} \qquad A_2 > \frac{\lambda_r^{*} - (1-P_2)/(1+r_2)}{(1-P_2)(\bar{D}_2+L)}$$

where A_2 is the absolute risk aversion coefficient corresponding to t=2 and $\lambda_r^{*} = (\delta\lambda_2^{*}/\delta r_2)g(\lambda_2^{*})$.

The above proposition can be proved by differentiating (5) and taking into account equation (4).

A slight manipulation of the above condition shows that fulfilment of the second order conditions is both necessary and sufficient to yield a downward sloping demand for loans[5].

We are now in position to sketch the borrower's expected isoutility contours and the corresponding demand for loans where $U_0 < U_1 < U_2$ and also where the positive effect of a decrease in r_2 is bigger than an increase in the new amount borrowed capturing the influence of the inherited debt on the borrower's optimum decision (figure 1).

3.2. Competitive Lenders

Lenders maximise the expected present discounted value of profits. Expected profits conditional upon what happened at date t=1 are:

If borrowers repudiate in t=1:

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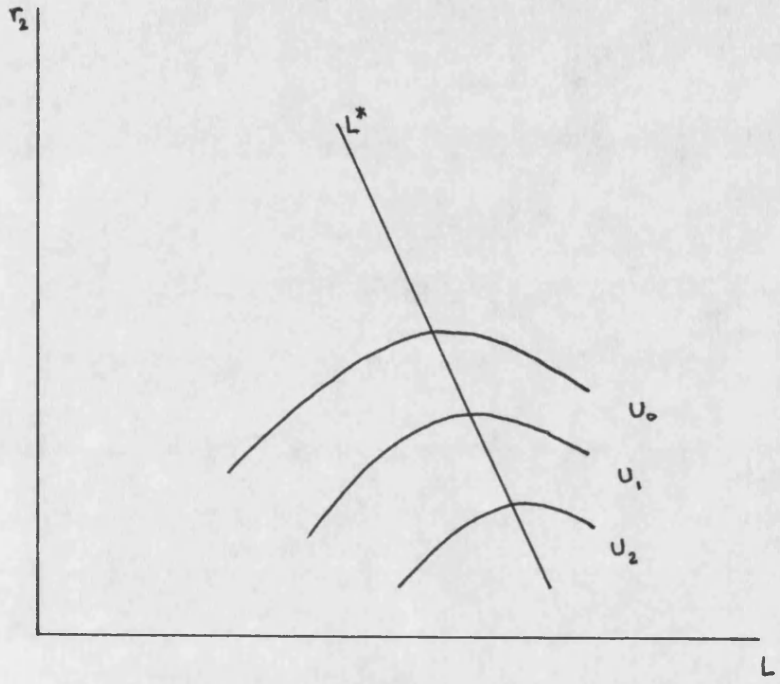
[5] Second order conditions are checked in the appendix.

Figure 1

Expected Isoutility Contours and Demand for Loans



$$E\pi\Big|_{\lambda_1<\lambda_1^*} = -(1+\bar{r})(D_1+\xi\bar{D}_2) \qquad (9)$$

where $\xi=1/(1+\bar{r})$ is the discount factor and L=0.

If borrowers service their debts in t=1[6]:

$$E\pi\Big|_{\lambda_1>\lambda_1^*} = \xi\{(1-P_2)(1+r_2)(L+\bar{D}_2)-(1+\bar{r})(L+\bar{D}_2)\} \qquad (10)$$

Because lending is a natural course of action only if borrowers repay in t=1, the option of analysing the case where borrowers service their debts in t=1 needs no major justification.

Risk neutrality and perfect competition in the credit market imply zero expected profits

$$(1-P_2)(1+r_2)(L+\bar{D}_2) = (1+\bar{r})(L+\bar{D}_2) \qquad (11)$$

i.e. expected gross revenue of supplying the loan equals the cost which lenders have to face irrespective of the repayment-repudiating decision of the borrower.

Under perfect competition and free entry, if L>0 and $0<P_2<1$, then $r_2>\bar{r}$. The difference between r_2 and $\bar{r}$ may be interpreted as the repudiation premium ($\bar{r}$ is equal to the safe interest rate in a perfect capital market) which compensates for the risk involved in lending[7]. This follows directly from (11). Let $s=r_2-\bar{r}$, then $s=(1+\bar{r})P_2/(1-P_2)$. If $P_2=0$ then s=0 but if P_2 tends to 1, then s tends to infinity. The repudiation premium (s) is positively related to the repudiation

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[6]Under the assumption of perfect competition in the loan market, outgoings equal expected receipts, i.e. $(1+\bar{r})D_1=(1+r_1)D_1[1-G(\lambda_1^*)]$.

[7]See Edwards (1986) who analyses the determinants of the spread by relating it to the probability of non repayment.

probability and what is more important, it is endogenously determined depending on the behaviour of lenders and borrowers.

Solving (11) for L gives the implicit market supply for loans

$$L=L(r_1,\ r_2,\ \bar{D}_2,\ Y_2,\ \bar{r}) \tag{12}$$

and its shape in (L,r_2) space is derived by differentiating the zero expected profit maximisation condition

$$\left.\frac{dL}{dr_2}\right|_{E\pi|\lambda_1\rangle\lambda_1^*=0} = -\ \frac{(1-P_2)(L+\bar{D}_2)-(1+r_2)(L+\bar{D}_2)\lambda_r^*}{(1-P_2)\ (1+r_2)-(1+r_2)(L+\ \bar{D}_2)\lambda_L^*-(1+\bar{r})} \tag{13}$$

where $\lambda_L^*=(\bar{\delta}\lambda_2^*/\bar{\delta}L)g(\lambda_2^*)$ and $\lambda_r^*=(\bar{\delta}\lambda_2^*/\bar{\delta}r_2)g(\lambda_2^*)$.

Proposition 2

The competitive supply curve for loans is increasing up to $r_2^*=[(1-P_2)/\lambda_r]-1$ and decreasing thereafter.

Zero expected profits implies that in (13) the denominator is negative while the numerator is positive (negative) for low (high) levels of L respectively, hence $\left.\frac{dL}{dr_2}\right|_{\substack{E\pi|\lambda_1\rangle\lambda_1^*=0\\ L\rangle 0}} \gtrless 0$. By continuity, there must exist a value for r_2 equal to r_2^* such that $\left.\frac{dL}{dr_2}\right|_{\substack{E\pi|\lambda_1\rangle\lambda_1^*=0\\ L\rangle 0}}=0$.

The interpretation of this proposition relies on the relation between expected profits and the repudiation probability, both depending on the levels of L and r_2. Select a point (L,r_2) on the $E\pi=o$ locus. If L is very small, the probability of repayment is high

and the repudiation premium (s) very low. An increase in L, for given $\bar{r}$, implies negative expected profits since the probability of repudiation increases. A rise in r_2 is required to offset this increment in the lending risk. Obviously, a rise in r_2 has a negative impact on the probability of repayment but the net effect is still positive. Then, as L and r_2 increase, loans are still forthcoming. However, changes in r_2 affect the repudiation probability through two channels: the new loan and the old debt. Eventually, an r_2^* is reached such that further increments in L and r_2 raise the repudiation probability and yield negative expected profits. After this r_2^*, additional r_2 increments can only be implemented with cuts in L.

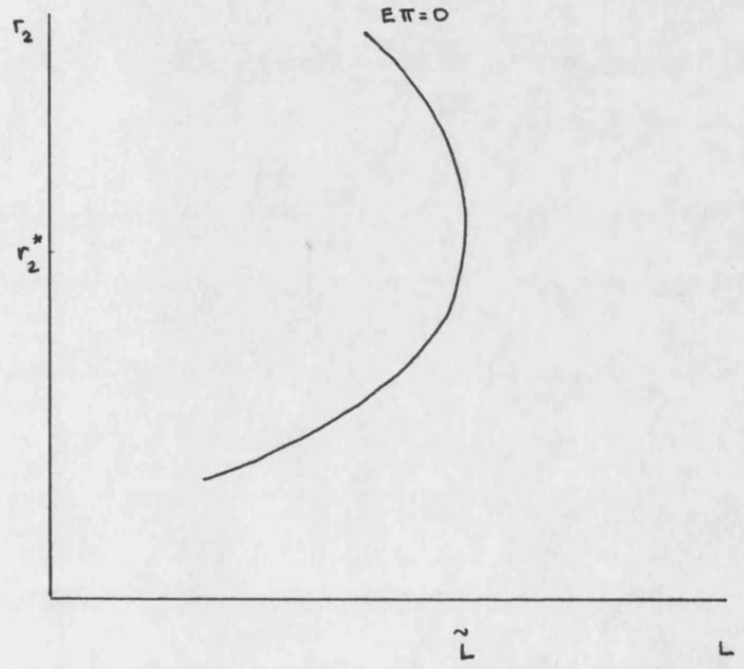
Note that in Proposition 2, $r_2^*>0$ if $1-P_2>\lambda_r$ (i.e. the probability of repayment outweighs the effect of a change in the probability of repudiating caused by a small change in r_2).

Figure 2 depicts the implicit competitive market supply for loans. As r_2 rises above r_2^*, L should decrease in order to compensate for expected losses due to the effect of the change of r_2 in the repayment probability. In other words, lenders will not extend credits beyond $\tilde{L}$ at any lending interest rate. A higher repudiation premium could only be achieved at the cost of less loans, but cannot be increased forever since it affects old debts and in consequence, the repayment probability.

The effects of an increase in r_2 and L on the repudiation probability are always positive but their contribution will differ depending on the amount of new loans and the interest service

Figure 2

Expected Isoprofit Contour



corresponding to past debts

$$\frac{\bar{\delta}P_2}{\bar{\delta}r_2}\frac{r_2}{P_2} = \frac{(L+\bar{D}_2)g(\theta_2^*)}{Y_2}\ \frac{r_2}{P_2} \gtreqless \frac{\bar{\delta}P_2}{\bar{\delta}L}\frac{L}{P_2} = \frac{(1+r_2)g(\theta_2^*)}{Y_2}\ \frac{L}{P_2} \qquad \text{if } r_2\bar{D}_2 \gtreqless L$$

Remark

Having derived the ex ante market equilibrium, it is possible to argue that at the level of the individual competitive lender, the ex ante supply for loans is perfectly elastic at the market equilibrium lending interest rate. Since the probability of repudiation perceived by borrowers and lenders is the same, the lender takes also the repayment probability (which is determined by the market equilibrium) as given. The lender's supply of loans is given by $r_2=[(1+\bar{r})/(1-P_2)]-1$ and $dL/dr_2=\infty$.

3.3. Market Equilibrium

The market has n lenders and borrowers where n is large, finite and fixed. Borrowers are perceived as equally risky and also, they are indifferent from whom they borrow. In other words, there are no asymmetries. In addition, it is assumed that no binding agreements or commitments are possible.

In the conventional setting of perfect competition, the market demand is derived by asking an individual how much he will borrow at each prevailing interest rate, and then aggregating over all potential borrowers. The market supply is constructed in a similar way. Equilibrium is found by superimposing these two sides of the market. With uncertainty, it is no longer possible to analyse these two sides of the market separately because the optimal behaviour of the

borrowers depends on what lenders do and vice versa. Therefore, demand and supply must be considered simultaneously (Heffernan ,1986; Cuddington, 1985; Krugman,1985).

The Nash or competitive market outcome is given by the simultaneous solution of equations (4), (5) and (11). An equilibrium may fail to exist or we may face the possibility of having multiple equilibria. Nevertheless, we assume that one exists and that it is unique. We label it $N=(L^n, r_2^n)$.

However, assume that a new loan is forthcoming only if borrowers repay $(1+r_1)D_1$, and that the decision whether to repay or repudiate in t=1 depends on the borrowers. In this sense, borrrowers behave as Stackelberg leaders i.e. they maximise present discounted value of utility on the assumption that lenders will accept it and take it as given in maximising their own present discounted value of expected profits. Formally,

$$\text{MaxEU}\left|_{\lambda_1}\right\rangle \lambda_1^* = u_1(C_1) + \beta\left[P_2 E[u_2(C_2)\left|_{\lambda_2}\right\langle \lambda_2^*] + (1-P_2)E[u_2(C_2)\left|_{\lambda_2}\right\rangle \lambda_2^*]\right] \qquad (14)$$

$$\text{s.t. } (1-P_2)(1+r_2)(L+\bar{D}_2)-(1+\bar{r})(L+\bar{D}_2)=0$$

i.e. borrowers find the best available combination of (L, r_2) that satisfies the implicit market supply for loans which may be interpreted as the lenders' optimal reply. The solution to (14) is given by the tangency of the expected isoutility contour and the market supply for loans

$$\frac{u_1'(C_1)-\beta(1+r_2)(1-P_2)Eu_2'(C_2\left|_{\lambda_2}\right\rangle \lambda_2^*)}{-\beta(L+\bar{D}_2)(1-P_2)Eu_2'(C_2\left|_{\lambda_2}\right\rangle \lambda_2^*)} = \frac{(L+\bar{D}_2)[(1-P_2)-(1+r_2)\lambda_r^*]}{(1+r_2)[(1-P_2)-(L+D_2)\lambda_L^*]-(1+\bar{r})} \qquad (15)$$

and using equation (11),

$$\frac{u_1'(C_1)-\beta(1+r_2)(1-P_2)Eu_2'(C_2|\lambda_2)\lambda_2^*)}{\beta(L+\bar{D}_2)(1-P_2)Eu_2'(C_2|\lambda_2)\lambda_2^*)} = \frac{(L+\bar{D}_2)[(1-P_2)-(1+r_2)\lambda_r^*]}{(1+r_2)(L+\bar{D}_2)\lambda_L^*} \qquad (15')$$

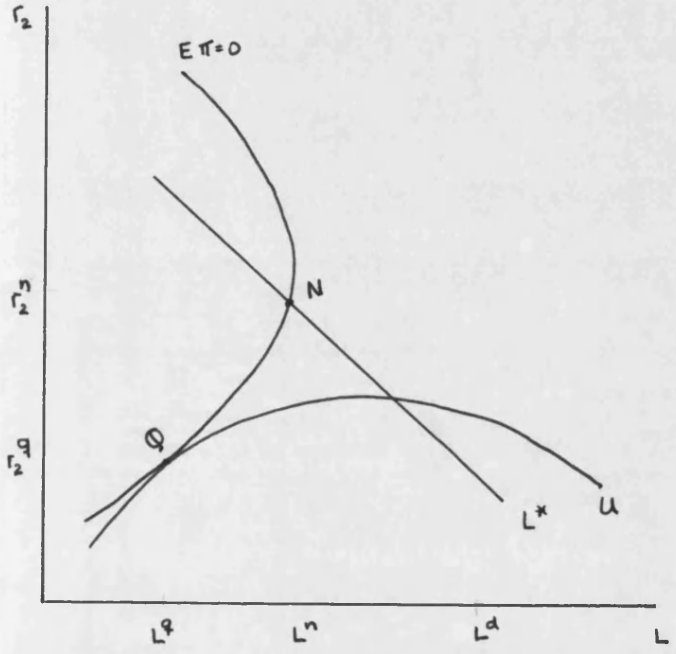
which is positive for low levels of L implying that $L<L^n$ and $r_2<r_2^n$. We label this equilibrium $Q=(L^q,r_2^q)$. The Stackelberg and Nash equilibria are graphed in figure 3. Equation (15') suggests that at the Stackelberg solution, the slope of the market supply for loans and the borrowers' isoutility contour is positive. Moreover, being on the demand schedule implies that the numerator of the LHS is equal to zero which does not satisfy the above equation. This reinforces the argument that at the Stackelberg solution, the borrowers are off their demand for loans.

Definition: An ex ante loan contract defined in (L,r_2) is a competitive (Nash) equilibrium if no participants can gain by deviating unilaterally from it. This Nash loan contract will be a constrained Pareto optimum if no agent's welfare can be improved without decreasing that of another.

The Nash credit market equilibrium (N) entails no credit rationing but it is not optimal. The equilibrium Q is a constrained optimum since applicants get a smaller loan than they desire at the quoted interest rate or it may be the case that some applicants are denied loans even though for the lenders, borrowers are identical. Risk averse borrowers choose the lowest possible r_2 for which $L>0$ when maximising present discounted value of expected utility because of the uncertain cost of repudiation and the effect of high interest rates on the debt burden. Lenders can not ensure repayment and for a given r_2^q they will offer a low level of L ($L^q<L^d$), otherwise their $E(\pi)<0$ and

Figure 3

Nash and Stackelberg Equilibria



N: Nash equilibrium

Q: Stackelberg equilibrium

thus, no loan is supplied. Credit rationing occurs due to the uncertain repudiation penalty, risk averse borrowers and the non monotonicity of the expected supply of loans.

This inefficiency may be also interpreted as arising from externalities (Glick and Kharas, 1986). From the perspective of the country as a whole, the lending interest rate rises with the volume of loans and has a negative effect on the repudiation risk associated with the aggregate stock of debt. Individual borrowers may not take into account the rising part of the supply curve which leads to an equilibrium associated with excess borrowing from the social point of view. A policy measure leading to reduced borrowing could be welfare improving.

The situation just described can also be contrasted with the efficiency wage hypothesis where involuntary unemployment is due to high wages and the labour market does not clear because a cut in wages may harm productivity and in consequence, increase labour costs (Katz, 1986; Yellen, 1984). In the case of the model presented, lenders are not constrained in pursuing their optimal policy. The loan market does not clear at Q but the borrowers' welfare is improved at the cost of "involuntary" credit rationing.

In sum, at $Q=(L^{q},r^{q}_{\tilde{z}})$, lenders will not overlend and borrowers will be credit rationed because borrowers maximise subject to the zero expected profit condition and lenders use all the information available to avoid loan contracts in which the debt might not be serviced. Therefore, although Q is characterised by credit rationing, it is efficient.

The equilibrium Q resembles what Kletzer (1984) called a constrained optimum with observability of concurrent indebtedness and what Krugman (1985) labelled equilibrium lending interest rate. At first sight, the comparison between both studies is confusing since the former assumes asymmetric information while the latter does not. Nevertheless, both studies may be partially reconciled if Krugman's information symmetry is interpreted not only as equal (borrower's and lender's) uncertainty about the repudiation penalty but also common knowledge about the concurrent indebtedness. Indeed, one of the conclusions that arises from his study is that the equilibrium lending interest rate is characterised by credit rationing, but he does not derive the market demand for loans. Kletzer divides lenders into two groups: those with, and those without, observability of concurrent indebtedness. He concludes that "observability" entails credit rationing in the sense that lenders are able to restrict the quantity of loans supplied at any lending interest rate. Therefore, in both studies, it is possible to infer that "non-observability" will give rise to market equilibrium with no credit rationing and a higher interest rate than the "observability" case.

Kletzer constructs an infinite period horizon model where uncertainty comes from the state of nature and the repudiaton penalty is interpreted as credit cuts; while Krugman works out a finite two-period model with uncertain fixed repudiation penalty so the cost of repudiation brings the uncertainty element into his model.

The uncertain indirect repudiation penalty plays a crucial role in finite period horizon models by means of enforcing a loan contract. Credit cuts have no such force. Indeed, if $L<(1+r_1)D_1+\beta(1+r_2)\bar{D}_2$, the

overall net transfer always goes in one direction, from debtors to creditors, making the credit cut penalty less effective.

In infinite horizon models, exclusion from the loan market per se may not guarantee debt servicing. With discounting and assuming a decreasing returns to scale production function, as the country develops, its needs to finance investment will decrease and so its needs to access the credit market (Eaton et al., 1986). Also the direct exclusion penalty becomes ineffective if it is possible to predict a point such that after it is reached, the country borrower does not gain anything from transferring funds to his creditors. In such cases, only when some "flow" uncertainties (e.g. temporary shocks, income variations, terms of trade changes, etc.) are included, the penalty of credit market exclusion really binds.

4. Bilateral Monopoly Market Equilibirium

International sovereign debt has been frequently described as a game between international banks, governments and official institutions (Eaton et al., 1986; Griffith-Jones, 1986; Kettle and Magnus, 1986; Sachs, 1984, 1982).

Pure competition (atomistic lenders and atomistic borrowers) lacks strategic considerations making the game degenerate (Friedman, 1983; Weintraub, 1975). To have an infinite horizon model, three sets of players (government borrowers, lenders and their governments) with the possibility of coalitions and an oligopolistic market structure sounds more realistic but unfortunately very complicated. We confined our analysis to a simple two player finite horizon framework in order

to provide some basic insights concerning international sovereign debt.

Consider the problem of a single risk neutral lender in the international credit market who confronts a single risk averse borrower. In this bilateral monopoly context, the extent to which the (L, r_2) contingent loan agreement is a bargain between the lender and the borrower suggests that elements of conflict might be used in the analysis.

As before, loans are used only for consumption purposes and the finite two period game is defined as follows. There are two players: lender and borrower. The lender's strategy is to maximise expected present discount value of profits, while the borrower maximises utility defined on consumption pending on his decision to repay or repudiate. The payoff functions are:

If the borrower repudiates in t=1: $u_1=u_1[Y_1(1-\lambda_1)]$, $\pi_1=-(1+\bar{r})D_1$.

If the borrower repays in t=1: $u_1=u_1[Y_1+L-(1+r_1)D_1]$, $\pi_1=(r_1-\bar{r})D_1$.

If the borrower repudiates in t=2: $u_2=u_2[Y_2(1-\lambda_2)]$, $\pi_2=-(1+\bar{r})\bar{D}_2$.

If the borrower repays in t=2: $u_2=u_2[Y_2-(1+r_2)(L+\bar{D}_2)]$, $\pi_2=(r_2-\bar{r})(L+\bar{D}_2)$

In addition, complete information (common knowledge) and perfect recall are also rules of the game.

Under the assumption of repayment in t=1, the lender's present discounted value of expected profits as viewed in t=1 is:

$$E\pi\Big|_{\lambda_1>\lambda_1^*} = (r_1-\bar{r})D_1+\beta[(1-P_2)(1+r_2)(L+\bar{D}_2)-(1+\bar{r})(L+\bar{D}_2)] \qquad (16)$$

Maximisation over r_2 or (L) yields the optimal r_2 (or L) which substituted in the above equation gives the maximum value of expected profits, say $\bar{\pi}$. The shape of the isoprofit contour is given by

$$\left.\frac{\delta L}{\delta r_2}\right|_{E\pi=\bar{\pi}} = -\frac{(1-P_2)(L+D_2)-(1+r)(L+D_2)\lambda_r^*}{(1-P_2)-(1+r_2)(L+D_2)\lambda_L^*-(1+\bar{r})} \gtreqless 0 \qquad (17)$$

suggesting the existence of a maximum level of L which satisfies $\bar{\pi}$. Across isoprofit contours, the locus connecting the (L,r_2) points at which equation (17) equals zero is the lender's optimal reply (it may be interpreted as his "supply" of loans) and its slope is derived by differentiating it with respect to L and r_2

$$\left.\frac{dL}{dr_2}\right|_{\lambda_1>\lambda_1^*} = -[-2\lambda_r^*/-\lambda_{Lr}^*(1+r_2)-\lambda_L^*]<0 \qquad (18)$$

where $\lambda_{Lr}=(\delta^2\lambda)_2^*/\delta L\delta r_2)g(\lambda_2^*)$

As in the previous section, if the borrower repays in t=1 his problem is described by equation (2), the shape of his isoutility contour by equation (7) and the slope of his optimal reply (i.e. demand for loans) is negative under the assumption of sufficient risk aversion.

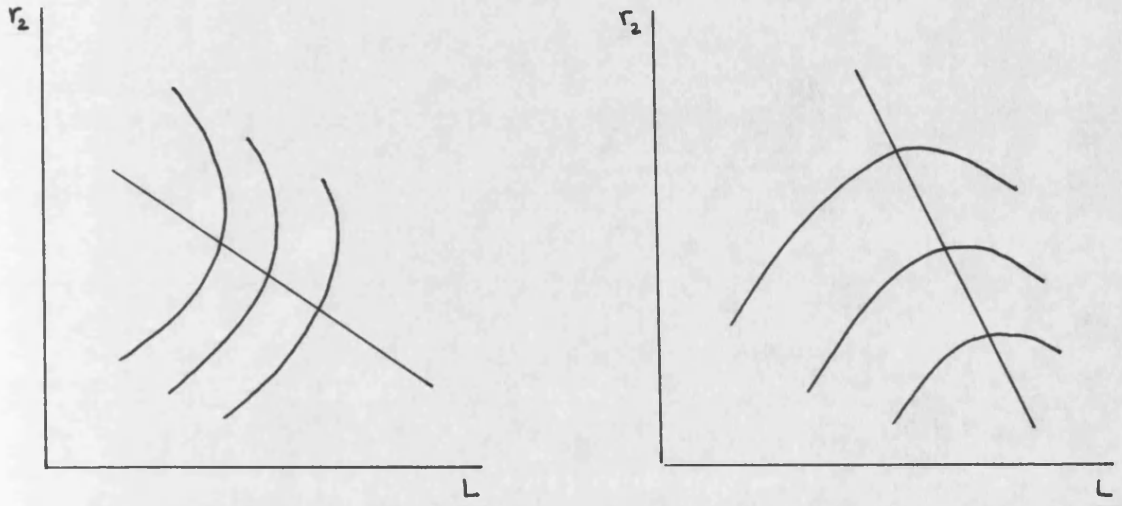
The lender and borrower behaviour is depicted in figure 4. The lender prefers high r_2 and low L, while the borrower prefers low r_2 and high L. Thes opposing interests give rise to conflicts between the two players and indeterminacy of the equilibrium.

4.1. A Dominant Lender

The lender would like to move NW direction as far as he can.

Figure 4

Lender and Borrower Optimal Replies



Lender

Borrower

Given the demand for loans (i.e. maximum level of utility at each quoted interest rate), the best (L,r_2) the lender can achieve is determined by the tangency of the corresponding isoprofit curve with the demand for loans. Formally, the lender

$$\text{Max}E\tilde{\pi}\Big|_{\lambda_1\rangle\lambda_1^*} = (r_1-\bar{r})D_1+\xi\left[(1-P_2)(1+r_2)(L+\bar{D}_2)-(1+\bar{r})(L+\bar{D}_2)\right] \qquad (19)$$

$$\text{s.t. } u_1'(C_1)=\beta(1+r_2)(1-P_2)Eu_2'(C_2\Big|_{\lambda_2\rangle\lambda_2^*})$$

The solution is

$$\frac{(1-P_2)-\lambda_L^*(L+\bar{D}_2)(1-\gamma)A_2}{-(1+r_2)\{(1-P_2)A_1-\lambda_L^*(1-\gamma A_2)\}} = \frac{(\bar{D}_2+L)[(1-P_2)-\lambda_r^*(1+r_2)]}{(1+r_2)[(1-P_2)-\lambda_L^*(\bar{D}_2+L)]-(1+\bar{r})} \qquad (20)$$

where $\gamma=(1+r_2)(1-P_2)/\lambda_L^*$, and A_1 and A_2 are the absolute risk aversion coeficients in t=1 and t=2 respectively. The sign of the LHS of the above equation is negative, suggesting that the lender must be operating at high levels of r_2 (i.e. in the negative slope part of the isoprofit contour).

The loan contract (M) described by the above solution is not efficient because r_2 is too high and L is too low. The lender forces the borrower to pick a low level of L since he imposes a high r_2.

4.2. A Dominant Borrower

The borrower seeks to achieve the lowest isoutility contour, so he wishes to move as far as he can in a S.E. direction. The lender's optimal reply solves for the maximum levels of profits at any given L. The best (L,r_2) combination the borrower can get is determined by the tangency of his isoutility locus with the lender's optimal reply. The borrower solves:

$$E\,U\big|_{\lambda_1\rangle\lambda_1^*} = u_2(C_1)+\beta\left[P_2Eu_2(C_2\big|_{\lambda_2\langle\lambda_2^*})+(1-P_2)Eu_2[C_2\big|_{\lambda_2\rangle\lambda_2^*}\right] \qquad (21)$$

$$\text{s.t. } (1-P_2)(L+\bar{D}_2)-(1+r_2)(L+\bar{D}_2)\lambda_r^*=0$$

so

$$\frac{u_1'(C_1)-\beta(1+P_2)(1+r_2)Eu_2'(C_2\big|_{\lambda_2\rangle\lambda_2^*})}{\beta(L+\bar{D}_2)(1-P_2)Eu'(C_2\big|_{\lambda_2\rangle\lambda_2^*})} = -\left[\frac{\lambda_{Lr}^*(1+r_2)+\lambda_L^*}{2\lambda_r^*}\right] \qquad (22)$$

The sign of the RHS of the above equation is negative and suggests that the borrower must be operating at high levels of L (i.e. negative slope part of the isoutility contour).

The dominant borrower market solution (B) is not efficient. The borrower selects a high level of L and the lender is pushed to charge a low level of r_2. The best a very powerful borrower can do is to drive the lender to accept zero expected profits.

4.3. Bargaining

The situation just described contains elements of conflict and the final equilibrium will depend on the bargaining strength of the two parties involved. Before analysing some ways of obtaining the possible bargaining solution, we characterise the Nash solution.

From proposition 1 and equation (18), the optimal replies of the borrower and the lender slopes downwards. A necessary and sufficient condition for the existence of Nash equilibrium is that the optimal replies intersect at least once in the (L,r_2) positive quadrant. Note that in deriving the optimal replies we have assumed that the lender sets r_2 and the borrower sets L. The equilibrium is stable if the

lender's optimal reply is flatter than the borrower's. This is guaranteed by the fulfilment of the borrower's second order conditions . The Nash equilibrium satisfies $\delta(EU|_{\lambda_1 \rangle \lambda_1^*})/\delta L=0$ and $\delta(E\pi|_{\lambda_1 \rangle \lambda_1^*})/\delta r_2=0$ simultaneously, and it is depicted as N^* in figure 5.

The Pareto negotiation locus (contract curve) is given by the equality of the slope of the lender's isoprofit curves and the slope of the borrower's isoutility curves:

$$\frac{-(1-P_2)(1+r_2)+(1+r_2)(L+\bar{D}_2)\lambda_L^*}{(1-P_2)(L+\bar{D}_2)-(1+r_2)(L+\bar{D}_2)\lambda_r} = \frac{u_1'[Y_1-(1+r_1)D_1+L]-\beta(1+r_2)(1-P_2)Eu_2'(C_2|_{\lambda_2 \rangle \lambda_2^*})}{\beta(L+\bar{D}_2)(1-P_2)\,u_1'[Y_2-(1+r_2)(L+\bar{D}_2)]} \qquad (23)$$

It slopes downwards in (L,r_2) space and lies to the left of the lender's optimal reply[9]. Notice that as a result of the externalities, the Nash solution is not a member of the contract curve i.e. such equilibrium does not belong to the efficient bargaining set. Moreover, the efficiency curve lies below the demand for loans because (23) holds only for positive slope values of the isoutility and isoprofit contours.

To construct the bargaining set, define the set H as the collection of all feasible cooperative outcomes. Assume that the two players may achieve any payoff (u,π) within the payoff space H of the game if they can reach an agreement. The players are free to use any

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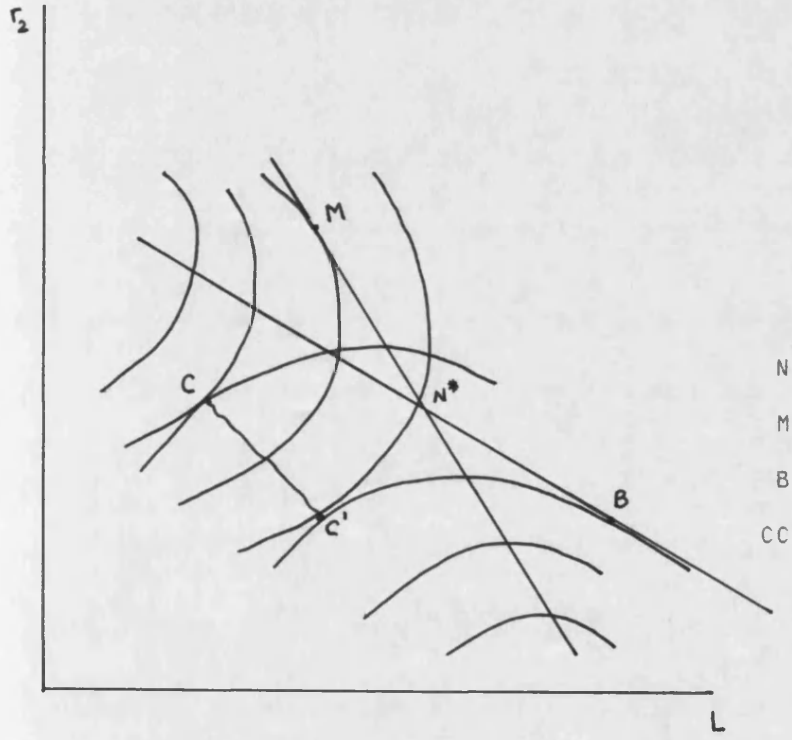
[8] See appendix where stability is also discussed.

[9] See appendix.

Figure 5

A Dominant Lender, a Dominant Borrower and the Nash Equilibrium



N* :Nash equilibrium

M :Dominant lender

B :Dominant borrower

CC':Contract curve

randomised strategies which makes H a convex set and assume that H is compact.

Define the status quo (or autarky) point $q=(u_o, \pi_o)$ as the pay off each player will receive if they fail to achieve an agreement or more accurate, as a situation where none of the players can take unilateral actions to hurt the other[10]. Assume that q is independent or regarded as given i.e. q is fixed. In more general bargaining models, q is treated as a dependent variable and it is computed with the final bargaining equilibrium outcome because the player's choice of a disagreement action is guided by the effect of that action on the final cooperative outcome.

We graph the P payoff space and the set H in figure 6. Any point $x \in P$ such that $x \geq q$ belongs to the negotiation curve. Let ψ be the minimal expectation or conflict point, then the efficient negotiation curve must be restricted to payoffs of at least utility or profit increments if bargaining happens. Thus CC' may be termed the efficient bargaining or negotiation locus.

There is a range of possible bargaining equilibrium points that might be achieved by the borrower and the lender and its choice remains to be explained. Although the static axiomatic approach (originated by Nash) has been criticised among others by Binmore et al. (1985), it constitutes a good starting point when dealing with

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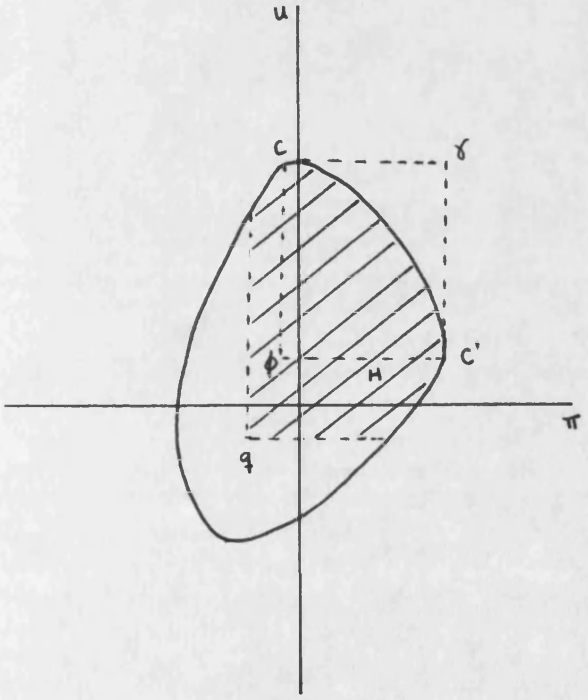
[10] It is possible to distinguish between the status quo and the conflict point. The usual meaning of status quo is the existing states of affairs but should be interpreted as a common point of reference to which the way of resolving the conflict is compared to. The choice of q may be regarded as a matter of modelling judgement (Gupta and Livne, 1986; Friedman, 1986; Binmore et al., 1985).

Figure 6

Payoff Space



γ: maximal expectation
$\gamma = (\gamma_\pi - \gamma_u) \notin H$

φ: minimal expectation

q: status quo

P: set of all possible payoffs

H: set of all feasible cooperative outcomes

cooperative outcomes.

4.3.1. The Nash (Fixed Threat) Bargaining Solution

The Nash solution[11] is an element of H that maximises the product of the players' gains from an agreement (figure 7)

$$\text{Max } E[G]=E[u(.)-u_0]\ [\pi(.)-\pi_0] \qquad (26)$$

and is represented by η i.e. the tangency point between the upper boundary CC' and the hyperbola described by $E[u(.)-u_0]\ [\pi(.)-\pi_0]$.

In the Nash bargaining game, the status quo point (q) has the key role of being the reference point to obtain the Nash solution, narrowing the sets of alternatives taken under consideration. In addition, the condition of independence of irrelevant alternatives implies a priori exclusion of potential agreements from the payoff space since under such postulate, these payoffs would not be chosen by

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[11] The solution must satisfy the following conditions:
1. It must be individually rational (i.e. each player must achieve at least the payoff he will get in case of no agreement) and Pareto optimal.
2. Symmetry and invariance to any positive affine transformation. The solution should be independent of the labelling of the players and independent of the scale chosen to represent the preference of each player.
3. Independence of irrelevant alternatives. Suppose that a solution to H is found. Assume that another set H' exists and that H and H' are related in the following way: they have the same status quo (q=q'). H is contained in H' and that the solution of H' is an attainable point in H. The condition of independence of irrelevant alternatives requires that the solution to H' be the solution to H because q=q' and $H \subset H'$.

Figure 7

The Nash (Fixed Threat) Bargaining Solution

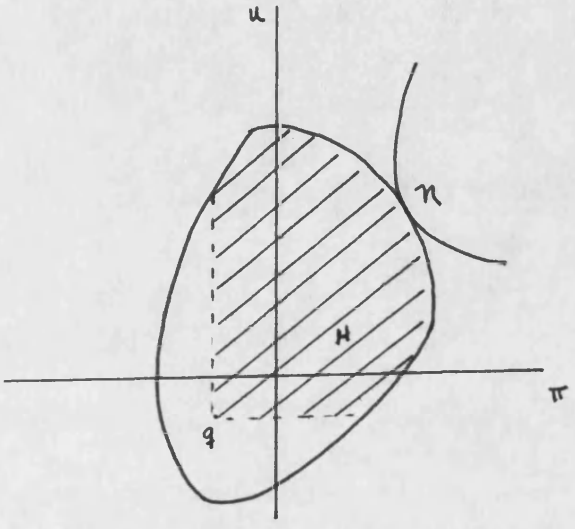
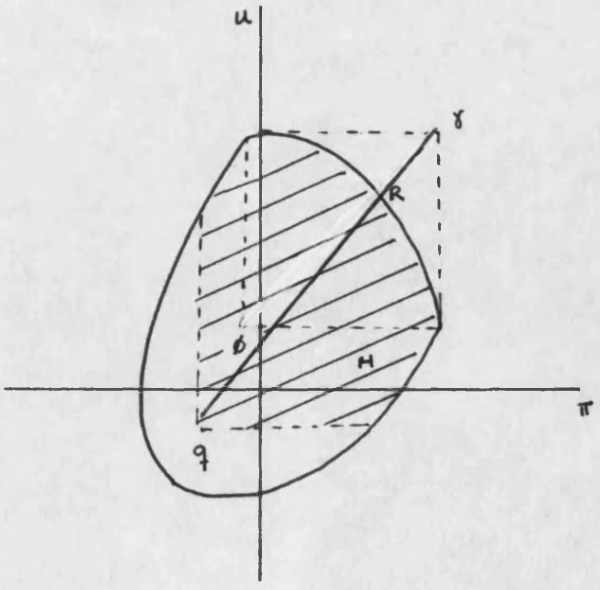


Figure 8

The Raiffa-Kalai-Smorodinsky Bargaining Solution



the players (Friedman, 1986; Binmore et al., 1985).

4.3.2. The Raiffa-Kalai-Smorodinsky (RKS) Bargaining Solution

The Raiffa-Kalai-Smorodinsky solution is an alternative approach to that of Nash and takes into consideration two reference points to obtain the bargaining solution. It assumes that each player would like to have the largest payoffs available which are consistent with individual rationality. However, these ideal payoffs are not obtainable simultaneously but constitute the ideal reference point (or point of maximal expectations) and is located above the Pareto negotiation locus. The other reference point (which is assumed to be fixed) is given by the status quo position.

The RKS solution[18] involves settling at the largest attainable payoffs between the status quo and the ideal reference point, being the solution proportional to such points and located on the efficient negotiation locus (figure 8). Let $R=(R_x,R_y)$ be such a solution which satisfies

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[18]Besides the condition of symmetry and invariance to positive affine transformations, the RKS solution satisfies:
1. Strong Pareto optimality i.e. there is no other alternative that can give more to one of the players without having to give less to one of them.
2. Monotonicity. For two different games, say A and B, with the same status quo and where the Pareto set of game A is included in B, if the maximum payoff to player 1 is the same in both games but the maximum payoff to player 2 in game B is larger than (or at least as large as) the maximum payoff he gets in game A, then the solution payoff for player 2 in game B should be larger than (or at least as large as) what he obtains in the solution of game A.

$$\frac{u(R_u)-u_o}{\pi(R_\pi)-\pi_o} = \frac{u(\eta_u)-u_o}{\pi(\eta_\pi)-\pi_o} \qquad \text{if } u(V_u-u_o)=u(\eta_u)-u_o \quad (25)$$

$$\pi(V_\pi-\pi_o)=\pi(\eta_\pi)-\pi_o$$

and $V=(V,V_u)\rangle R=(R_\pi,R_u)$

then, $V\notin H$

In other words, the amount each player will receive is above his status quo payoff and it is proportional to his ideal payoff with the proportionality held constant for both players. The condition attached to (25) guarantees that the solution would lie on the efficient bargaining locus.

Contrasting the Nash and the RKS solutions, the former states when a change in the game has no effect on the bargaining solution, while the latter tells us when a change benefits a particular player. Both solutions belong to the static axiomatic approach. They describe an actual bargaining equilibrium or solution but do not show how this equilibirum is actually reached. This shortcoming is reflected in the absence of an explicit bargaining procedure and the abstraction of the environment in which it operates (Binmore et.al, 1985). For example, delays in reaching agreements may be costly for the borrower and/or the lender and thus, influence the final agreement.

5. Applications

5.1. Increase in the Cost of Funds

In the early 1970s the real lending interest rate was not only low but negative. This borrowers' paradise changed in the late 1970s

when real interest rates were not only positive but high (Dornbusch 1985, 1984). If we add oil shocks, global recession and policy mismanagement, then we have the scenario of the 1982 debt crisis. We can capture the effects of an increase in the cost of funds ($\bar{r}$) on the level of loans (L) and the lending interest rate (r_2).

In the competitive case, comparative statics applied to equations (3a), (3b) and (11) yields $\frac{dL}{d\bar{r}}<0$, $\frac{dr_2}{d\bar{r}}>0$[19]. In the perfectly competitive market the supply for loans shifts back and the demand for loans stays put. The contract curve shifts to the left reflecting lower levels of (L,r_2) due to the increase in the endogenous repudiation probability. The effect of an increase in $\bar{r}$ is similar to a tax imposed on the supply side which can be decomposed into $\Delta\bar{r}L$ and $\Delta\bar{r}D_2$. For every lender, the former increases the marginal cost curve while the latter raises the average cost. The market supply contracts and the quantity of loans demanded decreases to offset the effects of the high debt service.

In the bilateral monopoly market, the effects of a change in $\bar{r}$ are analogous to a tax on expected profits because D_1 and D_2 were agreed in the past, the borrower sets (for any given r_2) L optimally and the lender's optimal reply describes (for any given L) the maximum price of loan that could be charged. The lender's and the borrower's optimal replies do not change, the position of the contract curve is not modified but shrinks because the lender's isoprofit curves are "rescaled" upwards. If the feasible payoff set is contained in the

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[19] See appendix for details.

original one, the solution to the larger set available in the smaller one and the status quo point is unchanged, then the Nash bargaining solution is the same However, the RKS outcome is different. The maximal expectation or ideal point tilts in favour of the borrower, hence his solution payoff should be increased while the lender's payoff solution should be decreased.

5.2. Debt Restructuring

We can not explain debt restructuring in our willingness-to-pay model unless some other assumptions are included in the model. On the one hand, it is obvious that if income after debt repayment is larger than (or at least equal to) the country's minimum consumption level, lenders will not accept a breach of the original contract. On the other hand, the inclusion of income uncertainty as an additional assumption is not enough to explain debt restructuring. An ex ante loan contract considering the probability of different states of nature precludes debt restructuring from the outset.

In the context of our model, debt restructuring is an ex post action and can be motivated by assuming not only income uncertainty but that the realisation of income differs from what borrowers and lenders expected, so income (net of minimum consumption) is less than the amount due.

In line with our model and to avoid extending it to a larger time horizon, assume that the borrower has been honouring debts and receiving new loans so the "inherited" debt in t=1 is the portion of debt due corresponding to his own past loans. At time t=1, income

turns out to be less than what was expected, say equal to the minimum consumption and the borrower can not service the debt. If the borrower does not repudiate, the lender either calls a default and punishes the borrower or starts the round of negotiations to restructure the debt.

It is evident that repudiation or a default declaration will not be pursued if there are other arrangements available. From the viewpoint of the borrower, repudiating or being declared in default leads to the same punishment. From the viewpoint of the lender, declaring the borrower in default or allowing repudiation yields the same cost.

There are two main ways of restructuring debt:
a) the lender refinances arrears either by extending a "new" loan (equal to the amount not serviced) which in turn, has to be used by the borrower to clear the arrears or simply, the arrears are rolled over under the terms of the original agreement;
b) the lender agrees to reschedule the arrears and in doing so, changes the contractual terms of payments (maturity, grace period, interest rate, etc) and extends a "new" loan which may or may not be used to repay the part of the debt consolidated.

Lenders can avoid an immediate default by "involuntarily" advancing a loan to cover the portion due and also maintain the loan as a performing asset by retaining the chance of being repaid in t=2. The borrowers are better off because the penalties are not imposed and the repudiation decision is postponed to the last period.

In this modified setting, if the borrowers repudiate in t=1 the

lenders will lose $-(1+\bar{r})(D_1+\bar{D}_2)=\ell$. Lenders by advancing $L=(1+r_1)D_1$ if $\xi(L+\bar{D}_2)[(1+r_2)(1-P_2)-(1+\bar{r})]>\ell$ can not be worse off than in the case of repudiation if $(1-P_2)>0$ and the "involuntary" loan is less than the total amount owed by the country. From the point of view of the borrowers, $P_1=0$, net transfers are zero in t=1 but they have to repay $(1+r_2)(L+\bar{D}_2)$ in t=2 and their problem is similar to the one described by equation (2).

This "debt roll over" scheme postpones repayment but does not guarantee repayment. Borrowers are put into deeper debt in t=2 and if expected income is not high enough, the probability of debt repudiation increases[14]. If income is only influenced by the state of nature (say by a multiplicative shift parameter θ_t independently distributed of λ_t for all t), then the option of benefitting from good fortune underlies the rationale for debt postponement.

Debt rescheduling is also a way of postponing repayment leading to debt accumulation over time if the borrower is not given enough time and resources to earn the required foreign exchange and repay the debt. In our setting, the lack of relation between income generated and loans restricts the analysis of debt rescheduling. Assume that the realisation of Y_2 depends not only on the state of nature but also on L_1 and that $\bar{\delta}Y_2/\bar{\delta}L_1>0$. The borrower's and the lender's decision problem remain the same except that in the event of a bad state of nature, the lender has an incentive to provide fresh loans. The possibility of deciding upon the levels of L and r in t=1 brings in

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[14]This is consistent with Lindert and Morton (1989) where extra lending does not remove repudiation incentives but raises it.

the bargaining aspects.

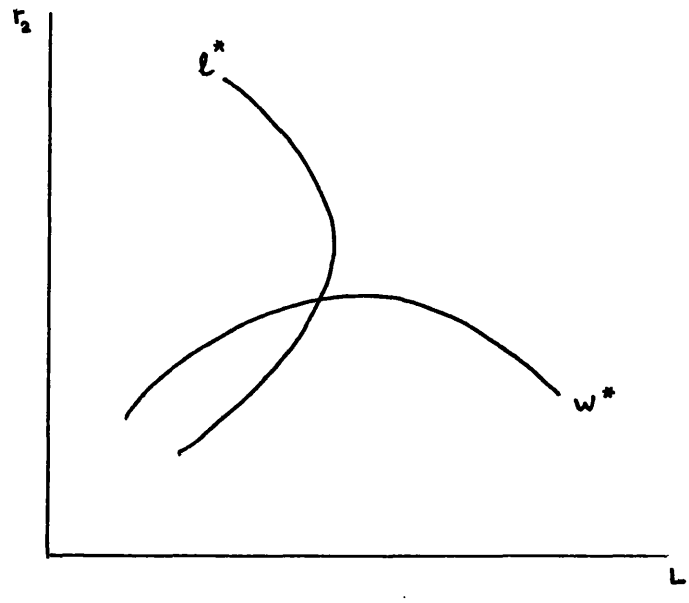
Let ℓ^* be the locus showing the maximum losses of the lender in the case of no rescheduling and w^* be the locus showing the borrower's maximum benefits in case of repudiation (figure 9). Any point between both loci improves the welfare of any of the parties. This situation is basically the same as in the bilateral-monopoly-willingness-to-pay case and the selection of the final outcome may be analysed in similar fashion.

The shortcomings of the static axiomatic approach may be illustrated with the Nicaraguan 1980 debt rescheduling where timing and the political environment played an important role. The Nicaraguan debt is relatively small compared to other Latin American countries. Creditors (and their governments) were more afraid that Nicaragua might move to the East sphere rather than repudiating, so they decided not to insist on the agreement to an IMF adjustment programme to start the round of negotiations. Nicaragua's decision of not to repudiate may be explained by its favourable bargaining position and its perception of unbearably high costs if sanctions were applied.

The Nicaraguan rescheduling agreement of December 1980 involved very soft conditions i.e. interest rate capping, a very large proportion of arrears was rescheduled and the maturity structure of most of the amortisations were lengthened between nine to twelve years (Plan, 1985; Milivojevic, 1985). This experience suggests that economic and political considerations might affect the status quo point and more insights would be gained by modelling debt restructuring in the manner of Binmore et al.(1985).

Figure 9

Debt Restructuring



The main debt strategy adopted so far is one of debt postponment where "new" lending is undertaken by commercial banks to refinance the portion of interest due. However, as we will see in chapter 5, it has not been succesful in improving LACs' creditworthiness. Krugman (1988) points out that the potential repayment of the country is not independent of its debt burden. Indeed, a country borrower might be discouraged from doing well if most of the benefits of improved economic performance are likely to go to foreign creditors.

6. Conclusions

The notion of sovereign risk relies on the absence of collateral and the non-existence of any explicit legal mechanism for deterring a government borrower from repudiating its external debts. In our model, creditors have to make credible the threat that a borrower who repudiates debt obligations will be punished. The sanctions imposed are twofold, those directly implied by the lenders' credit cut and an "autarky" sanction which can only be implemented by the government of the lenders' countries of origin.

Assuming a "willingness-to-pay" setting, the competitive market equilibrium is inefficient as a consequence of the non monotonicity of the supply of loans which arises from the own nature of sovereign risk and the endogenous probability of repudiation. We arrived at this result by assuming risk averse borrowers and risk neutral lenders. With specific forms of utility functions, the endogenous repudiation probability will depend not only on the debt-to-output ratio but also on the degree of risk aversion of the borrowers. The Stackelberg (i.e. constrained Pareto) solution responds to the debtors' preference

for low levels of lending interest rates (because it affects past and new loans) so as to reduce the probability of repudiation and avoid the penalty of not repaying.

Moral hazard, adverse selection and imperfect information have, of course, distorting consequences in the credit market. However they should be interpreted as extra complications that add to the already existing inefficiencies caused by the nature of the sovereign loan contract.

The introduction of the bilateral monopoly framework helps to illustrate the nature of the conflict in the credit market, bring in some bargaining aspects and provide some insights into debt restructuring.

The rationale for debt restructuring does not lie strictly on the distinction between illiquidity and insolvency because the net worth position of a country can not be calculated; but rather on the fact that neither repudiation nor default is optimal if the decision to take such an action can be postponed (Krugman, 1988, 1985; Plan, 1985; Heffernan, 1985). Otherwise, a deadweight loss for society will occur. The lender retains the prospects of being repaid at some stage and borrowers do not bear the penalties, yet have the option of repudiating in the future.

Although refinancing and rescheduling convey debt accumulation if repayments are not resumed soon, rescheduling has the attractive feature of flexibility (changes in interest rate, maturity, grace period, etc.) giving the chance of affecting repayment prospects, adapting them to the economic environment and minimising society

losses. As we discussed earlier, successful rescheduling might involve a positive net transfer from the lender so as to increase potential output and the prospects of repayment.

However, continuous debt restructuring is not sustainable because it allows for the possibility of dishonest behaviour and decreases the credibility of the non repayment penalty. Can this be avoided? Since debt restructuring is an ex post action, it is not quite right to include the posssibility of debt restructuring in the design of the original ex ante optimal loan contract. Genotte (1986) suggested the design of contracts which are "ex post optimal" i.e. a contract to which lenders and borrowers adhere in any state of nature. Of course, it is not possible to design contingent contracts taking into account all possible states of nature. Nevertheless, it is possible to include contingent clauses which consider movements of key variables that might impair debt repayment and are not under the control of the borrower. There have been some steps forward in that direction. For example, the 1986 Mexican debt restructuring package links future rescheduling with sudden changes in the price of oil[15].

[15]This rescheduling package protects Mexico against sudden external shocks through the provision of an automatic additional financing if the price of oil drops below $9 dollars per barrel. For more details, see the "terms sheet" or creditors' agreement corresponding to 18 October 1986.

APPENDIX

1. Borrower Behaviour: Second Order Conditions and Proposition 1

Recall that $P_2=\int_0^{\lambda_2^*} g(\lambda_2)d(\lambda_2)$, $C_1=Y_1+L-(1+r_1)D_1$ if $\lambda_1>\lambda_1^*$, and $C_2=Y_2-(1+r_2)(L+\bar{D}_2)$ if $\lambda_2>\lambda_2^*$. Second order conditions[16] evaluated at the point satisfying first order conditions are:

$$\frac{\delta^2 EU|_{\lambda_1>\lambda_1^*}}{\delta\lambda_2^{*2}}=-\beta Y_2 u_2'[Y_2(1-\lambda_2^*)]g(\lambda_2^*)<0 \qquad (1)$$

$$\frac{\delta^2 EU|_{\lambda_1>\lambda_1^*}}{\delta L^2}=u_1''(C_1)+\beta(1+r_2)\{\lambda_L^* u_2'(C_2)+(1+r_2)(1-P_2)u_2''(C_2)\} \qquad (2)$$

$$\left[\frac{\delta^2 EU|_{\lambda_1>\lambda_1^*}}{\delta\lambda_2^{*2}}\right]\frac{\delta^2 EU|_{\lambda_1>\lambda_1^*}}{\delta L^2}-\left[\frac{\delta^2 EU}{\delta L\,\delta\lambda_2^*}|_{\lambda_1>\lambda_1^*}\right]^2>0 \qquad (3)$$

Equation (2) can be written as

$$u_1''(C_1)+\beta(1+r_2)\lambda_L^* u_2'(C_2)\{1+[(1+r_2)(1-P_2)/\lambda_L^*]u_2''(C_2)\} \qquad (2a)$$

or $$u_1''(C_1)+\beta(1+r_2)\lambda_L^* u_2'(C_2)\{1-\gamma A_2\} \qquad (2b)$$

where $\lambda_L^*=(\delta\lambda_2^*/\delta L)g(\lambda_2^*)$, $\gamma=(1+r_2)(1-P_2)/\lambda_L^*$, $u_1''=\delta^2U_1/\delta C_1^2$, $u_2''=\delta^2U_2/\delta C_2^2$, and $A_2=-u_2''(C_2)/u_2'(C_2)$

Then,

$$\frac{\delta^2 EU|_{\lambda_1>\lambda_1^*}}{\delta L^2}<0 \quad \text{if} \quad 1-\gamma A_2<0 \text{ or } A_2>\lambda_L^*/(1+r_2)(1-P_2)>0$$

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[16] SOCs are sufficient for concavity of the value function. For strict concavity, the differential of the SOCs must be taken into consideration.

i.e. the coefficient of absolute risk aversion in t=2 has to be greater than the ratio that captures the variation in the repayment probability due to changes in the amount borrowed. As the probability of repayment increases (decreases), the higher (smaller) needs to be the absolute risk aversion coefficient in order to avoid repudiation.

A more general condition may be obtained by slight manipulation of equation (2),

$$A_1-[\lambda_L^*/(1-P_2)]+(1+r_2)A_2>0 \quad \text{or} \quad A_1+(1+r_2)A_2>\lambda_L^*/(1-P_2)>0$$

where A_1 and A_2 are the absolute risk aversion coefficients corresponding to t=1,2 respectively. Since $\lambda_L^*/(1-P_2)$ is positive, risk aversion in both periods suffices to fulfil second order conditions.

The slope of the borrower's demand for loans is derived by differentiating FOCs with respect to L and r_2,

$$\frac{dL}{dr_2} = -\left[\frac{-\beta u_2'(C_2)\{(1-P_2)[1+(L+\bar{D}_2)(1+r_2)A_2]-(1+r_2)\lambda_r^*}{u_1''(C_1)+\beta(1+r_2)\{\lambda_L u_2'(C_2)+(1+r_2)(1-P_2)u_2''(C_2)\}}\right] \qquad (4)$$

where $\lambda_r^*=(\bar{\delta}\lambda_2^*/\bar{\delta}r_2)g(\lambda_2^*)$

If SOCs are fulfiled, the denominator and numerator are negative. Note that a negative numerator implies $A_2>[\lambda_L^*/(1+r_2)(1-P_2)]-[1/(L+\bar{D}_2)(1+r_2)]>0$ which is guaranteed by the SOCs.

2. Bilateral Monopoly: Stability and the Contract Curve

For the analysis of the stability of the Nash equilibrium, recall

that the lender sets r_2 and the borrower sets L. The lender's and borrower's optimal reply are downward sloping. For stability of the Nash equilibrium, the lender's optimal reply must be flatter than the borrower's. Comparing both slopes in absolute values, stability requires not only $A_1>0$ but $A_1>1/(L+\bar{D}_2)$. Intuitively, stability can be analysed by beginning with a pair (L,r_2) such that $L>L^n$ and $r_2<r_2^n$ where (L^n,r_2^n) is the Nash equilibrium solution. Convergence requires that the first movement be an L decrease and this is obtained only if the borrower's optimal reply lies below the lender's optimal reply. Notice the important role played by the borrower's risk aversion coefficients.

The equation of the contract curve has the same specification as the one derived for the competitive market, that is

$$\frac{-(1-P_2)+(1+r_2)(L+\bar{D}_2)\lambda_L^*+(1+\bar{r})}{(L+\bar{D}_2)[(1-P_2)-(1+r_2)\lambda_r^*]} = \frac{u_1'(C_1)+\beta(1+r_2)(1-P_2)u_2'(C_2)}{\beta(L+\bar{D}_2)(1-P_2)u_2'(C_2)} \qquad (5)$$

where $C_1=Y_1+L-(1+r_1)D_1$ if $\lambda_1>\lambda_1^*$ and $C_2=Y_2-(1+r_2)(L+\bar{D}_2)$ if $\lambda_2>\lambda_2^*$. Its slope in (L, r_2) is negative. Given that the lender's optimal reply is flatter than the borrower's optimal reply, the contract curve locus lies to their left.

3. Comparative Statics

The effects of a change in $\bar{r}$ in the competitive market equilibrium can be found by recalling

$$u_1'[Y_1+L-(1+r_1)D_1]-\beta(1+r_2)\int_{\lambda_2^*}^{1} u_2'[Y_2-(1+r_2)(L+\bar{D}_2)]g(\lambda_2)d\lambda_2=0 \qquad (6)$$

$$\lambda_2^* = (1+r_2)(L+\bar{D}_2)/Y_2 \tag{7}$$

$$\beta\left[\int_{\lambda_2^*}^{1} (1+r_2)(L+\bar{D}_2)g(\lambda_2)d\lambda_2 - (1+\bar{r})(L+\bar{D}_2)\right] = 0 \tag{8}$$

Obtain a two equation system by substituting (7) into (6) and (8), defining $C_1 = Y_1 + L - (1+r_1)D_1$ and $C_2 = Y_2 - (1+r_2)(L+\bar{D}_2)$ and differentiating with respect to L, r_2 and $\bar{r}$:

$$JdL + Wdr_2 = 0 \tag{9}$$

$$QdL + Zdr_2 = (L+\bar{D}_2)d\bar{r} \tag{10}$$

where $u''(C_1) + \beta(1+r_2)\int_{L}^{\lambda_2^*} u'(C_2)[1-\gamma A_2] = J$

$$-\beta u'(C_2)[(1-P_2)(1+(L+D_2)(1+r_2)A_2)] = W$$

$$(1-P_2) - (1+r_2)(L+\bar{D}_2)\int_{L}^{\lambda_2^*} - (1+\bar{r}) = Q$$

$$(1-P_2)(L+\bar{D}_2) - (1+r_2)(L+\bar{D}_2)\int_{r}^{\lambda_2^*} = Z$$

and $J<0$, $W<0$, $Q<0$ ($Q>0$) and $Z>0$ ($Z<0$) for low (high) levels of L and r_2.

From equations (9) and (10) and using Cramer's Rule,

$$\frac{dL}{d\bar{r}} = \frac{W(L+\bar{D}_2)}{JZ-WQ} < 0 \quad \text{and} \quad \frac{dr_2}{d\bar{r}} = \frac{J(L+\bar{D}_2)}{JZ-WQ} > 0.$$

Chapter 3

The Determinants of Debt Arrears: An Empirical Study for Latin American Countries

1. Introduction

Since the early 1980s, debt service has been one of the main concerns of banks, governments and international institutions. Empirical studies of repayment problems have concentrated basically in two areas:

-Assessment of the causes of debt repayment difficulties with the aim of providing an early warning model[1].

-Analysis of the determinants of the spread (on Libor or U.S. Prime Rate) with the objective of exploring the lenders' response to borrowers' creditworthiness indicators[2].

Early studies chose independent variables on the grounds of "theoretical common sense", and then narrowed them down with the aid of statistical and econometric techniques. In the words of Heffernan (1985, p.390): "...this approach puts the cart before the horse: the literature continues to lack a thorough analysis of the determinants of supply and demand for foreign loans."

Recently, efforts in not only searching for statistical relationships but providing behavioural underpinnings have been made,

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[1] For a study addressing early warning of debt rescheduling, see Schmidt (1984).

[2] See Dewhirst (1986), Edwards (1986,1983), Burton and Inoue (1985), Feder and Ross (1982) among others.

either by justifying the chosen variables from the borrower's constraint or by specifying the borrower's demand for loans and the lender's supply of loans.

Within that context, not only has the definition of the dependent variable been modified (from probability of rescheduling to probability of arrears or non-repayment) but the underlying econometric framework applied has been evolving. Early studies apply discriminant, principal components, probit and logit techniques. More recent studies attempt to incorporate explicitly the notion of market disequilibrium, first applied to sovereign loans by Eaton and Gersovitz (1981).

The idea underlying the application of disequilibrium to the analysis of international sovereign debt lies in the relation between repayment, arrears, effective and notional demand and the supply of loans. A country can let debt obligations fall into arrears without any active action being taken because lenders consider that the repayment problem is "acceptable" or not severe. On the other hand, the requirement of an IMF support loan programme and/or rescheduling indicates that arrears are binding, hence action by the lenders and borrowers is needed to attempt to solve the impasse. Both cases reflect excess demand in the credit market differing, in this sense, only in degree i.e. a "moderate" and "large" level of excess demand respectively. Thus, arrears are related to the concept of "effective" demand since borrowers are supply constrained, while situations of full repayment are linked to the concept of "notional" demand.

The term and nature of the disequilibrium merit some clarification. To characterise a situation of arrears as one of

disequilibrium may be confusing. If there is an excess demand for loans, lending interest rates should increase to clear the credit market. However, lending interest rates may fail to adjust because of the negative effects on the probability of repayment[3]. The concept of "non-Walrasian"[4] equilibrium is a better description than disequilibrium because it incorporates the idea that lenders do not raise lending rates because it is rational for them not to do so and not because of any price stickiness or adjustment cost. Therefore, it is quantity rationing rather than price fixity which is of concern. Under this view, we follow Eaton and Gersovitz (1981), McFadden et al (1985) and Hajivassiliou (1987) and prefer to let the agents bargain over the level of loans and treat the lending rate as exogenous (determined by the LIBOR or US Prime Rate and an "institutional" spread).

Modelling the levels of spreads charged to borrowers focuses solely on the supply side and therefore assumes either continuous excess demand or market clearing. The main objective is to show how much lenders differentiate borrowers on the basis of the determinants of country risk which in turn is presumed to be reflected in the spread charged. Empirical studies do not report a very significant relation between spreads and the usual economic determinants of country risk[5].

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[3]This issue has been explored in the theoretical chapter where the probability of non repayment depends negatively on the lending interest rate. Market imperfections (imperfect information, moral hazard, etc.) corroborate it. On related issues see Clemenz (1986) and Glick and Kharas (1986) among others.

[4]See Hahn (1978).

[5]See for example Dewhirst (1986), Edwards (1983) and Feder and Just (1977).

Country risk has a broader meaning than sovereign risk[6]. In spite of that, academics have treated them as equivalent on the basis of the impossibility of quantifying and/or attaching probabilities to unmeasurable events. However, there is consensus that political aspects influence the decision to borrow in the international markets. The few researchers who have included political variables in their models found that either they did not perform well (eg. Burton and Inoue, 1985) or that most of the economic variables tested were not significant (eg. Citron and Nickelsburg, 1987).

This chapter reviews empirical work carried out by different researchers in their attempts to assess the determinants of debt servicing problems. Instead of merely surveying their models, we prefer rather to highlight some of their results and comment on them by re-estimating some of their regressions for LACs. The reasons for doing so are twofold. On the one hand, their results are not strictly comparable because of the different samples involved. On the other hand, by reviewing models with low prediction errors and highly significant explanatory variables, we hope to trace variables that might be included in our own model and identify the problems associated with their econometric estimation.

The Latin American countries (as defined by the Economic Commission for Latin America) included in our study are Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Haiti, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, Uruguay and Venezuela. At the outset of the

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[6]For a discussion on the definition and application of both concepts see Heffernan (1986) and Nagy (1979).

1982 debt crisis, Argentina, Brazil, Chile, Mexico and Venezuela were the major borrowers in the region. In terms of debt and debt-service ratios, not only these countries but also Bolivia, Colombia, Costa Rica, Ecuador, Peru and Uruguay were among the most highly indebted countries.

Throughout the re-estimations, unless otherwise stated, the dependent variable is a dichotomous variable which takes the value of 1 in the year where the borrower country encountered debt repayment problems and 0 otherwise. We constructed three different dependent variables according to how repayment problem was defined:

a) arr1 is a dummy variable taking the value of 1 in the year of signature of a rescheduling with commercial banks and/or official creditors, and 0 otherwise;

b) arr2 is also based on the year of a rescheduling signature but the year is modified if arrears happened before their signatures. That is, it takes into consideration the year that precipitated a rescheduling;

c) arr3 is defined as arr2 but, in addition, includes Stand-by higher tranches and Extendend Fund Facility loans. The former allows the IMF member country to borrow much more than 25 percent of its quota (first tranche) subject to agreement on a stabilisation programme. Both types of credit are primarily given to ease balance of payments problems and as from early 1970, IMF conditionality has been seen as an assurance that the member country would carry out a stabilisation programme that would enable it to repay its foreign debts[7]. This is our preferred dependent variable because it captures the refinements proposed by Saini and Bates (1984) and Feder et al.(1981).

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[7] See Pastor (1987).

The time period chosen for this study is 1971-86. The starting year corresponds to the systematic account of debt indicators by the World Bank. The final year is associated with the increasing popularity of debt conversion schemes although the secondary market in traded debt was still very limited. This alternative way of dealing with the debt problem reflects past unsuccessful rescheduling agreements and the increasing perception that full repayment is unlikely.

We start our survey by reviewing Schmidt (1984) who explored the capability of different statistical methods in signalling rescheduling problems. We also present the basic logit model tested by McFadden et al (1985) and Citron and Nickelsburg (1987). We do so because they included an alternative definition of the dependent variable and/or an interesting selection of regressors. Section 3 looks at models which are explicitly framed in disequilibrium fashion. In all of the above sections, absolute values of the "t" statistics will be given in parenthesis. Section 4 summarises and concludes our investigation. The data appendix provides data sources and definitions of variables for the panel data used in this study.

2. Logit Models

Most sovereign debt models have been estimated using probit or logit techniques[8]. Disequilibrium models in the estimation of

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[8]To explore the causes of debt servicing difficulties, discriminant analysis and principal components were also applied. See Schmidt (1984), Abassi and Taffler (1984), Dhonte (1975) and Frank and Cline (1971).

international debt problems have been introduced recently.

The structure of the probit and logit equations[9] can be readily understood just by taking the bivariate discrete case. Let

$$y_i^* = \beta' x_i + u_i \tag{1}$$

be the regression to be estimated. The value of y_t^* is not observable, but what we observe is a dummy variable of the form

$$y = 1 \quad \text{if } y_i^* > 0 \tag{2}$$

$$y = 0 \quad \text{otherwise}$$

From (1) and (2) we get

$$\text{Prob}(y_i=1) = \text{Prob}(u_i > -\beta' x_i) \tag{3}$$

$$= 1 - F(-\beta' x_i)$$

so the likelihood function is

$$L = \prod_{y_i=0} F(-\beta' x_i) \prod_{y_i=1} [1-F(-\beta' x_i)] \tag{4}$$

The functional form of (4) will depend on the assumptions made about u_i in (1). If the cumulative distribution of u_i is logistic, we have a logit model

$$F(-\beta' x_i) = \frac{\exp(-\beta' x_i)}{1+\exp(-\beta' x_i)} = \frac{1}{1+\exp(\beta' x_i)} \tag{5}$$

If we assume that u_i is $IN(0,\sigma^2)$ then

$$F(-\beta' x_i) = \int_{-\infty}^{-\beta' x_i/\sigma} \frac{1}{(2\pi)^{1/2}} \exp(-t^2/2)\, dt \tag{6}$$

and we have a probit model.

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[9] See Maddala (1983) and Amemiya (1981) among others.

Several studies apply logit and probit techniques to the analysis of debt servicing difficulties[10]. Typically, researchers employ a binary (1, 0) dependent variable related to instances of reschedulings or no rechedulings. The list of regressors incorporates liquidity as well as long run creditworthiness indicators.

We start our survey by reviewing the Schmidt paper which explores the capability of different statistical methods in signalling rescheduling problems.

2.1. Schmidt (1984)

After examining the experience of 52 developing countries from 1974 to 1978 ("warning" years), Schmidt concluded that the logit method seems to predict better than univariate methods, multiple discriminant analysis and cluster analysis. From a data set of 21 independent variables (chosen by inspecting the literature on international sovereign debt and taking into account restrictions on data availability) and executing a stepwise multiple discriminant analysis for 1974-1978, he arrived at the five best combinations for each year. For comparison purposes, he entered the same combinations when he applied logit. He found, using a cut-off probability[11] of 0.31, that the 1977 and 1978 estimations gave lower type I (predicting

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[10] See for example Feder and Just (1977), Mayo and Barret (1978), Feder et. al. (1981), Cline (1984), and Kharas (1984).

[11] Through minimisation of error percentages, he obtained a cut-off probability of 0.31 for the separation of rescheduling and non-rescheduling countries. A non-rescheduling country was one that exhibited a computed probability less than 0.31.

a rescheduling when it did not occur) and type II (predicting no rescheduling when it occurred) errors than the previous years. Therefore, he remarked that for an "early warning model", the results of the logit analysis were satisfactory on the whole if relatively "fresh" data was used in the estimation.

The independendent variables used by Schmidt in the 1977 regression are: debt from suppliers/total debt, total reserves minus gold/imports, outstanding debt/gross domestic product, interest payments/gross domestic product. For 1978, the annual rate of growth of outstanding disbursed and undisbursed debt and the ratio of interest payments to average outstanding debt were entered instead of outstanding debt/gross domestic product and interest payments/gross domestic product. The dependent variable was constructed using the information on multilateral debt rescheduling provided by the OECD (1981). It took the value of 1 in the event of a rescheduling and 0 otherwise.

Table 1 reproduces Schmidt's results for 1977 and 1978. The 1977 model gave the lowest error percentages and Schmidt also showed that the estimated coefficients were relatively stable over time. We also test its robustness. We re-estimated his logit model after redefining the dependent variable as arr3 and lagging all the independent variables one year to cope with the problem of simultaneity[12]. We re-estimated it with (model I) and without (model II) the ratio of OPEC current account to OPEC gross national product (ca/gnp OPEC) to

[12]When we re-estimated the model defining the dependent variable as arr1 and using contemporaneous regressors, only the debt/gdp ratio was found statistically significant. This result is not reported.

Table 1

Probability of Signing a Rescheduling

Method of Estimation: Logit

Dependent Variable: Probability of Signing a Rescheduling

	1977	1978
Independent Variables:		
constant	2.005	1.681
(suppliers credit/debt)100	0.083	0.086
(reserves/imports)100	-0.189	-0.140
(debt/gdp)100	0.135	
(interest/gdp)100	-4.672	
annual growth of debt including undisbursed		0.107
interest payments to average outstanding debt		-1.093
Sample Size	52	52
Type I Error	11	11
Type II Error	5	7

Source: Schmidt (1984).

Notes : Standard errors, "t" statistics and percentage correctly predicted were not reported in the paper by Schmidt.

include the second oil shock[19]. The cut-off probability to compute type I (classifying a country as having repayment problems when it did not) and type II (classifying a country as not having repayment problems when it did) errors is 0.50. The results of our logit estimations are reported in table 2.

The asymptotic "t" statistics for all the variables are highly significant in both, model I and model II. The interpretation of the signs of the estimated coefficients is as follows:

- A positive value for the ratio of suppliers credit to total debt means that suppliers will not reduce their credits to LACs as would financial lenders in case of disruption. This may be because suppliers' credits are trade related and, in general, they are repaid on time.
- A high value of the ratio of reserves to imports enables the country to use more international reserves to repay its loans. Therefore, we expect a negative sign.
- A country with a high debt to gnp ratio may encounter financial problems, thus increasing the probability of non repayment.
- Contrary to Schmidt's finding, the interest payment/gnp ratio has a positive sign. He suggested that high interest rates are not an indicator of higher risk. However, it is well known that the interest payment/gnp ratio is a measure of the debt burden, so the higher this ratio is, the higher the probability of repayment problems.
- The current-account-to-gnp ratio of OPEC countries has the correct

[19] We also tested the model using a (1,0) dummy variable to take care of the oil shock instead of the OPEC current account/gnp ratio. Both variables, in turn, were significant and had the expected signs but the OPEC current/account ratio predicted better than the oil shock dummy.

Table 2

Latin American Countries:

Probability of Arrears, Rescheduling and IMF Support

Method of Estimation: Logit

Dependent Variable : arr3

	1975-1986	
	Model I	Model II
Independent Variables:		
(all lagged one year)		
constant	-1.9092	-1.0382
	(3.908)	(1.894)
(suppliers credit/debt)100	0.0589	0.0951
	(1.754)	(2.542)
(reserves/imports)100	-0.0264	-0.0354
	(2.495)	(3.146)
(debt/gnp)100	0.0263	0.0199
	(2.252)	(1.716)
(interest/gnp)100	0.4257	0.3537
	(2.438)	(2.086)
ca/gnp OPEC		-0.0772
		(3.122)
Sample size	209	209
Log likelihood	-104.76	-98.96
Correct predictions (%)	77.51	77.51
Type I error (%)	11.38	15.48
Type II error (%)	38.37	32.56

sign, that is, the higher the ratio, the higher the funds recycled in the financial markets and hence, more funds are available for lending. The inclusion of this variable improves the value of the log likelihood, reduces the type II error, but increases the type I error. An inspection of the predicted probabilities for both sets of equations reveals that the reduction in type II error is due to corrections in the probability of non-repayment of oil importing countries. Unfortunately, the increase in type I error seems not to be related to the high indebtedness of oil exporting countries.

Concerning the size of the estimated coefficients, models I and II predict that the interest/gnp ratio has a substantial effect on the logarithm of the odds that a country will fall in arrears. That is, 42.57 and 35.37 respectively. In model I, a unit increase in the suppliers' credit/debt ratio, holding other variables constant, changes the log-odds ratio by 5.89 (9.51 in model II); while a unit increase in the reserves/imports ratio decreases the log-odds ratio by 2.64 (3.54 in model II). Similarly, the effect of a change of a unit increase in the debt/gnp ratio changes the log-odds ratio by 2.63 (1.99 in model II). The predicted effect (in model II) of a unit increase in the OPEC current account/gnp ratio is to a change the log-odds ratio by -0.08.

The calculated "quasi-elasticities"[14] for the probability of

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[14]The "quasi-elasticity" is calculated at the point of means of each of the independent variables according to $[\partial L(\bar{\Sigma x}_i \hat{\beta}_i)/\partial x_{ik}](\bar{x}_{ik}/\bar{p}_i) = \left[(\exp(\bar{\Sigma x}_i \hat{\beta}_i)/[1+\exp(\bar{\Sigma x}_i \hat{\beta}_i)]^2)\hat{\beta}_{ik}\right](\bar{x}_{ik}/\bar{p}_i)$ where $\bar{x}_{ik}$ is the k^{th} element of the mean vector of explanatory variables $\bar{x}_i$, $\hat{\beta}_{ik}$ is the k^{th} element

arrears and the suppliers credit/debt ratio, the reserves/imports ratio, debt/gnp ratio and the interest/gnp ratio are 0.20, -0.39, 0.54 and 0.57 for model I (and 0.32, -0.51, 0.40, 0.46 for model II). The "quasi-elasticity" for the OPEC current acount/gnp ratio id -0.34. That is, a 1% change in any of the above mentioned ratios will lead to change of less than 1% in the probability of arrears. Nonetheless, the probability of arrears is relatively more responsive to changes in the interest/gnp ratio in model I and to changes in the reserves/import ratio in model II.

To analyse the overall stability of the coefficients, model II was run for different sample periods (table 3). Not only does the precision of the estimates fluctuate from one sample period to another (which is not surprising since it depends on the sample correlations), but the value and sign of the coefficients do as well. A likelihood ratio test to determine the usefulness of estimating by pooling the data (1975-1986) instead of breaking it into three periods (four years each), yields a chi-square statistic of 38.64 with 10 degrees of freedom, leading to a rejection at the 0.005 level! Surprisingly, over time, the model predicts the countries with repayment problems better than the ones with no repayment problems. Indeed, in the last period, the type I error becomes enormous while the type II error is very small. Table 3 thus strongly suggests the possibility of misspecification in the Schmidt model.

Accepting the usefulness of the logit technique in the estimation of debt repayment problems and searching for a better specification

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of $\hat{p}_i$ and $\bar{p}_i$ is the mean value of the predicted probabilities.

Table 3

Latin American Countries:

Probability of Arrears, Rescheduling and IMF Support

Method of Estimation: Logit

Dependent Variable: arr3

	1975-1978	1979-1982	1983-1986
Independent Variables:			
(all lagged one period)			
constant	0.417	1.594	-0.459
	(0.351)	(1.619)	(0.522)
(suppliers credit/debt)100	0.134	0.172	0.103
	(2.209)	(1.806)	(1.030)
(reserves/imports)100	-0.088	-0.083	-0.140
	(2.292)	(2.354)	(0.942)
(debt/gnp)100	-0.508	0.060	0.109
	(0.262)	(1.940)	(0.807)
(interest/gnp)100	-0.508	-0.041	0.298
	(0.418)	(0.106)	(1.434)
Sample size	72	71	66
Log likelihood	-24.99	-27.08	-33.36
Correct predictions (%)	84.72	84.51	74.24
Type I error (%)	3.33	8.70	82.35
Type II error (%)	75.00	28.00	6.12

than the Schmidt model we next review papers which have included alternative definitions of the dependent variable and, at the same time, provided an interesting selection of exogenous variables (capital flight, political instability, etc.).

2.2. McFadden, Eckaus, Feder, Hajivassiliou and O'Connell (1985)

McFadden et al. analysed data for 93 developing countries over the period 1971-82. The dependent variable used in this study is very precise. It is defined to be a rescheduling or debt restructuring, IMF higher tranche support, arrears on principal exceeding 1% of debt outstanding and disbursed or arrears on interest exceeding 0.1% of debt. In a logit model[15] they capture demand and supply effects by associating repayment problems with variables related to the demand for new credit and to lenders' perception of creditworthiness. They show that the probability of repayment problems is positively related to the imports/gdp ratio, debt/exports ratio and the debt service due (interest, amortization and arrears)/exports; and negatively related to the reserves/gdp ratio, real per capita income and the real growth rate of gdp. In addition, they include a dummy variable (0 for countries with flexible exchange rates or with pegged rates equal to the rate of growth of the real exchange rate) to reflect the possibility of capital flight. This variable was found to be

[15] It refers to their basic model which afterwards is reformulated to explore the effects of previous repayment problems, the influence of the degree of openness of the countries and world variables that might affect the supply of credit. The variables found significant are then carried over to their full model of repayment problems where level data on new loans and arrears are used to identify the demand and supply of new loans and the limit on arrears.

insignificant, but appeared with the expected sign.

They carry out two further exercises. Firstly, they test the model for non-poor countries[16] and find the effects of the reserves/gdp ratio and the debt service due/exports ratio insignificant for this group. These ratios are associated with short-run liquidity problems of generating foreign exchange flows to cover current account deficits. Therefore, they suggest that non-poor countries are affected by longer-run creditworthiness. Secondly, including all the LDCs considered in their study, they break the sample into two periods (1971-75 and 1976-82) and find substantial differences in the coefficients. They conclude that the coefficients of the model are not stable over time. Table 4 reports their results.

We re-estimate their model after first redefining some of the variables. Our dependent variable is arr3, instead of debt service due we use debt service repaid[17] and instead of dividing the reserves and imports by gdp we divide by gnp. We omit the exchange rate regime dummy variable and use the Cuddington measure of capital flight[18]. Table 5 presents results excluding the capital flight proxy, while table 6 includes it.

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[16]Countries with GNP per capita below 500 US dollars were excluded from the sample.

[17]Unfortunately, we could not gain access to the confidential files on arrears of the World Bank.

[18]He calculates capital flight by adding the errors and omissions to short term capital items selected invidually for each country. This "hot money" or short term capital flow approach has been criticised by Cumby and Levich (1987). Nevertheless, we use the Cuddington series mainly because of data availability.

Table 4

Probabilities of Significant Arrears, Rescheduling or IMF Support

Method of Estimation: Logit

Dependent Variable: Significant Arrears, rescheduling or IMF support

	ALL COUNTRIES			NON POOR
	1971-82	1971-75	1976-82	1971-82
Independent Variables:				
(lagged one year)				
constant	-1.242	-0.629	-1.614	-1.351
	(5.12)	(1.44)	(4.97)	(3.70)
reserves/gdp	-2.196	3.271	-6.418	0.059
	(2.16)	(2.43)	(4.73)	(0.07)
imports/gdp	1.512	-2.067	3.193	0.924
	(3.11)	(1.85)	(5.02)	(1.61)
debt/exports	0.523	0.613	0.519	1.110
	(4.10)	(2.51)	(3.33)	(4.35)
debt service due/exports	1.437	-0.377	2.306	-0.577
	(2.14)	(0.25)	(2.88)	(0.61)
real gnp p.c./1000	-0.500	-0.237	-0.677	-0.712
	(3.04)	(0.91)	(2.95)	(3.30)
real growth of gdp	-5.673	-6.863	-4.355	-6.695
	(3.43)	(2.39)	(2.04)	(3.15)
dummy real exchange rate	0.839	0.162	1.383	0.083
regime	(1.58)	(0.18)	(2.13)	(0.11)
Sample size	728	273	455	479
Log likelihood	-415.4	-149.8	-249.8	-251.5
Correct predictions (%)	72.25	73.99	72.31	77.24
Type I error (%)	29.60	27.27	31.15	27.27
Type II error (%)	17.36	25.90	26.43	22.17

Source : McFadden et al (1985).

Table 5

Latin American Countries:

Probabilities of Arrears, Rescheduling or IMF Support

Method of Estimation: Logit

Dependent Variable: arr3

	ALL LACs	SELECTED LACs[1]
	1975-85	1975-85
Independent Variables:		
(all lagged one year)		
constant	-2.546	-1.785
	(3.511)	(0.765)
reserves/gnp	-6.691	-9.670
	(1.544)	(1.080)
imports/gnp	2.193	9.593
	(3.455)	(1.843)
debt/exports	1.411	1.488
	(3.736)	(2.039)
debt service/exports	1.165	-2.496
	(0.553)	(0.725)
real gnp p.c./1000	0.099	-0.398
	(0.361)	(0.806)
real growth of gdp	-0.174	-0.208
	(4.153)	(2.705)
Sample Size	208	77
Log Likelihood	-95.49	-35.75
Correct predictions (%)	80.77	83.12
Type I error (%)	12.50	9.52
Type II error (%)	30.00	25.71

Notes : [1]The Cuddington capital flight estimates include Argentina, Brazil, Chile, Mexico, Peru, Uruguay and Venezuela for the period 1974-84. The heading "Selected LACs" includes only those countries.

Table 6

Selected Latin American Countries[i]:

Probabilities of Arrears, Rescheduling and IMF Support

Method of Estimation: Logit

Dependent Variable: arr3

	1975-1985
Independent Variables:	
(all lagged one year)	
constant	-1.735
	(0.733)
reserves/gnp	-7.778
	(0.845)
imports/gnp	9.457
	(1.803)
debt/exports	1.391
	(1.890)
debt service/exports	-2.038
	(0.593)
real gnp p.c./1000	-0.624
	(1.173)
real growth of gdp	-0.157
	(1.828)
capital flight/gnp	16.470
	(1.375)
Sample size	77
Log Likelihood	-34.69
Correct predictions (%)	81.82
Type I error (%)	11.09
Type II error (%)	25.71

Notes : [i]Includes Argentina, Brazil, Chile, Mexico, Peru, Uruguay and Venezuela.

For all LACs, the coefficients have the correct sign except for the real gnp per capita. However, only the ratios of imports to gnp, debt to exports and real gdp growth are significant. Exclusion of the insignificant variables does not substantially change the value of the log likelihood nor the percentage error in the prediction (not reported). We test a similar model using a subsample of LACs that had experienced capital flight. Almost the same pattern is observed, except for the debt-service-to-exports ratio (incorrect sign but insignificant) and the real gnp percapita (correct sign but insignificant).

Notice that the reserves/gnp ratio and the debt service/exports ratio are associated with short run liquidity problems and that all LACs are middle income countries[19]. Our results suggest that middle income countries are affected by longer-run creditworthiness factors, and thus corroborate those of Cuddington et al.

Considering all LACs, the model predicts that, ceteris paribus, a unit change in the imports/gnp ratio will change the log-odds ratio by 2.19. A unit change in the debt/exports ratio will change the log-odds ratio by 1.41 while a one point increase in the percentage of real gdp growth will decrease the log-odds ratio by 0.17. The "quasi-elasticities" with respect to the imports/gdp ratio, the debt/exports ratio and real growth of gdp are 0.46, 1.05 and -0.32 respectively.

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[19] "Middle income" refers to countries in which 1984 GNP per capita is more than 400 US dollars. Haiti with GNP per capita of 320 US dollars in 1984 is the only low-income Latin American country. To preserve the integrity of other low-income classifications, the World Bank includes Haiti in the "middle income" group. See World Debt Tables (1985-86 edition).

In the case of the subsample of LACs, the effect of a unit change in the imports/gnp ratio on the log-odds ratio is 9.59, much higher than for all LACs taken together. A one point increase in the percentage of the real growth of gdp decreases the log-odds ratio by 0.21. Once again, this effect is higher than when we considered all LACs. The effect on the log-odds ratio of a unit change in the debt/exports ratio is 1.49. The "quasi-elasticities" associating the probability of arrears with the imports/gnp ratio and the real growth of gdp are 1.19 and -0.43 respectively. A 1% increase in the debt/exports ratio increases the probability of arrears by 1.12%.

Inclusion of the capital flight/gnp ratio as an additional explanatory variable in the subsample of LACs does not change the pattern of results. Again, despite having the correct signs, variables reflecting short run liquidity problems and real gnp per capita do not perform well. Surprisingly, the capital-flight-to-gnp ratio is significant only at the 17% level. It affects the log-odds ratio substantially (a one unit increase in this ratio changes the log-odds ratio by 16.47) and its calculated "quasi-elasticity" is 0.11. However, these results should be interpreted with some care because of the difficulties encountered when estimating the magnitude of the capital flight effect. The Cuddington capital flight series are not adjusted for trade misinvoicing and consider only short-term capital movements rather than both short and long term[20]. Biases due to measurement errors are thus a distinct possibility.

With regard to the magnitudes of the estimated coefficients, the

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[20]Refer to footnote 18, Gulati (1987) and Economic Commission for Latin America and the Caribbean (1986).

effect of a unit change in the imports/gnp ratio on the log-odds ratio is 9.46 while a one point increase in real gdp growth decreases the log-odds ratio by 0.16. The log-odds ratio changes by 1.39 when the debt/exports ratio increases by one unit. In terms of "quasi-elasticities", a 1% change in the imports/gnp ratio changes the probability of arrears by 1.17%. A 1% increase in the real growth of gdp decreases the probability of arrears by 0.21%. The probability of arrears changes by 1.04% when the debt/export ratio increases by 1%.

2.3. Lanoi (1986)

Lanoi critically reviews the outcomes of 15 studies in which statistical techniques (typically logit and discriminant analysis) were applied. Acknowledging that a comparison among them is somewhat misleading (the studies vary considerably), he lists 42 independent variables which were found significant in at least one study. From this set, only 7 variables were found significant three times or more. These variables are: the ratios of debt service (interest payments) to exports (ix), debt to gdp or debt to exports (dg or dx), debt amortisation to total outstanding debt (1/aml), reserves to imports (rm); the inflation rate ($\dot{p}$) and the share of investment in gdp (inv/gdp). Lanoi classifies the first four variables as financial indicators and the three others as debtor's economic performance indicators.

Most of the ratios just mentioned are quite popular. We give a brief explanation of some of them:

a) The debt amortisation to total outstanding debt ratio (the inverse

of the "average" maturity of loans) reflects the debtor's short-run flexibility in lowering its debt service commitments by a temporary reduction in borrowing. Thus, a low value of this variable increases the probability of arrears.

b) The inflation rate is related to the macroeconomic management of the country. If devaluation is not kept in line with inflation, the real exchange rate appreciates, imports increase while exports decrease. This might lead to a build-up of external debt with adverse consequences for repayment prospects.

c) The share of investment in gdp represents the proportion of gdp allocated to the accumulation of real assets (as opposed to consumption). The higher this share is, the higher the future productive capacity of the economy and in consequence, more resources should be available to service the debt.

We estimate an equation of the form

$$Y = f\ (ix,\ dg,\ 1/aml,\ rm,\ \dot{p},\ inv/gdp,\ u) \qquad (7)$$
$$\qquad\quad +\ \ +\ \ -\ \ -\ \ +\ \ -$$

where u is the error term. In addition, we consider the oil shocks and the world recession[21]. Table 7 presents the outcomes of the logit equation estimated for the period 1971-86.

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[21] First we tested the model in its original form and found all variables had the expected signs but inflation and the debt amortisation/debt outstanding were statistically insignificant (model III in table 7 reports the results after excluding the insignificant regressors). We thenproceeded to include the proxies for oil shock and world recession. The proxy for world recession is the real rate of growth of the United States, Japan, Germany, France, United Kingdom, Italy and Canada, while the effects of the oil shocks are entered as OPEC current account to gnp. We tried also the rate of growth of all OECD countries and a dummy variable for the oil shocks. The results reported correspond to the best fit.

Table 7

Latin American Countries:

Probability of Arrears and Significant IMF Support

Method of Estimation: Logit

Dependent Variable: arr3

	1971-1986		
	I	II	III
Independent Variables:			
(all lagged one period)			
constant	0.687	0.513	-0.797
	(0.785)	(0.690)	(1.204)
debt service/exports	11.568	11.085	13.278
	(3.363)	(3.274)	(4.133)
debt/gdp	4.078	4.229	4.183
	(4.172)	(4.517)	(4.766)
debt amortisation/debt outstanding	-1.982		
	(0.681)		
reserves/imports	-2.660	-2.575	-3.034
	(2.248)	(2.204)	(2.535)
inflation	0.121		
	(0.990)		
investment/gdp	-7.699	-7.968	-7.796
	(2.697)	(2.811)	(2.825)
ca/gnp OPEC	-0.048	-0.051	
	(1.962)	(2.083)	
real growth of OECD	-0.321	-0.326	
	(3.427)	(3.509)	
Sample size	289	289	289
Log likelihood	-115.98	-116.63	-123.78
Correct predictions (%)	82.01	82.35	79.58
Type I error (%)	8.25	7.73	9.28
Type II error (%)	37.89	37.89	43.16

All the variables exhibit the correct sign but the inflation rate (percentage change in CPI, 1980=100) and the inverse of the average maturity of loans (amortisation/debt outstanding) are insignificant. Contrary to McFadden et al's findings, variables associated with short run liquidity problems (in the present model, the reserves/imports ratio and the debt service/exports ratio) are important in explaining debt repayment difficulties.

In all three models, the size of the effect of a unit increase in the debt service/exports ratio on the log-odds ratio is relatively large compared to the other regressors. It is followed by the investment/gdp ratio, the reserves/imports ratio, the OPEC current account/gnp and the real growth of OECD countries. Although (among the three models) there are no sharp differences in the calculated "quasi-elasticities", they are relatively smaller for model II. In model II, a 1% increase in the debt service/exports ratio increases the probability by 0.48%, a 1% increase in the debt/gdp ratio increases the probability of arrears by 0.73%. A 1% increase in the reserves/imports ratio changes the probability of arrears by -0.36%, a 1% increase in the investment/gdp ratio changes the probability of arrears by -0.96%. The "quasi-elasticities" of the probability of arrears with respect to the OPEC current account/gnp ratio and the real growth of OECD countries are -0.21 and -0.57 respectively.

Brandford and Kucinski (1988) and Darity (1986) signal 1979 (last quarter) and 1980 as benchmarks in the reverse of the international lending trend. To test for the usefulness of breaking the sample in two, we estimate model II and III for 1971-79 and 1980-86 (see table 8). The likelihood ratio test (for the validity of pooling the data) in model II yields a chi-square statistic of 7.69 with 7 degrees of

Table 8

Latin American Countries:

Probability of Arrears and Significant IMF Support

Method of Estimation: Logit

Dependent Variable: arr3

	MODEL II		MODEL III	
	1971-79	1980-86	1971-79	1980-86
Independent Variables:				
(all lagged one year)				
constant	0.878	-0.009	0.374	-0.765
	(0.808)	(0.008)	(0.397)	(0.709)
debt service/exports	11.534	9.658	11.808	10.442
	(1.700)	(2.051)	(1.748)	(2.505)
debt/gnp	2.222	4.612	1.841	4.095
	(1.191)	(3.461)	(1.018)	(3.581)
reserves/imports	-7.945	-1.659	-8.782	-2.034
	(2.574)	(1.247)	(2.898)	(1.615)
investment/gdp	-8.318	4.213	-7.712	-5.795
	(2.080)	(0.918)	(2.004)	(1.393)
ca/gnp OPEC	-0.014	-0.087		
	(0.433)	(2.085)		
real growth OECD	-0.148	-0.375		
	(1.061)	(2.355)		
Sample size	169	120	169	120
Log Likelihood	-59.51	-53.27	-60.10	-58.36
Correct predictions (%)	85.80	80.83	86.39	79.58
Type I error (%)	1.41	23.08	0.70	26.92
Type II error (%)	81.48	16.18	81.48	19.12

freedom. This implies a rejection at the 50 percent level of significance but not at the 30 percent level. For model III, the calculated value is 10.65 with 5 degrees of freedom, exceeding the critical chi-square at the 5 percent but not at the 10 percent level. This suggests that in the case of model II we are better off estimating over the whole sample period, but perhaps not in model III.

Model III in table 8 shows that there is no reversal of the signs of the parameter estimates (except for the constant term) from one subperiod to the other. The debt service/exports ratio and the debt/gnp ratio become very significant while the reserves/imports ratio and the share of investment in gdp lose explanatory power. The model predicts much better countries with no repayment problems than countries with repayment problems over the period 1971-79. Overall, the model performs better in the second subsample than in the first.

Moreover, the results of model III in table 8 suggest that most of the repayment problems during 1971-79 were not caused by the usual debt burden indicators. In addition, the increasing tendency of the share of investment in gdp and the low type I error might be signalling expectations of increased resources for debt repayment in the future. Notice that after 1980, real LIBOR rates were positive and high, and since most of the debt was contracted at variable interest rates, LACs experienced not only the burden of interest payments but also the consequences of a period of heavy borrowing, i.e. the claims of the rest of the world on LACs' resources increased substantially. It is interesting to note that in spite of the 41 billion dollar decrease in imports in 1985 with respect to 1980, the reserves-to-import ratio during the second subperiod is marginally significant. Therefore, it seems that the squeeze in imports was not

enough to cope with the new debt situation.

2.4. Citron and Nickelsburg (1987)

They proposed and estimated a model of country risk for foreign borrowing. That is, they incorporated in addition to economic variables, a political instability variable in the analysis of international sovereign debt.

They assume that goverments maximise the following objective function

$$\underset{\{G,D\}}{\text{Max}}\ W = W(G,D,\mathbb{T}) \qquad (7)$$
$$\qquad\qquad + \ + \ -$$
$$\text{s.t. } PG+ED=P(X-M)+TPY+E\Delta R$$

where G: government expenditure
D: debt repayment
$\mathbb{T}$: shift variable representing political instability
P: domestic price level
E: exchange rate
(X-M): trade balance or current account
T: income tax rate
R: level of international reserves
Y: gross domestic product

The welfare cross derivative (W_{GD}) and the marginal welfare function for G and D (W_G and W_D) are assumed to depend on $\mathbb{T}$. Therefore, in politically unstable scenarios, the ruler weighs debt repayment against expenditure. That is, he might decide not to repay on schedule and direct resources to calm those who might attempt to overthrow him.

For a range of values of π, maximisation of (7) yields an interior solution for G and D. But if the level of political instability is very high, the optimum is a corner solution with repayment equal to zero. Assuming that a stochastic element is embodied in (7), the corner solution is modelled as the probability of hitting the corner. Citron and Nickelsburg assume that this probability follows a logistic distribution and estimated

$$F(\hat{\beta}' f(.)) = \{1+\exp[-f(\Delta(X-M), \Delta R, \Delta Y, \pi]\}^{-1} \qquad (8)$$

where the left hand side is defined as the probability of default and f is a function derived from the governmental decision rules.

The countries in the sample had different degrees of political stability (Argentina, Brazil, Mexico, Spain and Sweden) and the model was estimated for the period 1960-1983. The dependent variable (default) was defined to be a condition under which a country renegotiates the terms of a loan because it claims an inability to repay on schedule. However, they suggest that the differentiation of complete default, moratoria and rescheduling would improve the predictive power of their model. The change in gross domestic product, change in current account balance, change in international reserves plus IMF credit were drawn from IFS. The political instability variable was constructed as a five year moving aggregate of the number of changes in governments accompanied by changes in policy. Table 9 presents their results.

The estimated coefficients obtained by Citron and Nickelsburg have the expected sign but only the change in reserves and IMF credits and the political instability variable are significant. Notice that the type II error is substantial and that the classification failed

Table 9

Estimated Default Probability Model

Method of Estimation: Logit

Dependent Variable: Default

	Selected Countries[i] 1960-1982
Independent Variables:	
constant	-2.2
	(3.41)
change in gdp	-0.1
	(1.00)
change in current account/1000	-0.1
	(0.50)
change in reserves and IMF credits/1000	-0.8
	(2.66)
political instability index	0.48
	(2.82)
Sample size	110
Correct predictions (%)	80.00
Type I error (%)	2.53
Type II error (%)	47.61

Source : Citron and Nickelsburg (1987)

Notes : [i]Includes Argentina, Brazil, Mexico, Spain and Sweden.

mostly for Argentina and Brazil which are relatively more unstable than the other countries taken in the sample.

We re-estimated their model using our LACs data bank for the period 1971-1985 (table 10). We use a very crude version of political instability, that is a five year moving aggregate of changes in the head of government[22]. For the dependent variable, we use our constructed dichotomous variables in turn: arr1 (1 if rescheduling occurred and 0 otherwise), arr2 (1 indicates the year of arrears and 0 otherwise) and arr3 (1 signals the year of arrears and/or high tranche IMF Stand-By agreements and/or IMF Extended Fund Facility loans; the variable took the value of 0 if none of the mentioned events occurred). The change in the gross national product is used instead of the change in gdp.

The proxy for political instability and the change in gross domestic product have the correct sign and are very significant. Besides that, however, the overall result is not very encouraging. The change in reserves plus IMF credits is very significant but has a positive sign instead of the expected negative sign. A reduction in international reserves is, in general, an indicator of financial problems and hence, should increase the probability of non-repayment. In general, modifications in the definition of arrears do not change these results. However, a broader definition of arrears decreases the type II error.

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[22]This variable was constructed through our own research. It would have been better to consider the changes in policies instead of changes in head of governments, but that would require separate research since our sample is composed of 19 countries.

Table 10

Latin American Countries:

Probability of Repayment Problems

Method of Estimation: Logit

	1971-85		
Dependent Variable:	arr1	arr2	arr3
Independent Variables:			
(all contemporaneous)			
constant	-2.267	-1.620	-1.172
	(7.902)	(6.559)	(5.105)
change in gnp/1000	-0.053	-0.073	-0.096
	(2.673)	(3.044)	(3.157)
change in current account/1000	-0.009	0.017	0.019
	(0.022)	(0.423)	(0.491)
change in reserves and	0.785	0.616	0.547
IMF credits/1000	(3.138)	(2.544)	(2.229)
political instability index	0.272	0.447	0.399
	(2.091)	(3.304)	(2.985)
Sample size	238	238	238
Log likelihood	-90.04	-122.62	-134.12
Correct predictions (%)	85.29	75.22	71.01
Type I error	1.49	3.47	3.80
Type II error	88.89	81.54	78.75

In all cases, the effect of a unit increase in the change in gdp on the log-odds ratio is negligible as are corresponding "quasi-elasticities". A unit change in the index of political instability changes the log-odds ratio by 0.27, 0.44 and 0.40 when arr1, arr2 and arr3 are used as the dependent variable. The "quasi-elasticities" relating the probability of arrears and the index of political instability are 0.25%, 0.46% and 0.32% respectively.

We regress the same model using arr3 as the dependent variable and include the OPEC current account/gnp ratio[23] and the real growth of the five largest OECD countries as additional independent variables.

The first column of table 11 reports our results when all the independent variables are contemporaneous. The change in the current account has the correct sign but is insignificant. The change in gnp remains very significant and has the expected sign. Still of some concern is the fact that the change in reserves plus IMF credits is very significant and has the incorrect sign. The second column in table 11 shows the results when all the independent variables are lagged one year. Surprisingly, except for the index of political instability, none of the explanatory variables originally proposed by Citron and Nickelsburg are significant. What holds true is that in both cases (contemporaneous and one year lagged regressors), the index of political instability is very significant as well the proxies for oil shocks and world recession. In addition, there is a substantial improvement in the type II errror.

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[23] Alternatively, we tried dummy OPEC. The results remain almost the same when using ca/gnp OPEC or dummy OPEC. We report the regressions with ca/gnp OPEC because they predicted better.

Table 11

Latin American Countries:

Probability of Repayment Problems

Method of Estimation: Logit

Dependent Variable: arr3

	1971-1985	
Independent Variables:	(contemporaneous)	(all lagged one year)
constant	0.242	0.781
	(0.621)	(2.028)
change in gnp/1000	-0.078	-0.013
	(2.781)	(0.854)
change in current account/1000	-0.005	-0.021
	(0.134)	(0.556)
change in reserves and	0.567	0.117
IMF credits/1000	(2.277)	(0.791)
political instability index	0.417	0.383
	(2.677)	(2.569)
ca/gnp OPEC	-0.145	-0.133
	(5.268)	(5.344)
real growth OECD	-0.236	-0.350
	(2.754)	(4.064)
Sample size	238	238
Log likelihood	-113.99	-127.58
Correct predictions (%)	77.31	70.59
Type I error (%)	11.39	16.11
Type II error (%)	45.00	51.68

When using contemporaneous regressors, the effect on the log-odds ratio of a unit increase in the change of gdp is negligible. The effect on the log-odds ratio of a unit increase in the index of political instability is 0.42, larger than a unit increase in the real growth of OECD countries (-0.24) and a unit increase in the OPEC current account/gnp ratio (-0.15). In terms of "quasi-elasticities", a 1% change in the political instability index increases the probability of arrears by 0.32% while a 1% increase in the OPEC current account/gnp ratio decreases it by 0.61%. The "quasi-elasticity" corresponding to the real growth of OECD countries is -0.38.

When we entered all regressors with one year lag, the effect of a unit change of the political instability index on the log-odds ratio is 0.38 and the "quasi-elasticity" is 0.29. With respect to the OPEC current account/gnp ratio and the real growth of OECD countries, the effect on the log-odds ratio is -0.13 and -0.35 and the "quasi-elasticities" are -0.57 and -0.58.

In spite of the outcome of the estimation (i.e. most of the economic variables do not perform well), there are useful lessons. Whatever definition of dependent variable is used, the proxy for political instability was very significant. Citron and Nickelsburg argue that this result seems to confirm their position that in an unstable political environment, new governments would tend to increase expenditures and are less likely to meet debt obligations as scheduled. This might be true but it is also plausible that a government which will soon be leaving office would engage in more expenditures (reputation and image, or simply corruption) passing the burden of the debt to their successors. Finally, an overall criticism

is the fact that the variables are not adjusted for country scale.

3. Disequilibrium Models

Recalling the useful general framework proposed by McFadden et al (1985), the logit models reviewed in the previous section (except for Citron and Nickelsburg) could be implicitly interpreted as having an underlying disequilibrium structure. In this section, we survey models which are explicitly framed in a disequilibrium context. First we explore the seminal work of Eaton and Gersovitz (1981) and their estimation of demand and supply regimes; then we turn to models (McFadden et al, 1985) where it is not possible to identify demand and supply separately.

3.1. Eaton and Gersovitz (1981)

They develop a stochastic model of international borrowing with an endogenous default penalty. The punishment for non-repayment is permanent exclusion from the credit market. Countries borrow to smoothe consumption, so the cost of repudiation is higher, the higher their income variability and the higher the retaliation from the international community. Risk neutral lenders know all the borrowers' relevant characteristics and the structure of the repudiation incentives so they will not lend beyond the point where the borrowers' benefits of default exceed the cost. The lending interest rate does not play the role of a market-clearing device since a heavy borrower will not pay the price if he defaults and default is more likely the higher is his debt outstanding. The level of debt may be determined

either by the borrower's demand for credit or by a credit ceiling imposed by the lenders. Therefore, they argue, it is not appropriate to estimate a single relation between debt and a set of independent variables if the sample contains countries whose debt levels are determined by different regimes.

They estimate the following disequilibrium model

$$B_t^d = f(x) + u_{1t}$$

$$B_t^c = g(x) + u_{2t}$$

$$B_t = \min (B_t^d , B_t^c) \qquad (8)$$

where B_t^d: amount the country wishes to borrow

B_t^c: credit ceiling imposed by the lenders

B_t: observed debt

X_t: vector of country characteristics

u_{1t}, u_{2t}: random errors

Both demand and supply regimes are hypothesised to be functions of the percent variability of exports[24], ratio of imports-to-gnp, the growth rate of gnp[25], total real gnp, total population, the real level of debt to public institutions (other governments, international

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[24]For the periods 1964-1970 and 1968-1974 for each country, they ran a regression of the log of real exports on a constant and time. Variability of exports was defined as the standard error of this regression.

[25]For the periods 1964-1970 and 1968-1974 for each country, they ran a regression of the log of real gnp on a constant and time. The growth rate of gnp was defined as the coefficient on time.

organisations, etc.) and a dummy (0 for 1970 and 1 for 1974).

Only B_t is observed and it is not known whether any particular B_t belongs to B_t^d or B_t^c. They use the maximum likelihood methods of Maddala and Nelson (1974) to estimate the parameters of f(.) and g(.) jointly. We reproduce Eaton and Gersovitz's results for 45 LDCs in table 12

From the borrower's point of view, the higher the real growth rate of income, the higher his desired debt i.e. some of the future higher income is consumed today. But higher growth might or might not raise the credit ceiling. A borrower with increasing income might fear less from the future effects of default punishment, thus decreasing the credit ceiling. The variability of exports is also significant and has the expected sign (the higher the export variability, the higher the cost of default if the punishment takes the form of, for example, a trade embargo; hence the more the country can borrow).

In the case of the imports-to-gnp ratio, the supply regime exhibits the correct sign (the higher this ratio is, the higher is the cost of default i.e. disruption of financing trade). In the demand regime, the imports to gnp ratio is included to incorporate transaction effects since some debt is used to finance trade. The significant and negative sign of this ratio in the demand regime is characterised by Eaton and Gersovitz as "an anomalous result". Another surprising result is the insignificant effect of real gnp in the demand regime.

Table 12

Private Debt of Less Developed Countries

Method of Estimation: Switching regression, sample separation unknown

Dependent Variable: Real public debt (including undisbursed) with maturity over one year to private creditors (logged)

	1970 and 1974	
	B^c (supply regime)	B^d (demand regime)
Independent Variables:		
constant	-4.48	13.5
	(2.25)	(3.20)
exports variability	4.88	17.0
	(2.52)	(2.93)
imports/gnp	4.35	- 8.8
	(2.88)	(3.07)
log real gnp	1.18	0.01
	(6.46)	(0.03)
log population	-0.64	0.01
	(3.54)	(0.03)
gnp real growth rate	-0.12	0.67
	(2.60)	(3.14)
log real debt to public inst	0.63	-0.19
	(3.14)	(0.55)
dummy OPEC	-0.57	0.09
	(2.14)	(0.17)
Sample size	81	
Log likelihood	- 95.2	
Estimated of error variance	0.705	

Source: Eaton and Gersovitz (1981).

Debt to public institutions might act as a substitute for private loans in the context of the demand regime. However, in the supply regime, private lenders might regard a high value of debt to public institutions as a signal of confidence in the borrowers. This variable has the correct sign but is not significant in the demand regime, while it is very significant in the supply regime.

Eaton and Gersovitz, using a cut-off probability of 0.50, conclude that most of the countries for 1970 and 1974 are more likely to be supply constrained.

Morgan (1987) re-estimates the Eaton and Gersovitz model for the same countries but for the years 1977 and 1981. He finds that export variability is insignificant in the supply regime and only marginally significant in the demand regime. The imports-to-gnp ratio is marginally significant in the supply regime and insignificant in the demand regime. Real gnp growth is not significant in either of the regimes. The only significant variables in both regimes are real gnp and debt to public institutions. Comparing the change in the probabilities of belonging to one or the other regime, he concludes that the developing countries in the sample were less constrained in the late seventies/early eighties than in the earlier part of the seventies.

To analyse the trends in the data, Morgan re-estimates the Eaton and Gersovitz model for individual years (1970, 1974, 1977 and 1981). The importance of the coefficients (their signs and values) changes from sample to sample. Therefore, he doubts whether the model describes the period 1970 to 1981 well and suggests that the model should be modified to account for structural changes in the world

economy (oil shocks, the expanded role of private lenders, the increased usage of short term loans, etc.). None the less, he believes that apart from some drawbacks, the theoretical base of the model is good and that a re-specification of some of the variables would improve the fit.

There are some problems in models with unknown sample separation worth mentioning[26]. Problems might arise because we are asking too much from the data when we do not know which observations are on the demand and on the supply side. One of the statistical and computational problems when estimating this class of models is unboundness of the likelihood functions[27] unless some restrictions are imposed on the error variances. To bound the likelihood function, Eaton and Gersovitz assume that the errors (u_{1t} and u_{2t}) are independently and normally distributed with common variance ($\sigma_1^2=\sigma_2^2$). Violation of this assumption leads to inconsistent parameter estimates.

The particular form of the "minimum condition" depends on the source of disequilibrium and how rationing takes place. The one described in equation (8) assumes continuous market disequilibrium and constrains the observations to lie on the supply or on the demand curve. Under the assumption of price fixity, the market is almost always in disequilibrium and hence the application of the "minimum

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[26] See Maddala (1986, 1985).

[27] As the variance goes to zero, the likelihood function tends to infinity. Thus, in practical work, succesive iterations produce higher and higher values of the likelihood function without converging. See Maddala (1986, 1985), Quandt (1978) and Goldfeld and Quandt (1975).

condition" is somehow justifiable. However, it does not escape from the limitation of not considering observations off the demand and supply schedule. This becomes relevant for example, in debt crises or credit market breakdowns.

We test the Eaton and Gersovitz model by applying it to data on LACs for 1970-1985 (table 13). The dependent and independent variables are the same as theirs except that

- we use our dummy variable "arr3" which conveys information on arrears and IMF support loan programmes to help us classify observations among the two regimes[28] and

-instead of a dummy variable to take into account the oil shocks we include the OPEC current account to gnp ratio. World activity is captured by the rate of growth of selected OECD countries[29].

According to Eaton and Gersovitz, both desired debt and the credit ceiling should be positively related to income, with a unitary income elasticity if borrowers have constant relative risk aversion. The estimated income elasticities in both regimes are significantly positive but greater than one.

The credit ceiling is negatively related to export variability,

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[28]It is not always the case that a switching regression model with a regime classification observation (OR) is better than a model with no regime clasification observation (NOR). If the separation variable is observed without error, both NOR and OR are consistent but NOR is less efficient than OR. If the classification variable is not exact, then the OR estimator is inconsistent while the NOR estimator is consistent since it does not use the classification variable. This issue is explained by Hajivassilou (1986) and Lee and Porter (1984).

[29]See footnote 19.

Table 13

Private Debt of Latin American Countries

Method of Estimation: Switching regression, sample separation known

Dependent Variable: Real public debt (including undisbursed) with maturity over one year to private creditors (logged)

	1970-1985	
	B^c (supply regime)	B^d (demand regime)
Independent Variables:		
constant	-4.096	-4.512
	(12.683)	(8.394)
exports variability	-0.660	2.062
	(0.612)	(1.185)
imports/gnp	1.138	0.492
	(2.913)	(0.904)
log real gnp	1.544	1.537
	(12.940)	(6.965)
log population	-0.870	-0.772
	(4.283)	(2.666)
gnp real growth rate	-12.682	-1.334
	(5.172)	(0.252)
log real debt to public inst	0.747	0.602
	(7.373)	(3.573)
ca/gnp OPEC	-0.026	0.044
	(2.491)	(2.605)
real growth of OECD	-0.013	0.112
	(0.339)	(1.779)
Sample size	99	205
Standard deviation of residuals	1.024	1.156
Log Likelihood	-563.03	

although the coefficient is statistically insignificant. This negative sign might be explained through two arguments which are not strictly related to default punishments. Lenders might perceive the non-repayment problem as one of illiquidity rather than one of solvency; or the more predictable the country's foreign earnings are, the more confidence they have that their loans will be repaid. The amount a country wishes to borrow is likely to increase with the variability of exports. The estimated coefficient in the demand regime is positive but marginally significant.

The elasticity with respect to public debt is positive in both regimes. From the borrower's point of view, public debt does not seem to be a substitute for private debt but rather is complementary. Among other variables, creditworthiness might be associated with the amount of loans the country borrower is able to raise. Therefore, lenders might feel more confident lending to countries with high official or multilateral debt. On the other hand, lenders might also expect creditor governments to favourably intervene in case of non-repayment.

The ratio of imports to gnp has a significant positive effect in the supply regime, but is insignificant in the demand regime. We find that the amount the country wishes to borrow is not significantly related to the growth rate of income, but to the credit ceiling. Higher income growth might make borrowers fear future default punishments less, so an inverse relation between income growth and the credit ceiling is plausible.

The variables reflecting oil shocks and cyclical factors are significant and with the expected sign in the demand regime. The

significant and negative effect on the credit ceiling of the OPEC current-account-to-gnp ratio is difficult to justify since we would expect high average loans as a consequence of petrodollar recycling.

Finally, we estimated the same model for three subperiods (1970-74, 1975-79 and 1980-85). The model seemed to be fairly stable, but the determinants of the credit ceilings were better explained than the motives for borrowing[30]. In particular, for 1970-74, none of the variables significantly explained the country's desire to borrow, although they had the expected signs. Overall, it is possible to conclude that except for the coefficient on export variability, our results give support to the Eaton and Gersovitz default cost-benefit hypothesis.

3.2. McFadden et al (1985)

They test a three regime model where the probability of non-repaynment is determined by the level of excess demand for new loans.

A borrowing country has an intertemporal welfare function and sets policy to maximise this objective, weighting the benefits of consumption and investment financed by current account deficits against the cost of financing these deficits. If the punishment associated with arrears is not severe, the borrower will not adopt

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[30]The calculated chi-square statistic was 18.84, less than the critical chi-square at 25 percent level and 36 degrees of freedom. The value of the log likelihood improved over time, that is, the explanatory variables gained significance over time.

domestic policy measures to avoid a repayment problem. Lenders supply loans according to their assessment of borrowers' creditworthiness.

In the same vein as Eaton and Gersovitz (1981), McFadden et al assume that demand and supply are not equilibrated by adjustments in the interest rate spread. Even though the interest rate spread is considered as an indicator of scarcity and creditworthiness, it is not optimal for either lenders or borrowers to agree to high spreads which may cause debt repayment problems in the future. Thus, spreads may not rise to market clearing levels.

If the supply of new loans exceeds demand, the observed transactions lie on the demand curve and the debtor experiences no repayment problems. If demand exceeds supply on the other hand, the country borrows only the quantity voluntarily supplied by the market or may go into arrears i.e. a form of involuntary lending.

It is well known that not all countries in arrears are immediately involved in debt restructuring programmes. Moreover, lenders do not impose retaliation actions on the borrower as soon as repayment stops[31]. The novelty in McFadden et al's model is the existence of an arrears limit. Below this limit, lenders find it more costly to request debt restructuring than to tolerate the arrears. It is only if such an arrears limit is exceeded that lenders find it worthwhile to start renegotiation procedures.

Let L^* denote the arrears limit which triggers debt restructuring

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[31] See S. Griffith-Jones (1987).

(IMF arrangement, debt rescheduling, etc); N^d, the demand for new loans; N^s, the supply for new loans; N, the observed new debt; A, the observed arrears; and an indicator δ=1 if rescheduling and δ=-1 otherwise. Define A^*, desired arrears, as $A^* = N^d - N^s$. The three regime model is specified as follows

Excess Supply: $A^* \leq 0$, $N=N^d$, $A=0$, $\delta=-1$

Moderate Excess Demand: $0<A^* \leq L^*$, $N=N^s$, $A=N^d-N^s$, $\delta=-1$

Large Excess Demand: $A^* > L$, $\delta=1$

The demand (N^d) and supply (N^s) for new loans and the arrears limit (L^*) is comprised of a systematic component (D, S and L respectively) and an unobservable component. The econometric model is derived by specifying the distribution of the unobservable components of N^d, N^s and L^*, and the functional relationship between the systematic components and the observed country variables. Given that the probability of repayment problems and debt restructuring depend on the systematic components indicating excess demand (i.e. D-S and D-S-L respectively), it is not possible to identify demand and supply separately. However, it is possible to derive the equations describing the probability of observing each of the three regimes and hence, relate them to the observed outcomes of the country through specification of the functions D, S and L.

McFadden et. al. test the model for 822 country-year observations over the period 1970-82 using limited dependent variable techniques. The demand for new loans is found to be strongly increasing with the debt service-exports and the imports-gdp ratios and decreasing with

respect to real gnp per capita. The supply of new loans is negatively related to past repayment problems (proxied by an index of the number of reschedulings and IMF agreements since 1970) but, contrary to the conventional belief, positively associated with the debt-to-exports ratio. Lenders, they argue, do not guide themselves by current judgments of creditworthiness, but on the strategic position or export potential of borrower countries. Also, institutional reasons might affect the lenders' decision to call a default or keep on supplying more loans. The limit on arrears is significantly explained by the debt-service-to-export ratio and the proxy for past repayment problems. These suggest that lenders guide their actions through the percentage of payment due and will not increase the arrears limit if the borrower has a history of repayment problems. Finally, they find a significant positive correlation (0.28 with asymptotic t=4.79) between the demand and supply of unobservables, with most of the shocks arising from the demand side (σ_d=1.28 with asymptotic t=8.90 versus σ_s=0.47 with asymptotic t=20.28).

Hajivassiliou (1987) questions the robustness of the McFadden et al three-regime model. In particular, he pays attention to the panel nature of the data used to test it. One of the problems encountered in the use of panel models is the temporal dependence of unobservable variables which can cause serious misspecification. Temporal dependence can arise due to country heterogeneity that persists over time (countries differ in terms of history, financial development, etc) and serial correlation induced by the learning process that relies on the history of repayment problems as a predictor of debt repayment problems.

Being aware of such problems, Hajivassiliou first tests the

robustness of McFadden et al's model using a trinomial nested logit model. Then, he attacks the problem of unobserved country heterogeneity by allowing the vector of disturbance terms (u^d_{it}, u^s_{it}) to have an error-component structure: an i.i.d. normal random vector $(\varepsilon^d_{it}, \varepsilon^s_{it})$ and a country-specific normal random vector (η^d_i, η^s_i) uncorrelated with $(\varepsilon^d_{it}, \varepsilon^s_{it})$ for all i and t.

When he estimates this generalisation of McFadden et al's model, however, he finds that the signs of their estimated coefficients are confirmed. He finds a significant positive correlation (0.18 with asymptotic t=3.83) between the demand and supply of unobservables with most of the shocks arising from the demand side (σ^d_ε=0.94 with asymptotic t=2.38 versus σ^s_ε=0.45 with asymptotic t=20.97). Country-specific unobservables are important with the demand-side country effect having a standard σ^d_η=0.37 (t=7.53) and the supply-side effect with σ^s_η=0.11 (t=6.43). In general, changes in the asymptotic t statistics of the independent variables due to random effects estimation are in the range of 10 to 25 percent. The proxy for past repayment problems was found to be still significant, though its significance was lowered. Therefore, the importance of past repayment history seemed not to be affected by country heterogeneity.

4. Conclusions

The regressors found significant across the models re-estimated for LACs are: the interest-service payments/export ratio, the

international reserves/imports ratio, the investment/gnp ratio, real income growth, OPEC current account/OPEC gnp ratio, real income growth of OECD, the history of repayment problems and the index of political instability.

Excepting Citron and Nickelsburg, the logit models surveyed include variables associated with both lenders' and borrowers' behaviour. Although it is true that the determinants of repayment problems should include the perceptions of all agents, it is not possible to disentagle them. For example, the debt to exports ratio affects repayment problems positively. The higher this ratio is, the higher the demand for loans and the higher the probability of repayment problems. We expect lenders to curtail their loans unless they perceive that exports are temporarily too low. If the latter is the case, then we might find that the ratio is insignificant or even has a negative coefficient.

Disequilibrium models provide a way of tackling the above problem by allowing for the possibility of examining reactions of lenders and borrowers to a given variable. Interestingly, the same indicator may differ in importance and sometimes even in sign depending on whether the participant is a lender or a borrower (see the Eaton and Gersovitz model for example). Furthermore, lenders might let a borrower fall into arrears without taking any retaliatory action so the next step is to investigate the determinants of the arrears limit which triggers a rescheduling or an IMF agreement. McFadden et al and Hajivassiliou provide us with some answers on this. That is, an action for solving the impasse of non-repayment is undertaken when the debt service to export ratio is high and when the borrower does not exhibit a good repayment record. However, the impact of political variables which

carry an important weight with regard to the attitude of bankers (and also borrowers) is not addressed. The analysis of political variables as one of the determinants of debt re-arrangements is also motivated by the Citron and Nickelsburg's paper.

Problems of misspecification (due to the panel nature of the data) and parameter stability were highlighted in this survey. As pointed out by Hajivassiliou, countries differ in past history and economic structure and this should be taken into account when assessing the causes of non repayment. Also, variables explaining past debt trends might not be adequate to interpret the current non-repayment issues because of the change of the lending source (more from private lenders instead of official and multilateral sources). Furthermore changes in the economic conditions in developed countries may affect the probability of non repayment in less developed countries. This may prove useful in predicting the duration of debt crisis and helpful in the design of debt relief arrangements.

APPENDIX

Data Definition and Sources

Dependent Variables:

arr3: This arrears (0,1) dummy variable was constructed from our own investigation. Firstly we listed dates, amounts and type of lender of external debt restructured. Then, if the events precipitating a debt restructuring happened in a different year, we proceeded to shift the dates according to information provided by the Economic Survey of Latin America (Economic Comission for Latin America and the Caribbean or ECLAC or CEPAL), IMF Occasional Papers on external debt restructuring and international capital markets developments, Jorge, Salazar-Carrillo and Higonnet eds. (1983, 1985), Kisic et al (1985), Plan (1985) and Milivojevic (1985). This constructed variable was validated with the list of non defaulters presented by Dhonte (1975), Feder and Just (1977), Hardy (1982), Palmer and Gordon (1985) and Canto (1986). Data for multilateral debt relief agreements with official and private creditors was assembled using the information provided by the World Debt Tables of the World Bank, OECD, IMF and Kisic et al (1985). Stand-by Arrangements (SBA), Extended Fund Facilities (EFF) and Compensatory Financing Facilities (CFF) were compiled from IMF Annual Reports and checked using the data presented by Korner et al (1986) and Pastor (1987).

arr2: As arr3 but excluding IMF stand-by and Extended Fund Facility loans.

arr1: Dummy variable taking into account only the date of signature of a multilateral debt agreement with commercial banks and official

creditors. See above.

Independent Variables:

All variables (unless stated) are in million U.S. dollars. The debt related ratios correspond to long and medium government and publicly guaranteed debt outstanding and were collected from World Bank Debt Tables. Although data for short term debt for some countries has been recently published by the World Bank in the 1985-86 World Debt Tables, we have not included it because of missing data for years before 1978 and lack of disaggregation between types of creditors.

suppliers' credit/debt: percentage of debt outstanding and disbursed from suppliers to total debt outstanding and disbursed. Source: World Bank, World Debt Tables (WBDT).

reserves/imports: a) International reserves (excluding gold). Source: International Monetary Fund, Balance of Payments. b) Imports of goods and services. Source: WBDT.

debt/gnp: a) End period debt outstanding and disbursed. Source: WBDT. b) Gross national product. Source: WBDT.

interest/gnp: a) Interest payments to official and private creditors in the current period. Source: WBDT. b) Gross national product as above.

reserves/gnp: See above.

imports/gnp: See above.

debt/exports: a) Debt as above. b) Exports of goods and service. Source: WBDT.

debt service/exports: a) Interest and principal repayment in the current period. Source: WBDT. b) Exports as above.

capital flight/gnp: a) Capital flight defined to include short-term capital outflows by the private non bank sector plus net errors and omissions from the balance of payments. Source: J. Cuddington (1987), "Macroeconomic Determinants of Capital Flight: An Econometric Investigation" in D. Lessard and J. Williamson eds. Capital Flight and the Thirld World. b) gnp as above.

real gnp per capita: Gross national product per mid year population at 1980 market prices (U.S. dollar per capita). Source: International Monetary Fund, Output Statistics, Supplement 8 1984. Alternatively, we used gnp per capita and converted it to real terms applying the 1980 U.S.A. gnp deflator. Source: gnp from WBDT, mid year population from World Bank, World Tables and U.S.A. gnp deflator from International Monetary Fund, International Financial Statistics, 1987 Yearbook (IFS87).

interest/export: See above

debt amortisation/debt outstanding: This is the inverse of the average loan maturity. a) Debt amortisation includes current year principal repayments to private and official creditors. Source: WBDT. b) Debt outstanding as above.

inflation: Percentage change over the previous year of the consumer price index (1980=100). Source: IFS87.

investment/gdp: Share of total investment to gross domestic product. Source: IFS87.

dummy OPEC: (0,1) dummy variable which takes the value 1 in 1973-74 and 1978-79.

OPEC current account/OPEC gnp: OPEC member countries current account and gross national product. Source: OPEC, Annual Statistical Bulletin, 1985.

real growth of OECD: Growth of real gnp/gdp in the OECD area in percentages. Source: OECD, Economic Outlook, June 1988.

change in current account: Approximated by the change of the balance of trade over the previous year. Source: WBDT.

change in reserves and IMF credits): Percentage change over the previous year. a) Reserves as above. b) IMF credits are the country's use of Fund credit within the IMF General Department. Source: IFS87.

export variability: Similar to Eaton and Gersovitz (1981), for the periods 1964-70, 1965-71, 1966-72, 1967-73, 1968-74, 1969-75, 1970-76, 1971-77, 1972-78, 1973-79, 1974-80, 1975-81, 1976-82, 1977-83, 1978-84, 1979-85 and for each country, a regression of the natural logarithm of real exports on a constant and time was performed. Export variability was defined as the standard error of this

regression. Source: exports from WBDT.

log population: Natural logarithm of mid year population. Source: WT.

log real gnp: Natural logarithm of real gnp (1980=100). a) Gross national product in million of U.S. dollars. Source: WBDT. b) U.S.A. gnp deflator (1980=100). Source: IFS87.

gnp real growth rate: Two different measures were used. For our applied survey, we follow the Eaton and Gersovitz (1981) procedure. That is, for the same periods as for export variability and for each country, a regression of the natural logarithm of real gnp on a constant and trend was performed. Gnp real growth rate was defined as the estimated coefficient on time. Source: gnp from WDT. Unless otherwise explicitly stated, we also used the percentage change over the previous year of the gdp at 1980=100 prices. Source: IFS87.

log real debt to public institutions: Debt outstanding (including undisbursed) to official creditors deflated by the U.S.A. gnp deflator (1980=100). The variable was then logged. Source: WBDT and IFS87.

log real debt to private institutions: Debt outstanding (including undisbursed) to private creditors deflated by the U.S.A. gnp deflator (1980=100). The variable was then logged. Source: WBDT and IFS87.

political indicators: See appendix in the next chapter. Source: A. Banks (1980, 1986) Political Handbook of the World.

Chapter 4

Political Variables and Debt Arrears

1. Introduction

Most of the models we surveyed in chapter 3 suggested the presence of a systematic relation between macroeconomic variables and repayment problems. Except for Citron and Nickelsburg (1987), they did not attempt to include political variables which, in addition, explain the occurrence of debt servicing problems. This is surprising because it is recognised that political processes influence the way countries manage debt repayment. Indeed, political factors are taken into account in creditworthiness analysis performed by bankers.

The analysis of the politics of debt problems should simultaneously relate international and domestic politics[1]. The size of the outstanding debt, the political and strategic importance of the debtor, the formation of debtor cartels and the threat of repudiation are, among others, counted as possible factors affecting the international bargaining positions and outcomes between lenders and borrowers. At the negotiating table, the main issue is the amount of the loan and the terms of debt service. The agreement is summarised in a repayment profile which assumes macroeconomic projections and hence, implementation of domestic macroeconomic policies and structural adjustments. In practice, it turns out that intentions differ from implementation, debt servicing problems arise and

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[1] See for example, Haggard and Kaufman (1989), Pastor Jr. (1987) and Kahler ed. (1985).

borrowers have often been criticized for their lack of commitment to agreed economic programmes.

It is well known that stabilisation and adjustment policies have different consequences for each social group and political consequences for the government in power. They influence the design of a program and constrain governments in carrying out their intentions. However, as suggested by Haggard and Kaufman (1989), to analyse the choice of a policy decision we need to consider not only social conflicts but also the institutional setting where it is formulated and implemented.

It is not our intention to assess the international bargaining position of the creditors and debtors, forecast political upheavals, wars, etc. or model the political decision making process inherent in the resolution to fall into debt arrears. Subject to these caveats, this paper modestly aims to develop a statistical model of debt repayment problems which includes economic and political factors. In particular, we want to examine the incidence of unstable governments and the type of regime. Our sample consists of Latin American countries as defined by ECLA (with the exception of Cuba) for the period 1971-1986.

Including fixed country effects, we found that economic and political variables explained debt servicing problems. Short run and long run creditworthiness indicators as well as oil shocks and the income growth of industrialised countries affected debt repayment. From the political point of view, our results suggested that political instability (measured as the successive changes in government) and a history of military intervention were counter-productive with respect

to debt related issues.

After briefly reviewing previous research in the area, section 3 presents the basic framework of the model and the hypothesis to be tested. Section 4 deals with the empirical specification while section 5 examines the results. Finally, section 6 discusses the implications of our findings.

2. Previous Studies

Although economic and political variables are commonly cited as factors explaining debt servicing problems, empirical research to date has rarely included them as explanatory variables. In this section we review some studies that try to relate the behaviour of sovereign borrowers and/or lenders to economic as well as political indicators.

Burton and Inoue (1985) identified interest rate differentials (average spread over Libor) as the appropriate proxy for bankers' perception of country risk associated with sovereign loans. They assessed how far an awareness of potential default for economic and political reasons is actually reflected in interest rate differentials. They assumed that bankers are mainly influenced by the most recent events and thus lagged the economic and political variables one year. The political instability variable is represented by a simple arithmetic combination of assassinations, general strikes, guerrilla warfare, government crisis, purges, riots, anti-government demonstrations and coups d'etat over the three years preceding the year t-1. After estimating their empirical model for 58 LDCs over the period 1972-77, they concluded that the critical determinants of

interest rate differentials on LDCs' external debt were the size of the loan, the loan maturity and the ratio of foreign exchange to monthly imports. The political instability index was found to be insignificant with the wrong a priori sign. In sum, their results implied that country risk factors played a very small role in the determination of the interest rate differentials.

The following comment could be made on the Burton and Inoue work. The way the political instability index was constructed assumed that each event had the same weight and same effect in the countries under study. This variable is measured with error and the estimated coefficient should be expected to be biased (downwards) and inconsistent. No attempt was made to correct such bias by formulating, for example, a weighted average according to the particular characteristics of each country and the risk experience of the lenders with the sovereign borrower.

Another model of country risk incorporating political and economic factors is the one of Citron and Nickelsburg (1987) which we surveyed in the previous chapter. In contrast to Burton and Inoue, their model is derived from optimising behaviour of the government-borrower welfare function. They hypothesised that when governments are changing frequently, the marginal benefit of default relative to alternative policies becomes positive. This is so because during times of political instability, the cost of increasing taxes for debt repayment may sharply increase the probability of government collapse. Thus, in such circumstances, default provides a less costly way of adjusting the government budget. The political instability index was proxied by a five years moving aggregate of the number of changes in governments accompanied by changes in policy. A logit

equation was fitted for five countries (3 LDCs and 2 DCs) over the period 1960-83. They found that their political instability indicator was very significant though the only significant economic variable was the change in reserves and IMF credits.

When we estimated the Citron and Nickelsburg model using our LACs data, we also found the change in gdp had the expected sign and was significant. However, the type II error (predicting a non-rescheduling when in fact a rescheduling took place) was very high. After trying alternative definitions for the dependent variable and using contemporaneous as well as a one year lag in all regressors, our results suggested that the proxy for political instability is an important determinant of debt repayment problems.

Recent studies have tried to link political instability of developing countries to their accumulation of external public debt, private capital outflow, income distribution and debt repudiation. Alesina and Tabellini (1988) developed a theoretical model where two social groups (defined as "capitalist" and "workers") behave non-cooperatively. Each group, once in office, will attempt to redistribute income to their constituency by means of economic policies. Uncertainty over which group will hold office in the future generates political risk which in turn, affects the current decisions of economic agents and the government, and hence the probability of debt repayment. Private capital flight is explained as an insurance against the risk of future taxation. The desirability of capital controls depends on the nature of the government i.e. the government

representing the capitalists never finds it optimal to impose capital controls while the government representing the workers always imposes some restrictions on capital movements. Overborrowing occurs if the government does not internalise the future cost of servicing the debt. For example, if the capitalist government knows that with some probability the debt will be serviced in the future by the workers' government, then the capitalist government overborrows. Therefore, political polarisation may lead to overaccumulation of public debt and private capital flight. The costs of repudiating (measured by the country loss of output and seizure of private assets held abroad) have different distributional implications for the two types of governments. It is likely that it is less costly to repudiate for workers' governments; thus the model suggested that repudiation is more plausible if a workers' government unexpectedly gains office.

This idea was carried forward by Berg and Sachs (1988) in their attempt to relate the probability of debt rescheduling and the secondary market valuation of LDCs debt to structural country indicators. Using a cross-section probit model, they associated the pattern of rescheduling with the country's trade regime (the degree of outward orientation), political variables that affect effective political management (the degree of income inequality and the share of agriculture in gnp) and the level of real gnp per capita. This model was fitted to 24 observations including only commercial borrowers and commercial reschedulings as defined by the World Bank. The dependent variable took the value one when countries rescheduled their debts with commercial banks between 1982 and 1987. They found that their four explanatory variables pefectly discriminated between reschedulers and non-reschedulers. To test for a larger sample (35 LDCs) they created a measure of outward orientation for the missing data. This

time, the regression correctly predicted 89 percent of the cases and the trade regime variable was found to be statistically insignificant while the other regressors remained significant. The insignificance of the outward orientation variable is explained by measurement error bias.

Political instability in Berg and Sachs was not measured directly, but instead indirectly as they tried to identify structural economic variables that might contribute to it. Their interest was focussed on variables that matter for effective policy management. In this context, income inequality and the share of agriculture in gnp might be interpreted as proxies of social pressure and conflicts.

We are aware, as Berg and Sachs were, that it is not possible to construct accurate measures of the political determinants of country performance. The paper by Burton and Inoue also illustrates how difficult it is to build a measure of political instability. However, it is a common belief that too many changes in regimes during short periods, interruptions of constitutional or elected mandate, switches from right to left regimes, etc. disrupt debt repayment schedules. These qualitative variables are related to social conflicts and the setting where the policy is formulated and thus help to capture how viable a policy decision is. The advantage of working with such indicators is that they are directly observed and may be approximated using moving aggregates and dummies.

3. A Model of Debt Servicing Problems

3.1. General Framework

In our theoretical chapter we developed a two period willingness-to-pay model where the only source of uncertainty is the repudiation penalty. The basic framework was of the form:

$$L^d = L^d (Y_1, Y_2, r_1, r_2, D_1, \bar{D}_2) \quad (1)$$

$$L^s = L^s (Y_2, r_1, r_2, \bar{r}, \bar{D}_2) \quad (2)$$

where

L^d is the demand for loans in period 1 conditional upon repayment in period 1

L^s is the supply of loans in period 1 conditional upon repayment in period 1

Y_1 and Y_2 are output in period 1 and 2 respectively

r_1 and r_2 are the interest paid on debt in period 1 and 2 respectively

$\bar{D}_2=(1+r_1)D_2$ is the inherited debt owed in period 2

The probability of repudiation was determined by the uncertain penalty cost and derived from the borrower's utility maximisation. Obviously, the higher the penalty, the lower the probability of repudiation. If it is assumed that the repudiation penalty is uncertain, then for a given level of output it follows that the higher the debt-to-gnp ratio, the lower will be the consumption in the next period and therefore the higher will be the incentive to repudiate. If lenders can anticipate this result, it is in their interest to

supply loans so as to avoid repudiation. Therefore, the probability of repudiation takes into consideration both the behaviour of the borrowers and lenders.

For empirical purposes the model is limited. It is an "all-or-nothing" model in the sense that the borrower repudiates, the penalty is imposed and the market breaks down. However, the 1980s have been characterised by debt restructuring rather than debt repudiation. Nonetheless, our model provides some explanation of the use of the debt to gnp ratio as a long run creditworthiness indicator.

As we suggested before, one way out of this problem is to assume additional sources of uncertainty. Debt repayment problems happen because loans have been agreed in the past using all the information available at the time of signature. But repayments are due in the future and the borrowers might find themselves in a position where repayment is not possible because of say, too high interest rates and/or lower output and foreign exchange than expected. Since it is not possible to design contracts contingent on all states of the world and borrowers care about their credit reputation, a situation of arrears may be defined as one of ex-post excess demand for loans. Moreover, if borrowers and lenders prefer debt roll-overs to arrears, then the one period ahead ex-ante demand for loans would be derived from utility maximisation conditional upon the repudiation penalty and expectations of future repayment. In this context, arrears are never an ex-ante borrower's choice, but part of the next period inherited debt which modifies the resource budget constraint.

The lender's response to an arrears problem differs depending on the amount involved, expectations about future repayment and the

reputation of the debtor. If there is no prospect of future repayment, the lender might declare the loan "value impaired" and consequently, call a default and impose retaliatory actions[2]. If expectations of future repayment outweigh the expectations of non-repayment and the costs incurred in payment delays, then he might adopt one of the following attitudes. Either behave in a passive manner because renegotiation costs outweigh the cost of temporary delay payments[3] or restructure the debt and lend involuntarily. Testing for the determinants of debt restructuring involves considering variables that led to an arrears limit, and also, variables that capture confidence in future repayment.

These diverse ways of facing an arrears problem also have different implications for the credit market. Severe market break down occurs when lenders call a default or borrowers repudiate their debts. In both cases, penalties are expected to be imposed, but their type and duration might vary. In the former, the market break down might be seen as temporary until negotiations are resumed and a solution reached. Since outright repudiation is the borrower's refusal to accept liability for interest and/or capital repayment forever (or until a new government renews debt servicing and reaches an understanding with its creditors), the spell of market break down is expected to be permanent or at least to last a considerable time. By contrast, in cases of a low level of arrears or debt restructuring, the credit market still functions. Any market break down would be temporary because the debt will be rolled-over and lending practices

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[2]This has been the case of the IMF, private lenders and Peru since 1985.

[3]See Griffith-Jones (1987) and McFadden et al. (1985).

soon restored.

If the repudiation penalty binds so that borrowers always recognise their debts, and assuming that both debtors and creditors prefer some debt arrangement rather than end lending activities, then it is possible to define levels of arrears (A^*) which are compatible with the continued functioning of the credit market. Let[4]

$$L^d = D+\varepsilon^d \tag{3}$$

$$L^s = S+\varepsilon^s \tag{4}$$

where D, S are the systematic components of the demand (L^d) and supply (L^s) for new loans depending on the observed state of the country (i.e. history and characteristics) and ε^d, ε^s are random components. Then arrears may be defined as the excess demand for loans

$$A^* = L^d-L^s = D-S+\varepsilon^d-\varepsilon^s \tag{5}$$

We did not have access to the confidential World Bank files on levels of arrears, so we treated A^* as an unobserved variable and constructed a dichotomous (1, 0) dummy variable to account for the year when a country was in arrears. Therefore, we assume that there is an underlying response variable A defined by equation (5) so

$$A = 1 \qquad \text{if } A^* > 0 \tag{6}$$

$$A = 0 \qquad \text{otherwise}$$

and from the relations (5) and (6) we get

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[4]We borrow from the the standard econometric framework of McFadden et al. (1985).

$$\text{Prob}(A=1)=\text{Prob}(A^{*}>0)=\text{Prob}[\varepsilon^{s}-\varepsilon^{d}<(D-S)]=F[(D-S)] \qquad (7)$$

where F is the cumulative distribution of $(\varepsilon^{s}-\varepsilon^{d})$. The likelihood function is

$$L = \prod_{A=1} F(D-S) \prod_{A=0} [1-F(D-S)] \qquad (8)$$

To formulate an econometric model we need to specify the functional form and dependence of the systematic components on observed variables and the functional form of F( ) which in turn, depends on the assumptions made about the random components. Approximating the distribution of the random variables in equation (7) by the normal or logistic distributions yields the probit or logit model of repayment problems.

Incorporating country specific effects (α_i) and assuming that the the random components follow a logistic distribution, we have a standard logit model of the form

$$A^{*}_{it}=D-S+\varepsilon^{d}-\varepsilon^{s}=\alpha_i+\beta' x_{it}+\varepsilon^{d}-\varepsilon^{s} \qquad (5')$$

$$\text{Prob}(A_{it}=1 \mid \alpha,\beta,x)=F(\beta' x_{it}+\alpha_i) \qquad (7')$$

$$L = \prod_{A_{it}=1} F(\beta' x_{it}+\alpha_i) \prod_{A_{it}=0} [1-F(\beta' x_{it}+\alpha_i)] \qquad (8')$$

where $F(\beta' x_{it}+\alpha_i) = \exp(\beta' x_{it}+\alpha_i)/1+\exp(\beta' x_{it}+\alpha_i))$

$= 1/1+\exp(\beta' x_{it}+\alpha_i)$

and $1-F(\beta' x_{it}+\alpha_i) = \exp(\beta' x_{it}+\alpha_i)/1+\exp(\beta' x_{it}+\alpha_i)$

for $i=1,.....,19$

$t=1971,....,1986$

As in chapter 3, the sample period is 1971-1986 and we include all Latin American countries. Assuming that the observations from different countries are independent, α_i is a vector of incidental

parameters, β is a vector of structural parameters common to all 19 countries and x includes all the economic and political variables of the model as well as the history of repayment problems of the countries in the sample.

The model does not allow for separate identification of demand and supply because the systematic part depends only on excess demand, that is D-S. We postulate that the excess demand for loans is a function of economic and political variables and the borrower's history of repayment problems. Note that we are not including the forecast errors nor the political decision making process so the model should be interpreted as one of arrears pressure ie. potential arrears rather than actual arrears.

We lagged all the independent variables one year to reduce the problem of simultaneity, because while economic and political variables may exert pressure on arrears, at the same time they may also be a consequence of it. A one year lag also captures the assumption that the arrears are influenced by economic and political information available at the time of its assessment.

3.2. Explanatory Variables

3.2.1. Economic Indicators and History of Repayment Problems

After comparing the results of the studies discussed in the survey, we selected the variables which were found significant in most of our estimations for LACs. Since their influence on debt-servicing

problems have been discussed earlier, we will just list them and briefly recall their expected association with debt arrears:

a) Interest-service payments/exports ratio: It measures the share of foreign exchange earnings from exports released for interest payments. Higher values of this ratio implies greater risk of debt problems and thus, a deterioration in repayment prospects.

b) International reserves/imports ratio: This measure captures import sustainability when there is a shortfall in export earnings. High ratios are associated with low repayment problems.

c) Debt outstanding and disbursed/gross national product ratio: It is an indicator of debt capacity. The higher the ratio, the higher the claims of the rest of the world on the resources of the borrower country and hence, the higher the probability of repayment problems.

d) Investment to gross national product ratio: It proxies the share of production allocated to the accumulation of real assets as opposed to consumption. It raises the productive capacity of the economy and increases the amount of resources available to service the debt in the future.

e) Real income growth: It might be argued that borrowers with high real income growth fear less from repudiation penalties and hence, repayment prospects are low. However, for countries (such as LACs) which are heavily dependent on foreign capital, high real income growth is more likely to be negatively related to the probability of non repayment.

f) OPEC current account/OPEC gross national product ratio: This is a proxy for petro-dollars recycled from the surplus of oil producers. Therefore, we expect it to be negatively associated with debt arrears.

g) Real income growth of industrialised countries: It allows us to take into consideration not only the 1975/76 and 1981/83 world

recession but also the dependence of the rate of growth of exports from developing countries on the rate of growth of output of developed countries. We expect a negative relation between the probability of arrears and the real income growth of industrial countries.

h) The history of repayment problems: We include the cumulative count of rescheduling signatures and IMF support since 1970. We expect countries with a long rescheduling history to be more prone to have repayment problems. The expected sign of the IMF support history can be either positive or negative. Positive because it reflects continuous balance of payments problems in the borrowing countries so lenders might perceive those countries as highly risky. The negative association is plausible if we think of IMF loans as substitutes for multilateral and commercial loans or a precondition for debt restructuring.

3.2.2. Political Indicators

For the period being studied, table 1 shows that most of the LACs were characterised by alternations between civilian and military regimes, coups and prolonged periods of military rule.

Table 1 is self explanatory. We then ask, what is the relation between debt repayment problems and political instability?

Haggard and Kaufman (1989) linked debt servicing and domestic politics through the viability of implementing macroeconomic and structural adjustment measures. Their analysis ran in two interrelated levels. Firstly, they explored how competing social groups (business-government, unionised workers from the public and

Table 1

Latin America: Changes in Governments, 1970-86

Cumulative number of:	changes in presidents civil	mil	coups	years of military government
Argentina	4	6	3	11
Brazil	1	2	0	15
Bolivia	3	11	7	15
Chile	1	1	1	1
Colombia	4	0	0	0
Costa Rica	5	0	0	0
Dominican Republic	4	0	0	0
Ecuador	3	2	1	7
El Salvador	3	4	1	10
Guatemala	2	4	1	12
Haiti[1]	0	2	1	16
Honduras	3	3	2	12
Mexico	3	0	0	0
Nicaragua[2]	0	3	1	15
Panama	2	2	0	13
Paraguay[3]	0	0	0	17
Peru	2	1	0	11
Uruguay	4	1	1	14
Venezuela	3	0	0	0

Source: See Appendix

Notes: [1]The dictator Duvalier ruled until he was deposed by General Namphy in 1986.

[2]Dictator General Somoza ruled until 1979. He was deposed after a civil war and Nicaragua was governed by the FSLN. In 1985, Daniel Ortega was elected president.

[3]General Stroessner assumed power by coup d'etat in 1954 and had been "elected" president five successive times. The Colorado Party (dominated by Chaco War veterans) consistently supported his regime.

private sectors, and rural sector) influence the way policy decisions are made. Secondly, they analysed the effects of three institutional variables: the type of regime, political-electoral cycles and the strength of the administrative apparatus.

The identification and operationalisation of variables applicable to interest conflicts is very complex. The belief is that the opposition might undermine the government in power if it does not have strong support from other groups. Protests, strikes, etc. create political instability, affect the implementation of policies and consequently the prospects of debt repayment. Any measure of social conflict should consider the possible consequences (income distribution, working hours lost, etc.) of a policy implementation, how different groups are represented in the political arena and the formation of different alliances.

Ways of capturing social conflicts which undermine the political effectiveness needed for succesful macroeconomic management were proposed and tested by Berg and Sachs (1988). They identified income inequality and the share of agriculture in the national product. We explore the possibilities of using those indicators in our investigation.

Using the 1986 GNP per capita classification of the World Bank, all the countries in our sample except Haiti are middle income countries[5]. Venezuela has the highest GNP per capita followed by

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[5]Middle income countries are those which had GNP per capita above 425 U.S. dollars. To preserve the regional classification of other lower income countries, Haiti with GNP per capita of 330 U.S. dollars in

Argentina, Panama, Uruguay, Mexico and Brazil. For countries where data is available, table 2 shows the extent of income inequality. The percentage share of household income of the top quintile is not less than 50% while the lowest quintile receives not more than 5%. The pattern of income distribution is also very skew. The panel nature of our sample and the lack of appropiate census data precludes us from including such a variable in our model unless we make strong assumptions like constant income distribution during the period of study, irrelevance of the census date although some countries have gone through major economic changes, etc. We also explored other variables such as sectoral real wages, working hours lost due to strikes etc. as proxies for degree of conflict. Unfortunately, the data was unreliable and/or incomplete.

The share of agriculture in the national product was included by Berg and Sachs to offer some measure of the extent to which governments can derive their political support from rural sectors rather than urban interests since in the urban sector, people are better organised and more politicised. In fact, they found that the occurrence of violent coups was negatively related to the share of agriculture in national product after controlling for the level of per capita income. Since the number of coups is directly observed, we instead preferred to include it directly.

If coups are useful to proxy dissatisfaction with the previous government, a broader alternative measure is the successive changes in government. This will, in addition, reflect an overemphasis of short term economic policies. Needless to say the more frequent the changes

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1986 is considered by the World Bank as a middle income country.

Table 2

Ten Latin American Countries:

Percentage Shares of Household Income by Quintiles

	Date of Census	Quin1 (low)	Quin2	Quin3	Quin4	Quin5 (high)	Top 10%
Argentina	1970	4.4	9.7	14.1	21.5	50.3	35.2
Brazil	1972	2.0	5.0	9.4	17.0	66.6	50.6
Chile	1968	4.4	9.0	13.8	21.4	51.4	34.8
Costa Rica	1971	3.3	8.7	13.3	19.9	54.8	39.5
El Salvador	76-77	5.5	10.0	14.8	22.4	47.3	29.5
Honduras	1967	2.3	5.0	8.0	16.9	67.8	50.0
Mexico	1977	2.9	7.0	12.0	20.4	57.7	40.6
Panama	1973	2.0	5.2	11.0	20.0	61.8	44.2
Peru	1972	1.9	5.1	11.0	21.0	61.0	42.9
Venezuela	1970	3.0	7.3	12.9	22.8	54.0	35.7

Source: World Development Report 1980 and 1988

in the head of government, the less stable a country is and hence the greater the likelihood that it will be perceived as very risky by its creditors.

Canto (1986) argued that a fairly short planning horizon engenders instability and the only policies adopted will be those whose realised benefits exceed the realised costs during the government's term. As a result, governments will try to capture the maximum amount of resources during their expected term without taking into consideration the effects its policies will have on the economic activity beyond its expected tenure. Therefore, there are strong short run incentives to pursue a myopic strategy. In the long run, the effects of this myopic behaviour are detrimental because they are likely to result in accumulated debt with the government in office unable to meet its international obligations.

The hypothesis of Citron and Nickelsburg (1987) differs slightly from the one just presented but has the same connotations. The problem is not of a short sighted government but its desire to remain in power. When governments are changing frequently, the marginal benefit of non-repayment (relative to alternative policies) is positive because the proceeds from non-repayment are used as means to increase government expenditure which if reduced might lead to a government collapse.

Irrespective of the motives of the government incurring large deficits, the link between fiscal indiscipline and international debt servicing problems is well known. As already suggested, large government deficits may reflect not only policy mismanagement but also

an unwillingness on the part of governments to restrict certain aspects such as corruption and buying the support of the opposition to avoid a decline in legitimacy[6]. Unfortunately, consistent and comparable data on LACs budget deficits is not available.

One implication of the above discussion is that budgets might be exploited for short term political and personal advantage rather than long term economic and political strategy. This is more plausible if the governing political party does not expect to be re-elected since the cost is transferred to its successor. We test this hypothesis indirectly by constructing two dummy variables: one takes into account the changes in the head of government irrespective of his political affiliation; the other considers changes in the head of government accompanied by changes in the ruling political party.

The institutional setting where the policy is formulated provides a rough indicator of the "success" of its implementation. We concentrate on the influence of the regime type.

Given the country resource constraint, it is said that authoritarian governments must have a high degree of internal consensus which eases the carrying out of stabilisation or adjustment policies. In addition, the direct control of the military apparatus helps to ensure that such policies will be enforced. If so, lenders would be more inclined to lend to military regimes since expectation of repayment might be perceived to be higher than in democratic or multiparty regimes. In other words, it is the nature of the regime (democratic versus military) which influences repayment prospects.

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[6] See Sachs and Berg (1988) and Sachs ed. (1987).

There is no clear evidence if democratic or authoritarian regimes were more successful in implementing adjustment policies and thus, improving repayment prospects. Haggard and Kaufman (1989) argued that such categories might be too broad to be used as an analytical device. They suggest subdividing each category into weak and strong before relating them to economic outcomes. This might be true but we found it too difficult to apply their characterisation to our data without a very deep knowledge of the organisation of the government in each country. Instead, we attempted the following crude classification: democratically elected governments, military and military-dictators. Countries with military-dictators in our sample are Haiti, Nicaragua and Paraguay.

On the other hand, military regimes and dictators are also viewed as corrupt, abusive and repressive. The successive negation of human rights to manage austerity programmes brought internal manifestations of protest which had a strong impact in the international community. Military regimes remained in politics until their image was totally discredited and their power deteriorated. To capture such an effect, we include the cumulative years of military and dictatorship regimes. In addition, to proxy the international community (lenders included) we incorporated a "back to democracy" dummy which takes the value of 1 when a democratically elected government suceeded a military or dictatorship government. We expect the former to have a positive effect on arrears and the latter a negative effect because of the lender's desire to avoid encouraging political protest. This might lead to a civil war and a leftist regime which in turn might jeopardise any prospects of debt repayment.

Governments with different political inclination have different

attitudes towards debt repayment. As stated earlier, Alesina and Tabellini (1988) analysed the relations between governing political groups ("workers" or "capitalists"), accumulation of external debt, capital controls and private capital outflow, income distribution and repudiation of foreign debt. They argue that each group will redistribute income in favour of its own constituency. Left wing governments are more inclined to impose capital controls than right wing governments. Capital flight is expected to be high when a right wing government fails to keep power and gives way to a left wing regime. Debt repudiation is an option for both groups depending on the perceived repudiation penalty and the level of the outstanding debt. Assuming that the penalty is seizure of assets held abroad, then it is very costly for right wing governments to repudiate while this option is more likely to be observed if a left wing government unexpectedly holds office.

Despite the fact that the model designed by Alesina and Tabellini refers to repudiation incentives, it is also true that left-wing governments are less inclined to follow orthodox IMF stabilisation programmes and place the burden of adjustment on the workers. The behaviour of lenders is not modelled, but it is plausible to assume that the higher the political risk, the less will loans be granted because creditors will prefer a credit cut rather than raise the interest rate spread. Therefore, we expect to find a positive relation between arrears and leftist regimes.

There are several difficulties in operationalising a concept like the type of political regime. Mainly, the difficulty arises in the unavoidable subjective evaluation attached to the regime in question. Take for example, the PRI (Partido Revolucionario Internacional) in

Mexico. This political group is classified by A. Banks (1986) as center-left but as middle-of-the road conservative or reformist by J. Sheahan (1987). Perhaps one of the reasons for such differences is that the former considers the historical formation and aims of the group[7] while the latter links it to attitudes such as concern with market efficiency, reliance on market forces, social reforms, etc. Nonetheless, to have a reference about the kind of regimes might be preferable to lumping all the countries together in one group as if the differences do not matter.

4. Empirical Specification

Bearing in mind that all regressors are lagged one period and omitting country and time subscripts, our logit model is of the form

Prob(A=1) = f(dcountry, int/export, res/import, debt/gnp,
real growth gdp, inv/gdp, ca/gnp OPEC,
real growth gnp OECD, rescheduling history,
IMF history, index of gov changes, party-head,
head, military history, back to democracy
civil-mil-dictator, right-left)

where:

Prob (A=1)	Probability of arrears (arr3)
dcountry	fixed effect country specific dummy

[7]The PRI has its roots in the Mexican revolutionary period. It was founded as Partido Nacional Revolucionario in 1929 and redesignated as Partido Revolucionario Mexicano in 1938. It took the name Partido Revolucionario Internacional in 1946. Since its foundation, the main objective of the party has been to carry forward the work of the 1910 revolution. See Banks (1980, 1986).

int/export	interest service payment to exports ratio
res/import	international reserves to imports ratio
debt/gnp	outstanding debt to gnp ratio
real growth of gdp	real growth of gdp (1980=100)
inv/gdp	investment to gdp ratio
ca/gnp OPEC	OPEC current account to OPEC gnp ratio
real growth gnp OECD	real gnp growth of OECD countries
rescheduling history	cumulative count of rescheduling signatures since 1970
IMF history	cumulative count of SBA higher tranche and EFF since 1970
index of gov changes	moving aggregate of changes in the head of of the government
party-head	dummy for changes in the political party in office
head	dummy for changes of presidents
military history	cumulative years of military and/or dictatorships since 1970
civil-mil-dictator	dummy for years of military and/or dictatorship regimes
back to democracy	dummy for years of "back to constitution"
right-left	dummy for right to left regime grouping

Detailed definitions and sources of the dependent variable, economic variables and the indicators of history of repayment problems were given in the data appendix of the previous chapter.

We constructed proxies for the political variables to try to capture not only the effect of continuous changes in the head of government but also switches from one type of regime to another. We did so based on the information on presidents, coups and attempted coups, governing political party and political inclination of the government in office compiled from A. Banks (1980, 1986) and presented in the appendix. Next, we detail the way these proxies were built.

Index of gov changes: We tried both of the following specifications.

The first one is a five years moving aggregate of changes in the head of government i.e. Citron and Nickelsburg type of political instability. The second is a variation of the former. Instead of five years, we take the term election (e.g. 6 years for Argentina, 5 years for Peru, 4 years for Guatemala, etc.) to construct the moving aggregate. We started counting from the closest year to an election of a constitutional president. If such an event lagged with respect to 1970 more than a term election, then the counting started arbitrarily in 1970. We labelled it election term moving aggregate.

Despite being less restrictive than the simple five years moving aggregate of changes in the head of government used in our applied survey, the election term moving aggregate is only a crude measure of political instablity because it does not take into account the timing, nature, and changes of economic policies during the period[3].

Party-head: Dummy variable which takes the value of 1 if a change in the head of government and political party took place and zero otherwise.

Head: Dummy which takes the value of 1 if a change in the head of government (irrespective of the political party) took place and zero otherwise.

Military history: This is simply the cumulative count of years of military and dictatorship regimes since 1970.

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[3]As stated in our applied survey, a study of changes and effects of economic programmes would be a research in its own right.

Civil-mil-dictator: We constructed two dummies. The first one is a dummy variable that takes the value of 0, 1, 2 in the years of democratic, military and dictatorship regimes respectively. Countries with dictators are Haiti under Duvalier, Nicaragua under Somoza and Paraguay under Stroessner. The second dummy takes the value of 1 in the years of military and dictatorship regimes and zero otherwise. That is, it treats military and dictatorship governments as equivalent. We labelled this dummy, civil-mil.

Again, note that the military and/or dictatorship presence proxies are crude measures. They do not consider the cohesiveness of the elite which is a crucial factor in determining if a regime would be able to implement stabilisation policies, nor makes direct reference to the success or failures of the stabilisation programmes.

Back to democracy: Dummy variable which takes the value of 1 when a democratic elected government succeeded a military or dictatorship government and zero otherwise.

Right-left: We classified the regimes into four groups, from right (to which we assign a value of 1) to left (to which we assign a value of 4). The intermediate categories correspond to center-right and center-left. The only countries included as left are Chile in the Allende period and Nicaragua after 1979 because of their Marxist political leadership.

Besides the one lag common to all regressors, we included an additional lag in the investment to gdp ratio because it provided a better fit without modifying the basic results. By the same token, we used the real growth rate of selected OECD countries (United States,

Japan, Germany, France, United Kingdom, Italy and Canada) instead of the OECD total; we included the election term moving aggregate instead of the five years moving aggregate as our index of government changes and the civil-military dummy instead of the civil-military-dictator dummy.

Finally, it should be noted that we performed, without success, an alternative series of regressions using different empirical specifications and combinations of the political variables. In particular,

-since the index of government changes is highly positively correlated with the change in the head of government (head) and the cumulative number of coups and attempted coups from 1970 (70cumcoup), we tested the model using either head or 70cumcoup and both instead of the index of government changes.

-we tried a coup dummy variable (1 for coup and 0 otherwise) as an alternative to 70cumcoup

-we entered the dummies head and party-head with a one year lag to try to capture the end of the electoral term in which incumbent governments might spend more to leave a better political image or simply to have a "windfall gain" and enrich themselves, passing the cost to their successors.

5. Empirical Results

Table 3 reports maximum likelihood estimates of this model using 293 observations because of missing variables for Argentina (1985), Nicaragua (1984 and 1985) and Haiti (from 1978 to 1985). Model I presents the unrestricted version of the model under the assumption

Table 3

Latin American Countries:

Probability of Arrears and Significant IMF Support (1971-86)

Method of Estimation: Logit
Dependent Variable: Probability of arrears
Independent Variables (all lagged one year):

	Model I	Model II	Model III	Model IV
Argentina	0.268		0.019	
	(0.122)		(0.010)	
Bolivia	0.572		-0.014	
	(0.246)		(0.007)	
Brazil	-1.549		-1.754	
	(0.586)		(0.792)	
Chile	1.468		1.440	
	(0.817)		(1.119)	
Colombia	2.566		2.593	
	(1.313)		(1.428)	
Costa Rica	1.455		1.256	
	(0.842)		(0.752)	
Dom Repub	0.549		0.712	
	(0.309)		(0.463)	
Ecuador	2.233		2.210	
	(1.208)		(1.339)	
El Salvador	-4.335		-4.001	
	(1.926)		(1.950)	
Guatemala	-0.896		-1.190	
	(0.463)		(0.719)	
Haiti	2.984		2.595	
	(1.774)		(2.164)	
Honduras	1.877		1.563	
	(1.008)		(1.045)	
Mexico	-0.026		0.500	
	(0.011)		(0.278)	
Nicaragua	1.481		1.106	
	(0.716)		(0.612)	
Panama	1.854		1.498	
	(0.803)		(0.797)	

Paraguay	-11.873		-12.186	
	(0.080)		(0.082)	
Peru	2.463		2.430	
	(1.127)		(1.642)	
Uruguay	-0.044		-0.027	
	(0.026)		(0.020)	
Venezuela	2.225		2.565	
	(1.047)		(1.341)	
constant		-0.009		0.643
		(0.009)		(0.746)
int/export	12.809	8.692	12.832	9.040
	(1.838)	(2.235)	(1.871)	(2.468)
res/import	-4.825	-3.524	-5.014	-3.527
	(2.114)	(2.638)	(2.237)	(2.668)
debt/gnp	3.712	4.112	4.133	4.440
	(1.772)	(3.184)	(2.061)	(3.373)
$(inv/gdp)_{-i}$	-8.780	-5.785	-8.369	-6.204
	(1.827)	(1.879)	(1.710)	(1.981)
real growth of gdp	-0.124	-0.118	-0.112	-0.106
	(2.344)	(2.684)	(2.208)	(2.531)
ca/gnp OPEC	-0.090	-0.053	-0.084	-0.048
	(2.591)	(1.962)	(2.543)	(1.842)
real growth of OECD	-0.291	-0.243	-0.292	-0.244
	(2.341)	(2.350)	(2.427)	(2.391)
rescheduling history	0.464	0.559	0.513	0.523
	(1.554)	(2.370)	(1.946)	(2.335)
IMF history	-1.018	-0.232	-1.034	-0.271
	(2.500)	(1.288)	(2.686)	(1.549)
index of gov changes	0.762	0.226	0.769	0.231
	(2.315)	(1.277)	(2.352)	(1.372)
party-head	-0.871	-0.687		
	(0.775)	(0.710)		
head	0.589	0.750		
	(0.544)	(0.827)		
military history	0.256	-0.022	0.241	-0.005
	(2.241)	(0.407)	(2.189)	(0.109)
civil-mil	-0.511	0.465		
	(0.589)	(1.005)		

back to democracy	-1.952	-1.269	-1.911	-1.304
	(2.203)	(1.655)	(2.282)	(1.758)
right-left	0.224	0.279		
	(0.526)	(1.041)		
Sample size	293	293	293	293
Log likelihood	-92.06	-108.34	-93.11	-109.51
Correct predictions (%)	87.71	87.03	87.71	86.01
Type I error (%)	5.67	5.15	5.67	5.15
Type II error (%)	25.25	28.28	25.25	31.31

Absolute values of the "t" statistics are given in parenthesis.

that the peculiarities of each country are independent, while model II shows it without the country dummies. The likelihood ratio test was used to determine the usefulness of estimating the model with fixed country specific effects. The calculated value of 32.56 with 18 degrees of freedom exceeds the critical chi-square at 2.5% level of significance (rejecting the null hypothesis of no country fixed effects) but not at the 1% level. This cast doubts about whether the omission of country dummies yields unbiased and consistent estimates. El Salvador and Haiti are the countries showing very significant country specific effects[9].

We find the probabilities of arrears to be significantly increasing in the interest-service payments/export ratio and the debt to gnp ratio, suggesting the need for new loans to finance debt accumulation. The negative relation between the probability of arrears and the reserves/import ratio reflects lenders' perception of borrowers' creditworthy position rather than the borrowers' perception of the non-repayment penalty. Real income growth and the investment/gdp ratio are important determinants of the probability of repayment. Also their estimated coefficients seemed to be associated more with the reliance on loans to achieve growth than with the Eaton and Gersovitz type of repudiation penalty perception.

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[9]El Salvador is one of the lowest real income per capita countries in Central America, while Haiti has the lowest real income per capita in Latin America. We tested our general model including this variable to explore its importance. The estimated coefficient of real income per capita had a surprising positive coefficient (0.014), an insignificant "t" statistic (0.253) and did not help much to decrease the importance of the El Salvador and Haiti country effects.

The proxy for oil shocks and the real income growth of OECD countries were also found to be very significant and with the expected sign.

As expected, the history of reschedulings is a strong indicator of future repayment problems. On the other hand, the negative and significant coefficient of the IMF history regressor suggests that these loans are substitutes for multilateral or commercial loans and/or a precondition for lending. This does not disregard the fact that lenders perceive countries with successive balance of payment problems as less creditworthy. Both effects might be present but the former outweighs the latter.

Proceeding to political indicators, the significant positive relation between the index of government changes and the probability of repayment problems supports the political instability and non repayment pressure hypothesis.

The dummy variable signalling changes in the head of government turned out to be positive but insignificant. The positive sign suggests that new presidents find themselves in a difficult situation due to the debt left by their predecessors and to the unpopularity that immediate adjustment measures might cause. The dummy variable accounting for changes in the head of the government and political party is found to be negative although insignificant. This negative relation considers the behaviour of the party group and thus might be suggesting that presidents are less short-sighted if the party in power regains office. We also tried an additional lag in both dummies to account instead for the end of the electoral cycle, but the results were similar to the ones presented and are not reported.

The dummy for military and dictatorship presence is insignificantly negative. However, debt service problems strongly increase with the cumulative count of years of military and dictatorship rule. The signs of both estimates support the commonly held view that although authoritarian regimes might be perceived by lenders as more creditworthy than democratic ones, over time, authoritarian regimes tend to lose this reputation due to corruption and the use of force to control political upheavals. This in turn, threatens the prospects of debt repayment. In fact, the dummy accounting for "back to democracy" is significantly negative. Note that this variable captures only the euphoria of the change[10] and does not capture whether a military or democratically elected government is more inclined or not to incur debt repayment problems. As argued earlier, although the dummy for years of military and dictatorship presence has the expected sign, it can not be counted as one of the variables explaining debt service problems.

The variable accounting for right-to-left political regimes has the correct sign giving support to the Alesina and Tabellini argument. However, it is insignificant which is not surprising. The variable is likely to be measured with error because of the procedures applied in its construction, hence one should expect the estimated coefficient to be inconsistent and biased towards zero.

Model III shows that the accuracy of our prediction is similar

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[10]Instead of the "back to democracy" dummy, we tried a "democracy accommodation" dummy which took the value 1 in the year of the change from military to civil regime and also in the following year. The estimated coefficient of this variable was found to be negative but insignificant corroborating the euphoria effect.

after dropping all economic and political explanatory variables found insignificant in model I. Moreover, the likelihood ratio statistic is 2.11, well below the critical chi-square at 5 percent level and four degrees of freedom.

For completeness, model IV presents the results with no country specific effects. As expected, the likelihood ratio test between Model III and IV rejected the null hypothesis of no country specific effects at the 5 percent level of significance.

It is difficult to give an obvious interpretation of the country background dummy. A positive estimated coefficient might be reflecting the country bias in meeting debt obligations, creditors' lack of confidence in the prospects of future repayment, difficulties in maintaining the political status quo, etc. This is so if we recall that in our model arrears are assumed to be carried forward as part of the inherited debt. On the other hand, a negative relation implies a non repayment attitude or perhaps, a more compliant attitude by lenders to avoid jeopardising their own investment. In our preferred regression, the dummy appeared to be positive for the majority of the countries. Bolivia, Brazil, El Salvador, Guatemala, Paraguay and Uruguay (countries with strong military presence until at least 1985) were the ones with negative coefficients. Country specific fixed effects were found to be very significant only for El Salvador and Haiti and marginally significant for Peru.

Peru, has experienced two periods of center left governments, firstly from 1968-74 with very strong state intervention in the economy and secondly, the Alan Garcia's regime with the particular feature of limiting international debt repayments. Perhaps the Peru

dummy is picking up those effects. In fact, when the type of political inclination variable is included, the Peru dummy loses significance.

In contrast with the case of Latin America as a whole, where the increase in external debt came primarily from private creditors, around 75 percent of Haiti's debt outstanding is from official creditors. From 1975 to 1978, the Inter-American Development Bank lent Haiti about 60 percent of its multilateral loans. As a consequence, Haiti acquired its debt with the usual favourable implications for both the interest rate charged and maturity period. This in part explains its history of no debt restructuring in the 1970s and early 1980s despite having the lowest income per capita in the sample. Therefore, the debt burden itself seems not to offer an explanation of the significantly positive Haiti dummy. However, the particular characteristics of the Haiti economy (e.g. exporter mainly of coffee and cocoa, very underdeveloped industry and highly dependent on foreign direct investment, a reputation for mismanaging public projects, poltical elite's use of state finance, etc.) might explain its propensity to fall into debt service problems. In El Salvador, private commercial loans are also relatively modest. Its trade relies heavily on the United States and neighbouring members of the Central American Common market. Political problems between right and left wing groups rapidly escalated in 1979 and the possibility of a civil war grew. Bilateral loans more than trebled in 1980 compared to 1975, mainly to finance internal military activities. It is probable that its proximity to Nicaragua and the well known attitude of the United States in Central American affairs might explain the strong negative El Salvador dummy though it is still puzzling.

To explore the importance of political indicators, we estimated model III without them. Comparing such results with our preferred regression, type I and type II errors were similar. However, the value of the log likelihood ratio (12.36) was above the critical chi-square for 3 degrees of freedom, rejecting the null hypothesis (estimated coefficients of the political variables are zero) at the 1 percent level.

With regard to the size of the estimated coefficients, table 4 (column 1) shows the important effects of country liquidity and long run creditworthiness indicators on the log-odds ratio. The results suggest that, ceteris paribus, a high interest/export ratio substantially raises the probability that the country will be in arrears. Similarly, as the reserves/import ratio decreases, the probability of a country falling into arrears increases but the magnitude of this effect is less than that of the interest/export ratio. Other variables remaining constant, a high investment/gdp ratio decreases the probability that a country will be in arrears; an increase in the debt/gnp ratio also decreases this probability. Real growth of gdp, the proxies for OPEC surplus, world demand and history of repayment problems all have a significant influence on the probability of debt arrears though their magnitudes are small relative to the effect associated with any of the ratios mentioned earlier in the paragraph. Concerning political indicators, the index of government changes and the proxy for military history are both significant but the impact on the log-odds ratio is very small. A switch from military-dictatorship to democracy reduces the log-odds ratio by 2. As stated earlier, only the dummies for El Salvador and Haiti were found significant. Again, ceteris paribus, the El Salvador dummy reduces the probability of repayment problems while the Haiti

dummy shifts it up.

We use two methods to investigate the effects of a change in an independent variable on the probability of arrears. Firstly, we calculate the derivatives of the probabilities at the mean values of the independent variables and thus compute the implied "quasi-elasticities". Secondly, we replicate the model for a 1% change in each economic indicator in turn and then compare the predicted probabilities before and after the change. For variables indicating rescheduling and IMF history, as well as for the political variables (index of government changes and military history), we assume a one unit change instead. We also ask whether the probabilities would change if no country switched from a military-dictatorship to a democratic regime. Note that because of non linearities in the system, these two procedures of estimating the elasticities are different and not strictly comparable. The former procedure tells us about the "quasi-elasticities of the average". The latter procedure gives the "average of the elasticities".

According to the first method, if the average interest/exports ratio rises by 1%, ceteris paribus, the probability of arrears increases by 0.33%. Similarly, an increase of 1% in the reserves/imports ratio decreases the probability of arrears by 0.42%. A decrease of 1% in the debt/gnp ratio decreases the probability of arrears also by 0.42%. An increase of 1% in the investment/gdp ratio decreases the probablity of arrears by 0.60%. The "quasi-elasticities" of real growth of gdp, the proxies for OPEC surplus, world demand and history of repayment problems (cumulative number of reschedulings) are less than 0.30% though their influence on

Table 4

Latin American Countries: Significant[i] Regressors in Model III

	All LACs	All LACs except Bolivia
Colombia	2.593	3.027
	(1.428)	(1.660)
El Salvador	-4.001	-5.616
	(1.950)	(2.203)
Haiti	2.595	3.158
	(2.164)	(2.512)
Peru	2.430	2.938
	(1.642)	(1.936)
int/export	12.832	13.132
	(1.871)	(1.813)
res/import	-5.014	-6.343
	(2.237)	(2.607)
debt/gnp	4.133	4.541
	(2.061)	(2.165)
$(inv/gdp)_{-1}$	-8.365	-8.087
	(1.710)	(1.747)
real growth of gdp	-0.112	-0.126
	(2.208)	(2.310)
ca/gnp OPEC	-0.084	-0.126
	(2.543)	(3.210)
real growth of OECD	-0.292	-0.317
	(2.427)	(2.427)
rescheduling history	0.513	0.523
	(1.946)	(1.911)
IMF history	-1.034	-1.239
	(2.686)	(2.980)
index of gov changes	0.769	1.169
	(2.352)	(2.494)
military history	0.241	0.286
	(2.189)	(2.439)
back to democracy	-1.911	-1.900
	(2.282)	(2.088)
Sample size	293	277
Log likelihood	-93.11	-82.68
Correct predictions (%)	87.71	89.17
Type I error (%)	5.67	5.35
Type II error (%)	25.25	22.22

Notes : [i]At least 15% significance level.

the probability of arrears is very significant. A 1% increase in the number of cumulative SBA will decrease the probability of arrears by 0.55%. Concerning political indicators, a 1% change in the index of government changes will increase the probability of arrears by 0.34%. A 1% change in the proxy for military history will increase the probability of arrears by 0.45%.

In terms of the second method, ceteris paribus, an increase of 1% in the interest/export ratio would increase the average probability of debt arrears by 0.16%. Similarly, if countries had signed an additional rescheduling, the probability of arrears would increase by 0.16%. An extra SBA would decrease the probability of arrears by 0.28%. The effect of a 1% change in the other economic indicators is less than 0.005%. With respect to political variables, a one unit increase in the index of government changes would increase the average probability of arrears by 0.42% while one year more of military regime would raise it by 0.24%. If no countries were to return to constitutional democracies, then the probability of arrears would increase by 0.21% on average.

How many countries would fall into arrears after a change in one of the independent variables? In the logit (also probit) regression, a change in an exogenous variable would have the greatest impact on the probability of being or not being in arrears at the midpoint of the cumulative distribution. The low slope at the beginning and end of the distribution implies that a large change in an exogenous variables is necessary to change the probability. In our estimated equation, a 1% increase in the interest/export ratio would increase the number of predicted country-year observations in debt arrears by

21%. An extra rescheduling would have implied a 14% increase while an extra SBA would have switched only one year-country observation into the group of predicted countries with no arrears. An additional unit in the index of government changes would have shifted an extra 54% of observations into the group of predicted countries with debt troubles; while an additional year of military regime would implied 29% more. If countries with military-dictatorships were not to return to constitutional regimes, then the predicted countries with arrears problems would increase by 20%.

It is interesting to note that for the countries in the sample (except Haiti and Nicaragua), the long term interest/export ratio increased on average by 29% between 1981 and 1982. Over the same period, the reserves/import ratio fell by 17%, the debt/gnp ratio rose by 22% and real gnp declined by just over 2%. The OPEC current account/gnp ratio fell from 6.7 to -0.9 while the growth of real income of the five largest OECD countries declined from 1.7% to -0.7%. As we will see in chapter 5, the situation of the LACs has not improved substantially.

Finally, since Bolivia exhibited the highest number of changes in presidents and coups d'etat (see table 1), we estimated the whole set of equations excluding Bolivia from the sample. The results did not change substantially. We report our findings for model III in the second column of table 4.

6. Conclusions

In summary, on the basis of statistical tests, the logit model estimates indicate that economic and political variables are significantly related to debt service capacity. In addition to the interest payments to exports ratio, reserves to import ratio, total debt to gnp ratio, investment to gdp ratio and real income growth drawn from the studies we surveyed, our results indicate that the election term moving aggregate, the cumulative count of years of military political presence since 1970 and the "back to democracy" dummy are also relevant.

Indicators of repayment history (as suggested by McFadden et. al., 1985) were used in order to capture some of the country effects. They were found to be statistically significant. In addition, the country effects for El Salvador and Haiti were very signifcant but only marginally significant for Peru. There is no obvious interpretation of these variables, though to a certain extent we attempted some explanations.

We have, in part, reconciled the inclusion of political variables in the assessment of
creditworthiness as is often done by bankers. The election term moving aggregate was found to be significant suggesting, other things being equal, the shorter the planning horizon (due to succesive changes in the head of state) the more likely the occurrence of debt repayment problems. In spite of the fact that authoritarian and military regimes might have some apparent advantages in managing debt related issues over democratically elected governments, the history of their intervention appeared to be counter-productive. Most of the

countries which returned to democracy did so during the first half of the 1980s. This coincidence might support the view that military regimes withdraw from politics because of their inability to manage further austerity policies and their discredited reputation. Since actual debt problems are in general blamed on the predecessor, new democratically elected governments might not only gain the sympathy of the international comunity but also be more succesful in gaining political support for adjustment measures. Our estimate of political inclination of the head in office is subject to measurement error bias but gives some support to the Alesina and Tabellini hypothesis.

In terms of economic related variables, the countries' debt service capacity seemed to be affected by both short and long term creditworthiness indicators.

Latin American Presidents

Country/President	Date	Political Party and Comments
Argentina		
A. Frondizi	1958	UCRI
A. Guido	1963	UCR/Transitional Constitutional
A. Illia	1963	UCRP
Gral. J.Ongania	1966	Military coup
Gral. R.Levingston	1970	Military
Gral. A.Lanusse	1971	Military coup
Gral. H.Campora	1973	MNJ/Resigned
J. Peron	1973	FREJULI
E. Peron	1973	FREJULI
Gral. J.Videla	1975	Military coup
Gral. E.Viola	1978	Military
Gral. E.Galtieri	1981	Military
Gral. E.Bignone	1982	Military/Malvinas war
R. Alfonsin	1983	UCR

UCR:	Union Civica Radical
UCRI:	Union Civica Radical Intransigente
UCRP:	Union Civica Radical del Pueblo
MNJ:	Movimiento Nacional Justicialista
FREJULI:	Frente Justicialista de Liberacion
Term election:	six years
Regime type:	1970-72 (R)
	1973-74 (CR)
	1975-82 (R)
	1983-85 (CL)

Bolivia		
Dr. V.Paz Estensoro	1960	MNRM
Gral. R.Barrientos	1964	Military coup/Resigned
Gral. A.Ovando	1965	Military
Gral. R.Barrientos	1966	MNB/Military elected
L. Siles Salinas	1969	MNRH/Succeeded as vice president after the death of Barrientos
Gral. A.Ovando	1969	Military coup
Gral. R.Miranda	1970	Military coup
Gral. J.Torres	1970	Military coup
Gral. H.Banzer	1971	Military coup
Gral. J.Pereda	1978	Military elected

Gral. D.Padilla	1978	Military coup
W. Guevara	1979	Interim president
Col. A.Natush	1979	Military coup
L. Gurilier	1979	Interim president
Gral. L.Garcia	1980	Military coup/Resigned
Military Junta	1981	
Gral. C.Torrelio	1981	Military/Resigned
Gral. C. Vildoso	1982	Military
Dr. H.Siles Zuazo	1982	MNRI
Dr.V.Paz Estenssoro	1985	MNRH

MNRH:	Movimiento Nacional Revolucion Historico
MNB:	Movimiento Nacional Barrientitsta
Term election:	four years
Regime type:	1970-77 (CR)
	1978-81 (R)
	1982-85 (CR)

Brazil

J.da Oliveira	1956	
J.da Silva	1961	
Mar. H.Castello	1964	Military coup
Mar. A.da Costa	1967	Military
Gral. E.Garrastuzu	1969	Military
Gral. E.Geisel	1974	Military
Gral. E.Figueiredo	1979	Miliaty
J. Sarney	1985	PDS

PDS:	Partido Democratico Social
Election term:	six years
Regime type:	1970-78 (R)
	1979-85 (CR)

Chile

J. Alessandri	1958	
E. Frei	1964	PDC
S. Allende	1970	UP
Gral. A.Pinochet	1973	Military coup

PDC:	Partido Democrata Cristiano
UP:	Unidad Popular
Election term:	six years
Regime type:	1970-72 (L)
	1973-85 (R)

Colombia

A. Lleras	1958	PL
G. Valencia	1962	PC
C. Ileras	1966	PL
M. Pastrana	1970	PC
A. Lopez Michelsen	1974	PL
A. Turbay Ayala	1978	PL
B. Betancur	1982	PC
V. Barco Vargas	1986	PL

PL: Partido Liberal
PC: Partido Conservador
Election term: four years
Regime type: 1970-73 (R)
1974-81 (CR)
1982-85 (R)
1986 (CR)

Costa Rica

M. Jimenez	1958	
F. Orlich	1962	
J. Fernandez	1966	
J. Figueres	1970	PLN
D. Oduber	1974	PLN
R. Carazao	1978	PU
L. Monge	1982	PLN
O. Arias	1986	PLN

PLN: Partido de Liberacion Nacional
PU: Partido Unidad
Term election: four years
Regime type: 1970-86 (R)

Dominican Republic

Gral. R. Trujillo	1930	Dictator/Assassinated
J. Balaguer	1961	Overthrown by militaries/ Council of State succeeded
R. Bonelly	1962	Head of Council of State
J. Bosch	1963	PLD
Cnel. E.Wessin	1963	Military coup
H. Godoy	1965	Provisional Government after U.S.A. intervention
J. Balaguer	1970	PR/Re-elected for another term
	1971	Attempted coup
A. Guzman	1978	PRD

	1979	Attempted coup
S. Jorge	1982	PRD
Dr. J. Balaguer	1986	PRSC

PLD: Partido de la Liberacion Dominicana
PRD: Partido Revolucionario Dominicano
PR: Partido Reformista
PRSC Partido Revolucionario Social Cristiano
Term election: four years
Regime type: 1970-85 (CR).

Ecuador

Dr. C.Ponce	1956	
J. Velasco	1960	
	1961	Military coup
C. Arosemena Gomez	1961	PNR
Military Junta	1963	Military coup
C. Yerovi	1966	Interim Government
O. Arosemena Monroy	1966	CID/Interim Government
J. Velasco	1968	
Gral. G.Rodriguez	1972	Military coup
	1975	Attempted coup
Military Junta	1976	Whole cabinet resigned and the crisis led to its formation.
J. Roldos	1979	PDC/Resigned
O. Hurtado	1979	PDC/Succeeded as Vice President
L. Febres	1984	PSC
	1986	Attempted coup

PNR: Partido Nacional Revolucionario
CID: Coalicion Institucionalista Democratica
PDC: Partido Democrata Cristiano
PSC: Partido Social Cristiano
Election term: four years
Regime type: 1970-78 (R)
1979 (CL)
1980-86 (CR)

El Salvador

Lt. Col.J.Lemuo	1957	
Gral. M.Castillo	1960	Military coup
Gral. A. Portillo	1961	Military
Gral. E. Gordon	1962	Military
Cnel. J. Rivera	1962	PCN/Military elected
Gral. F.Sanchez	1967	PCN/Military elected

Cnel. A.Molina	1972	PCN/Military elected
Gral. C.Romero	1977	PCN/Military elected
Cnel. J.Gutierrez	1979	Military coup
Cnel. A. Majano	1979	Head of the civil/military Junta formed after the coup
J. Duarte	1980	PDC
A. Magana	1982	Provisional president
J. Duarte	1984	PDC

PCN: Partido de Conciliacion Nacional
PDC: Partido Democrata Cristiano
Election term: five years
Regime type: 1970-79 (R)
1988-86 (CR)

Guatemala

Cnel. C.Castillo	1954	Military coup/Assesinated
Gral. M.Idigoras	1958	Military
Cnel. E.Peralta	1963	Military
J. Mendez	1966	PR
Cnel. C.Arana	1970	CAN/Military elected
Cnel. K.Laugerud	1974	Military elected
F. Lucas	1978	PID
Gral. E.Rios	1982	Military Junta
Gral. O.Mejia	1983	Military coup
V. Cerezo	1986	PDC

PR: Partido Revolucionario
PID: Partido Institucional Democratico
PDCG: Partido Democracia Cristiana Guatelmateco
Election Term: four years
Regime type: 1970-85 (R)

Haiti

F. Duvalier	1958	Elected but degenerated in dictator.
J.Duvalier	1971	PUN/Dictator
Gral. H.Namphy	1986	Military coup

PUN: Parti de l'Unite Nationale
Regime type: 1970-85 (R)

Honduras

R. Villas	1957	
Cnel. O.Lopez	1963	Military coup
Cnel. O.Lopez	1964	Designated president by the Constituent Assembly
R. Cruz	1971	Constitutional president
Cnel. O.Lopez	1972	PN/Military coup
Cnel. J.Melgar	1975	Military coup
Gral. P.Garcia	1978	Military coup
R. Suazo	1982	Constitutional president
J. Azcona	1986	PLH

PN:	Partido Nacional
PLH:	Partido Liberal de Honduras
Election term:	four years
Regime type:	1970-71 (R)
	1972-74 (CR)
	1975-81 (R)
	1982-86 (CR)

Mexico

A. Lopez Mateo	1958	PRI
G. Diaz Ordaz	1964	PRI
L. Echevarria	1970	PRI
J. Portillo	1976	PRI
M. de la Madrid	1982	PRI
C. Salinas	1988	PRI

PRI:	Partido Revolucionario Institucional
Election term:	six years
Regime type:	1970-86 (CL)

Nicaragua

L. Somoza	1956	Dictator/Power remained in the Somoza familiy under the PLN
R. Shick	1963	PLN/Dictator
L. Guerrero	1966	PLN/Dictator
A. Somoza	1967	PLN/Dictator
Junta Nac. Reconst.	1979	FSLN
D. Ortega	1985	FSLN

PLN (R):	Partido Liberal Nacionalista de Nicaragua
FSLN (L):	Frente Sandinista de Liberacion Nacional
Regime type:	1970-78 (R)
	1979-86 (L)

Panama

R. Chiari	1960	
M. Robles	1964	
A. Arias	1968	
Gral. A.Torrijos	1968	Military coup
A. Royo	1978	PRD/Designated by the National Assembly
Gral. A.Torrijos and R. Espriella	1980	R. Espriella was designated vice president in 1978
N. Ardito Barletta	1985	Forced to resigned by Gral. M. Noriega
E. del Valle	1986	PRD/Designated by Gral. Noriega

PRD: Partido Revolucionario Democratico
Election term: five years
Regime type: 1970-77 (R)
1978-86 (CR)

Paraguay

Gral. A.Stroessner	1954	ANR-PC/Dictatorship
Gral. A.Rodriguez	1989	Military coup

ANR-PC: Asociacion Nacional Republicana-Partido Colorado
Regime type: 1970-85 (R)

Peru

Gral. R.Perez	1962	Military coup
Gral. N.Lopez	1963	Military coup
F. Belaunde	1963	AP
Gral. V.Alvarado	1968	Military coup/Resigned
Gral. F. Morales	1975	Military
F. Belaunde	1980	AP
A. Garcia	1985	APRA

AP: Accion Popular
APRA: Alianza Popular Revolucionaria Americana
Term election: five years
Regime type: 1970-77 (CL)
1978-84 (CR)
1985 (CL)

Uruguay

O. Gestido	1967	PC/Died 9 months after election

J. Pacheco	1967	PC/Succeded as vice president
J. Bodaberry	1971	PC
Grals Martinez/	1973	Military intervention due to
Calda/Cristi		corruption
	1976	Military coup
A. Demichelli	1976	Succeded as vice president
A. Mendez	1976	Elected by Council of Nations which was controlled by the armed forces
Gral. G.Alvarez	1981	Military elected
J. Sanguineti	1984	PC

PC: Partido Colorado
Election term: five years
Regime type: 1970-72 (CR)
1973-75 (R)
1976-85 (CR)

Venezuela

R. Betancourt	1959	AD
R. Leoni	1964	AD
R. Caldera	1969	PSC-COPEI
C. Perez	1974	AD
L. Herrera Campins	1979	PSC-COPEI
J. Lusinchi	1984	AD

AD: Accion Democratica
PSC-COPEI: Partido Social Cristiano - Comite Organizado Pro Elecciones Independiente
Election term: five years
Regime type: 1970-86 (CR)

Source: A. Banks (1980, 1986) Political Handbook of the World.

Notes : Regime type:
R: Right
CR: Center right
CL: Center Left
L: Left

Chapter 5

Latin America: A Case for Debt Relief?

1. Introduction

It has been recently recognised that the debt crisis poses less of a threat to the international financial system now that the banks are less exposed and have made large loan loss provisions (Williamson, 1989; World Bank, 1989; Sachs, 1989b; Sachs and Huizinga, 1987). In spite of the continuous reschedulings and the implementation of new financial packages, the situation of the borrowers has not improved. Indeed, it is said that borrowers are suffering from a debt overhang problem (i.e. the expected present value of potential resource transfers to creditors is less than their outstanding debts). This holds back their growth and threatens their political stability and has led to an active debate about the type of strategy that is required to solve the debt problem.

The "financing" approach or "muddling-through" strategy is the one that has been followed up to now and emphasised in the 1985 Baker plan. Within the "debt reduction" approach or "debt relief" strategy, the international community debates not only the pros and cons of voluntary debt reduction through market-based schemes, but also the possible ways to attempt a global debt solution.

Some Latin American countries (Argentina, Brazil, Bolivia, Chile, Mexico and Venezuela) have been experimenting with market-debt reduction schemes to ease their debt burden. However, it is not clear if this will help to reverse current trends such as decline in output, high inflation, negative international transfers and social unrest.

Most of the discussion is still at the theoretical level and compares the costs and benefits of straight debt-relief, buy-backs, debt equity swaps, exit bonds, etc. (Sachs, 1989; Froot, 1989; Krugman, 1988; Bulow and Rogoff, 1988; Corden, 1988). This has raised issues such as moral hazard, the possible return of capital flight and adjustment incentives.

The purpose of this chapter is to participate in the debate by examining the seriousness of the problem of debt overhang in Latin America and assessing how the debt problem has been handled. This is important not only for the borrowers' welfare but from the perspective of future fulfillment of debt obligations and restoration of voluntary lending. Although the economic situation in Latin America has not improved since 1982, our statistical results suggest that only Bolivia, Costa Rica, Ecuador and Peru are suffering from debt overhang. The account of how the debt has been managed up to now suggests that a prompt solution to the debt problem can rely neither on "refinancing" nor on market-based debt reduction schemes.

The chapter is divided into four parts. Section 2 analyses the economic performance of LACs in the aftermath of the 1982 debt crisis and explores the extent of the debt overhang problem a la Krugman (1988) and Cohen (1988) for the period 1986-1988. We then evaluate how the debt problem has been handled, in particular the 1985 Baker Plan and the 1989 Brady Plan. The final section concludes this chapter and suggests some lines for further research.

2. Latin America After the Debt Crisis

Recession, inflation and external net resource transfers characterise LACs in the 1980s. Table 1 shows the evolution of the GDP per capita since 1982 in several LACs. According to CEPAL[i] estimates, the regional GDP per capita for 1989 is 8% less than in 1980. With the exception of Chile and Colombia, the countries exhibit negative or stagnant rates of GDP per capita growth. The most extreme cases are Bolivia, Peru, Venezuela and Nicaragua where the cumulative variation for 1981-89 is over -20%. This has been attributed mainly to (see Cepal, 1989; Edwards, 1989): 1) the sudden unavailability of foreign loans; 2) the rapid adjustments in current account and trade balance achieved through devaluations, reductions in imports and investment; 3) fiscal deficits and the attempts to curb inflation .

Annual inflation measured by the variation of the CPI from December to December is shown in table 2. Through the decade, inflation intensified in the region. At the end of November 1989, annual inflation in Argentina was 3731%, Brazil 1476%, Nicaragua 3452% and in Peru 2949%. By 1989 Bolivia, Costa Rica, Ecuador, Nicaragua and Mexico were still facing inflation of more than 15% despite the severe stabilisation programmes implemented.

The social effects of the crisis are difficult to quantify. Real wages have deteriorated substantially. Comparing 1989 to 1980, the average urban minimum wage has fallen 23% in Argentina, 29% in Brazil, 58% in Ecuador, 49% in Mexico and 73% in Peru. The average rate of

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[i] See Balance preliminar de la Economia Latinomericana 1989, CEPAL (December 1989).

Table 1

Per Capita Growth Rates in Latin American Countries
(percentages)

	1982	1983	1984	1985	1986	1987	1988	1989[1]	Cumulative 81-89[1]
LACs[2]	-3.5	-5.0	1.2	1.3	1.3	0.7	-1.5	-1.0	-8.3
Argentina	-7.2	1.1	0.9	-5.9	4.4	0.5	-4.4	-6.7	-23.5
Bolivia	-6.9	-9.0	-3.0	-2.8	-5.6	-0.6	0.0	-0.4	-26.6
Brazil	-1.6	-5.6	2.8	6.1	5.2	1.5	-2.4	0.9	-0.4
Chile	-14.5	-2.2	4.3	0.7	3.6	3.7	-5.3	6.7	9.6
Colombia	-1.1	-0.2	1.7	4.9	3.7	3.7	1.6	0.9	13.9
Costa Rica	-10.0	-0.3	4.8	-2.1	2.4	2.5	0.1	2.3	-6.1
Dom. Repub.	-1.1	2.5	-2.0	-4.1	0.8	4.7	-0.7	0.7	2.0
Ecuador	-1.7	-3.8	2.0	2.1	0.7	-11.5	14.1	-2.0	-1.1
El Salvador	-6.5	-0.3	1.3	0.5	-1.2	0.8	-0.4	-3.1	-17.4
Guatemala	-6.1	-5.4	-2.8	-3.3	-2.6	0.7	0.8	0.8	-18.2
Haiti	-5.1	-1.2	-1.4	-1.5	-0.8	-2.1	-2.1	-1.6	-18.6
Honduras	-5.4	-3.6	-1.2	-1.9	1.6	0.7	0.7	-0.7	-12.0
Mexico	-3.0	-6.5	1.2	0.2	-6.0	-0.8	-1.1	0.8	-9.2
Nicaragua	-4.0	1.2	-4.8	-7.3	-4.3	-4.0	-11.1	-6.4	-33.1
Panama	2.7	-2.2	-2.6	2.6	1.3	0.1	-18.2	-2.0	-17.2
Paraguay	-4.0	-6.0	0.0	0.9	-3.3	1.4	3.6	2.6	0.0
Peru	-2.3	-14.1	2.1	-0.3	6.2	4.6	-10.9	-12.4	-24.7
Uruguay	-10.7	-6.6	-1.9	-0.4	7.2	5.8	-0.4	-0.1	-7.2
Venezuela	-4.0	-8.1	-4.2	-1.0	3.1	-0.5	2.1	-10.8	-24.9

Source: CEPAL 1989

Notes : [1]Preliminary

[2]Includes Barbados, Trinidad and Tobago, Guyana and Jamaica

Table 2

Changes in CPI from December to December
(percentages)

	1982	1983	1984	1985	1986	1987	1988	1989[1]
Latin America[2]	84.6	130.5	184.7	274.1	64.5	198.9	757.7	994.2
Argentina	209.7	433.7	688.0	385.4	81.9	174.8	387.5	3731.0
Bolivia	296.5	328.2	2177.2	8170.5	66.0	10.7	21.5	15.7
Brazil	97.9	179.2	203.3	228.0	58.4	365.9	933.6	1476.1
Chile	20.7	23.6	23.0	26.4	17.4	21.5	12.7	21.1
Colombia	24.1	16.5	18.3	22.3	21.0	24.0	28.2	27.1
Costa Rica	81.7	10.7	17.3	11.1	15.4	16.4	25.3	13.9
Dom. Repub.	7.2	7.7	38.1	28.4	6.5	25.0	57.6	43.2
Ecuador	24.3	52.5	25.1	24.4	27.3	32.5	85.7	59.2
El Salvador	13.8	15.5	9.8	30.8	30.3	19.6	18.2	21.2
Guatemala	-2.0	15.4	5.2	31.5	25.7	10.1	12.0	14.5
Haiti	4.9	11.2	5.4	17.4	-11.4	-4.1	8.6	5.9
Honduras	8.8	7.2	3.7	4.2	3.2	2.7	6.7	10.8
Mexico	98.8	80.8	59.2	63.7	105.7	159.2	51.7	18.2
Nicaragua	22.2	35.5	47.3	334.3	747.4	1347.9	33602.6	3452.4
Panama	3.7	2.0	0.9	0.4	0.4	0.9	0.3	0.1
Paraguay	4.2	14.1	29.8	23.1	24.1	32.0	16.9	28.7
Peru	72.9	125.1	111.5	158.3	62.9	114.5	1722.6	2948.8
Uruguay	20.5	51.5	66.1	83.0	76.4	57.3	69.0	81.9
Venezuela	7.3	7.0	18.3	5.7	12.3	40.3	35.5	90.0

Source: CEPAL 1989

Notes : [1]Preliminary. The figures for Costa Rica, Dominican Republic, Haiti, Honduras and Paraguay are October-October variations; for El Salvador is September-September and for the rest of the countries are November-November.

[2] Includes Barbados, Trinidad and Tobago, Guyana and Jamaica.

urban unemployment in Bolivia, Ecuador and Panama is above 10%[2].

Most of the external debt in Latin America is public and publicly guaranteed. Cardoso (1989) relates the resurgence of inflation in Latin America to the large government debt. The lack of foreign capital inflows needed to finance interest payments forced countries to run a balance of trade surplus to produce the required foreign exchange. Governments finance debt service by reducing expenditures, increasing taxes, but also by purchasing foreign exchange by issuing debt and printing money. The inflation impact of trade surpluses via money creation might come directly from the increase in foreign reserves as well as from the proceeds used to pay interest on government debt which is not counterbalanced by an increase in taxes.

Of course, in order to achieve balance of trade surpluses, countries have to depreciate their currency in real terms to gain competitiveness. This, in turn, leads to high prices of imported intermediate and final goods and also raises the cost of debt service in domestic currency which feeds back into the budget deficit, more money creation and thus, inflation. Therefore, in the presence of international credit rationing, debt service requires not only trade surpluses but also improvements in the budget deficits. Interestingly enough, Sachs (1989) argues that "debt relief" was the main component of the Bolivian stabilisation programme. In Bolivia a complete moratorium of interest payments helped to reduce expenditures, increase taxation and overcome the political harshness of implementing tough adjustment measures. Inflation was brought down from more than 8000% in 1985 to 11% in 1987.

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[2]See CEPAL op. cit.

Between 1982 and 1988, Latin America's total net resource transfers to creditors exceeded $140bn. Long term transfers alone were more than $108bn (see table 3). This was the result of a sharp decrease in loans as well as the efforts of LACs to "play by the rules" which transformed a persistent balance of trade deficit into surplus. Indeed, the 1981 trade deficit of $2bn was followed by a surplus of almost $9bn in 1982 and more than $39bn in 1983. Moreover, the trade balance remains in surplus and is estimated to be of the order of $28bn in 1989[3]. As table 4 shows, this rapid improvement in the trade balance was achieved despite the deterioration in the terms of trade. Imports decreased sharply below the 1981 level while the volume exported increased.

According to Pastor (1989) international capital availability measured as last year's net inflow of long term capital to last year's GNP is, among other variables, an important determinant of the current account deficits in Latin America during 1973-84. An increase in capital availability leads to a large current account deficit and debt accumulation. The 1970s saw a shift in supply of loans resulting from "recycling" of petrodollars and the aggressive lending practices of the international banks; hence the capital account was not constraining the current account. In contrast, lenders restricted their supply in the 1980s and current account improvements have occurred partly because the capital availability constraint is binding. On the policy side, Pastor suggests that neither higher growth rates in industrial countries nor the adjustment efforts in LACs will resolve the debt crisis without relieving the capital account via new inflows of capital, debt relief or partial default by

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[3] See CEPAL op. cit.

Table 3

Net Transfer of Resources from Official and Private Creditors to Latin America

(millions U.S. dollars)

		Long Term	
	Total Net Transfers[i]	Disbursements	Net Transfers
1970	n.a.	6055	1595
1980	- 1808	42860	5223
1981	5504	59692	15945
1982	- 6783	48249	2074
1983	-12554	29034	- 9813
1984	-18671	27151	-15866
1985	-30632	19063	-21002
1986	-28057	19454	-20196
1987	-19879	18810	-19467
1988	-26659	22167	-24148

Source: Data from World Debt Tables 1989-90.

Notes : [i]Total net transfers includes short and long net transfers
Net transfers=disbursements-principal repayment-interest payments
Disbursements=long term debt+IMF purchases
Principal Repayment=long term debt+IMF repurchases
Interest Payments=long term debt+IMF+short term debt

Table 4

Trade Balance, Current Account and Terms of Trade in LACs

(millions U.S. dollars)

	Exports	Imports	Trade Balance	Current Account	Terms of Trade index, 1980=100
1980	89130	90552	-1422	-30538	100
1981	95894	97938	-2044	-42147	92
1982	87441	78462	8974	-40463	83
1983	87495	56016	31476	-6375	87
1984	97589	58243	39347	-36	92
1985	92196	58140	34056	-1293	88
1986	78131	59612	18519	-15378	79
1987	89240	67317	21923	-8869	79
1988	101731	76204	25528	-8935	78

Source: Most of the data for exports, imports, trade balance and current account are from several issues of the IFS, IMF. Data for terms of trade, exports and imports for Brasil in 1988, El Salvador in 1987 and 1988, Guatemala in 1988 and Nicaragua in 1987 and 1988 are from Notas Sobre la Economia y el Desarrollo, CEPAL (Dec. 1988, Dec. 1989).

the borrowers.

Creditworthiness has not improved in the region. The debt-to-export ratio remains high and for most of the LACs it has not fallen below the 1982 level (table 5). The region experienced a decrease in this ratio only in 1984 when the terms of trade improved and in 1988 due to export expansion and debt stock reduction of more than $14bn[4]. However the ratios still far exceed the levels acceptable to restore confidence and voluntary lending. Table 6 shows how the market judges the performance of Latin American borrowers. The steady deterioration of the market valuation for debt reflects pessimistic expectations concerning future debt servicing.

Are Latin American countries suffering from a debt overhang problem? In other words, are these countries on the wrong side of the Debt Laffer curve? If so, creditors and debtors might benefit from a debt stock reduction because the potential repayment of a country is not independent of its debt burden (Krugman, 1989).

Answering the above question involves calculating the elasticity of the market price of debt with respect to its face value. If this measure is greater than one, then a debt overhang problem exists. To do so we follow Cohen (1989) and estimated a reduced form equation in which the dependent variable has the logistic form $p/1-p$ (where p is the secondary market price for one U.S. dollar debt) so as to let the elasticity depend upon the price level. This transformation of the dependent variable helps to avoid making inferences for the entire sample since it may be the case that only a subgroup of countries are

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[4]See CEPAL op. cit and World Bank Debt Tables 1989-90 edition.

Table 5

Debt[i]/export Ratios in Latin America
(percentages)

	1980	1981	1982	1983	1984	1985	1986	1987	1988
Latin America	202.9	224.7	279.5	315.0	296.0	319.1	383.1	374.1	319.2
Argentina	242.4	302.0	447.3	470.3	493.1	493.2	592.4	612.3	512.0
Bolivia	258.2	314.9	362.2	452.4	505.1	651.3	814.9	844.2	788.3
Brazil	304.3	299.2	392.8	400.5	345.3	355.9	445.8	436.2	313.4
Chile	192.5	279.0	335.9	371.1	410.0	436.6	395.3	331.2	232.5
Colombia	117.1	170.5	204.3	273.9	223.0	301.7	219.3	222.5	237.0
Costa Rica	224.5	274.0	317.2	355.1	302.3	344.1	314.4	314.2	270.5
Dominican Repub	133.8	134.4	188.5	202.5	196.8	220.5	218.3	210.2	188.4
Ecuador	203.1	262.5	291.0	282.6	279.0	259.5	355.7	425.9	410.1
El Salvador	71.1	111.3	149.4	167.2	162.3	163.1	144.2	191.0	195.0
Guatemala	63.6	82.9	117.1	149.3	185.8	219.7	229.0	241.3	199.3
Haiti	72.9	114.8	143.4	148.4	160.6	161.4	174.8	196.5	214.8
Honduras	152.5	189.0	235.1	260.8	264.9	297.8	292.4	338.4	322.5
Mexico	259.2	281.7	311.5	324.0	291.3	326.0	422.7	363.0	316.5
Nicaragua	422.3	442.3	731.2	874.2	1173	1604	2079	2226	2623
Panama	38.4	33.9	41.7	60.3	66.8	75.4	80.3	89.3	128.4
Paraguay	122.3	148.6	163.6	239.6	225.9	279.9	261.7	238.7	169.4
Peru	207.7	244.4	293.7	312.0	328.4	361.1	462.0	495.2	498.1
Uruguay	104.1	117.8	157.1	223.4	237.6	294.7	245.3	258.8	203.8
Venezuela	131.8	130.9	159.5	220.3	195.3	201.0	290.8	277.4	270.3

Source: Data from World Debt Tables 1988-89 and 1989-90 ed.

Notes : [i]Debt stocks include long-term debt (public and publicy guaranteed, private non guaranteed), use of IMF credit and short term debt.

Table 6

Secondary Market Bid Prices[i] for Latin American Debt
(monthly averages)

	6/86	12/86	6/87	12/87	6/88	12/88	6/89
Argentina	64.0	65.0	50.5	34.9	25.0	21.2	13.0
Bolivia	6.0	7.0	9.0	10.5	11.0	10.0	11.0
Brazil	75.0	75.0	61.0	46.2	51.4	41.4	31.0
Chile	66.0	67.0	69.0	60.5	60.2	55.7	61.0
Colombia	84.0	86.0	84.5	65.0	65.0	57.2	57.0
Costa Rica	53.0	35.0	36.0	15.0	11.0	11.5	13.5
Dominican Repub	n.a.	n.a.		23.0		21.5	
Ecuador	63.5	65.0	50.0	37.1	26.5	12.5	12.1
Honduras				22.0		22.0	
Mexico	60.0	56.0	56.8	51.2	50.9	43.4	39.5
Nicaragua				3.5		2.0	
Panama	67.0	68.0	66.0	39.0	24.0	20.5	10.2
Peru	20.0	18.0	15.0	7.0	6.1	5.0	3.0
Uruguay	63.0	65.0	73.5	59.5	59.7	59.5	55.5
Venezuela	76.0	74.0	71.0	58.4	54.9	40.9	36.9

Source: Solomon Brothers (several issues).

Notes : [i]Bid prices for a $100 U.S. dollar debt.

facing a debt overhang problem.

We re-estimated Cohen's equation for a sample of Latin American countries where data on secondary market prices for December 1986 to December 1988 was available. The pooled sample was further reduced[5] because of lack of data for the explanatory variables. The results came out as follows:

$$\log \frac{p}{1-p} = \underset{(2.162)}{0.849} - \underset{(4.346)}{1.151}\ \text{logD/X} + \underset{(0.453)}{0.502}\ \text{Xgrowth} - \underset{(0.410)}{0.149}\ \text{dum87} \qquad (1)$$

where p: December bid price of one dollar debt in the secondary market
D/X: debt-to-exports ratio
Xgrowth: real rate of growth of exports
dum87: dummy taking the value of 1 in December 1987 to indicate the influence on the market of Citicorp's decision to build up reserve losses for up to 3 billion U.S. dollars.

Absolute "t" statistics are given in parenthesis, $\bar{R}^2$=0.294.

Although Cohen used a different sample for his estimations, our results are quite different. All regressors were found significant in Cohen's estimation. Moreover, his estimated coefficient on Xgrowth had a negative sign and the coefficient of logD/X was -1.509. Note that in his estimation the elasticity of the price with respect to the debt is 1.509 $(1-p)$ so the hypothesis of debt overhang could not be rejected (at 95% degree of confidence) for countries for which the price was almost zero. In our estimation, the absolute value of the coefficient of logD/X is significant but for countries with zero secondary market price, the debt overhang problem is not rejected with 70% degree of confidence. In addition, the other two regressors are insignificant.

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[5]The countries included in our estimation are Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, Honduras, Mexico, Nicaragua, Panama, Peru, Uruguay and Venezuela.

It is not clear whether the sign of the Xgrowth estimated coefficient should be positive or negative[6]. On the one hand, Dhonte (1975) found that higher growth rates of debt were maintained by those countries that had higher growth rates of exports presumably because in a growing country, import expenditures (as well as debt service obligations) are likely to increase. A negative relation between the price of debt and the rate of export growth is more likely in countries where the outstanding debt is already large. On the other hand, Feder and Just (1977) found that countries with higher export rate growth were less likely to default or ask for reschedulings, hence a positive relation between the price of the debt and export growth is also plausible.

We decided to estimate a different type of equation since the one we have just reported did not look very promising. We postulated instead that the price of the debt was influenced by debt indicators (debt/gnp and reserves/imports ratios), the effective cash return of official and commercial bank lenders, and macroeconomic aspects of the country (inflation, export growth and trade regime). In addition, we included a dummy for Citicorp and a dummy for Peru.

Before reporting our results, we briefly discuss some of the regressors chosen for the estimation:

- The debt/gnp and reserves/imports ratios have the usual explanation and need no further justification.

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[6]Unfortunately, Cohen does not provide an explanation of its sign in his 1989 paper.

- The effective cash return of official lenders and commercial banks measures the net resource transfers of each kind of creditor in proportion to the outstanding claims of that creditor. We split them because it was suggested by Sachs (1989) that official creditors have been implicitly "subsidising" commercial bank creditors by receiving much less cash flow earnings than banks and hence, allowing borrowers to devote much of their repayments to banks.

Table 7 is useful to explore the Sach's argument. The share of official creditors (medium and long term debts) to Latin American public borrowers has increased from 20% in 1983 to 29% in 1988. The cash return on Latin American loans earned by both official and private creditors shows a clear upward trend reflecting the efforts of LACs to transfer funds and the lack of new lending. However, the cash return to official creditors has been negative until 1987 and always below the return received by private creditors, in particular, commercial banks. Therefore, on this account, it is plausible that official creditors have been implicitly bearing more costs than banks in lending to LACs.

The crude proxies for return on loans were lagged one year since they might be influenced by the price of debt. We expect a positive association between the price of debt and the return to commercial banks and a negative one for the return on official loans.

- Domestic inflation reflects macroeconomic management polcies of the country. Unless corrective measures are implemented, higher inflation leads to higher imports and lower exports. Therefore, we anticipate a negative correlation between inflation and the price of debt.

Table 7

Latin American Public External Debt[1] by Type of Lender and Cash Return[2] to Lenders
(percentages)

	Debt owed to		Cash Return to	
	Official	Private	Official	Private
1970	51.9	48.1		
1980	22.9	72.1		
1981	22.5	77.5	-8.65	-4.42
1982	21.8	78.2	-7.98	-3.18
1983	19.7	80.3	-4.65	-2.93
1984	19.4	80.6	-6.50	5.02
1985	22.2	77.8	-4.65	7.87
1986	25.0	75.0	-3.49	7.64
1987	28.1	71.9	0.77	5.46
1988	29.1	70.9	1.02	6.71

Source: World Bank Debt Tables 1990-91 ed.

Notes : [1]Includes only long and medium term debt

[2]Calculated as the net resource transfer of a creditor in proportion to the outstanding claims of that creditor.

- The 1987 World Bank Development Report suggests that the macroeconomic performance of outward oriented countries has been superior to that of inward looking strategies. This view has been criticised[7] but it appears to be generally accepted that outward oriented trade policies foster the growth prospects of developing countries and their capacity to adjust to external shocks. We constructed a dummy variable for trade regime using the categorisation of trade policies provided by the World Bank (1987). Forty-one less developed countries were classified on the basis of four groups: strongly inward oriented, moderately inward oriented, moderately outward oriented and strongly outward oriented. The dummy variable was then assigned a value ranging from 1 to 4 accordingly. None of the countries in our sample were among the strongly outward oriented group. Neither Ecuador, Panama nor Venezuela were in the list so we decided to classify them according to their trade policies, share of exports in GNP and export growth relative to the other LACs already grouped. Ecuador's trade regime was incorporated in the moderately inward oriented group with Panama and Venezuela in the moderately outward oriented group.

- The dummy variables for Peru and Brazil indicate their unilateral decision to suspend debt repayments as a result of an explicit policy decision[8]. Peru has imposed a partial debt moratorium by limiting debt repayments to 10% of exports since 1985, while Brazil declared moratorium in February 1987. We expect both country dummies to have a negative influence on the price of debt. We also

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[7] See for example, Singer (1988) and Singer and Gray (1988).

[8] These dummies should not be taken as inidcating arrears. They are intended to capture the conflicting attitude between creditors and borrowers.

incorporate time dummies (one for 1987 and another for 1988) to control for time effects.

Next we report the results of our estimation[9]:

$$\log \frac{p}{1-p} = -1.529 - 1.377 \log(D/GNP) + 1.659\ res/M - 2.157\ offloans \qquad (2)$$
$$(3.898)\ (5.310)\qquad (2.184)\qquad (2.105)$$
$$+ 1.222\ comloans - 0.056\ CPI/100 + 0.617\ Xgrowth/100 + 0.495\ outWB$$
$$(0.581)\qquad (1.956)\qquad (0.847)\qquad (3.933)$$
$$- 1.597\ dumPeru - 0.789\ dumBrazil - 0.729\ dum87 - 1.161\ dum88$$
$$(3.697)\qquad (1.262)\qquad (3.277)\qquad (4.859)$$

$$\bar{R}^2 = 0.812$$

$$\log \frac{p}{1-p} = -1.473 - 1.456 \log(D/GNP) + 1.617\ res/M - 2.504\ offloans \qquad (2')$$
$$(4.375)\ (6.092)\qquad (2.189)\qquad (2.138)$$
$$-0.061\ CPI/100 + 0.503\ outWB - 1.683\ dumPeru - 0.919\ dumBrazil$$
$$(2.262)\qquad (4.088)\qquad (4.127)\qquad (1.547)$$
$$-0.728\ dum87 - 1.143\ dum88$$
$$(3.398)\qquad (5.099)$$

$$\bar{R}^2 = 0.819$$

where p: December bid price of one dollar debt in the secondary market
D/GNP: debt-to-GNP ratio
res/M: international reserves-to-imports ratio
offloans: effective cash return to official creditors lagged one year
comloans: effective cash return to commercial banks lagged one year
CPI: inflation (%) based in the consumer price index
Xgrowth: real rate of growth of exports lagged one year
outWB: dummy for trade regime based on World Bank (1987)
dumPeru: dummy taking the value of 1 for Peru and 0 otherwise.
dumBrazil: dummy taking the value of 1 for 1987 and 0 otherwise.
dum87: dummy taking the value of 1 for 1987 and 0 otherwise
dum88: dummy taking the value of 1 for 1988 and 0 otherwise.
Absolute values of the "t" statistics are given in parenthesis

Although not all the estimated coefficients were significant, all had the expected signs. Real export growth influenced the price of debt at only 40% level of significance. The cash flow net return on commercial bank loans was insignificant but with the expected sign. The cash flow return on official loans was significant at the 5% level

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[9]Real export growth was entered with a year lag to attenuate the problem of simulataneity.

and with negative coefficient, supporting the view of Sachs (1989). After dropping insignificant variables from the regression, equation (2') suggests that the debt-Laffer-curve problem (for December 1988) could not be rejected for Nicaragua at the 95% degree of confidence; Peru at 90%; Bolivia, Costa Rica and Ecuador at 85%; and Argentina, Honduras and Panama at 70%. Given that since then the price of the debt has not increased nor has a substantial macroeconomic improvement occurred, we can argue that debt overhang is still a problem in some Latin American countries.

3. Handling of the Debt Crisis

For not only LACs but all LDCs, 1982 marked the beginning of both delays in debt servicing and attempts to renegotiate the terms of debt repayment. The international financial system was jeopardised and there were fears of a collapse. We have argued in the previous section that country borrowers seem to be in a very difficult position. In this section, we will explore how lenders faced the problem and overcame the threat of financial instability.

Rescheduling and refinancing[10] of official loans has been a common experience during the postwar period (ECLAC, 1985; Hardy 1982). Between 1956 and 1981, there were more than thirty multilateral debt restructurings involving more than twenty developing countries (Kisic,

[10]Debt refinancing involves the provision of new money to avoid default on existing obligations while rescheduling consists of a change in the contractual terms (maturity, grace period, interest rate) of payments of principal (and exceptionally interest) falling due in a specified period.

Danino and Morales, 1985). Most of the renegotiations took place under the auspices of the Paris Club. Among the LAC borrowers, Argentina, Brasil and Chile participated in the forum at least twice.

Until the mid 1970s, private creditors solved sovereign debt repayment problems by refinancing because there were few countries facing difficulties and the amounts involved were not too large. It was in the second half of the 1970s that banks began to reschedule with troubled borrowers[11]. Prior to 1980, there were few reschedulings and the pattern consisted of short amortisation periods (usually five to six years) and short grace periods (two years as the norm), high spreads (above 1.75 margin over Libor) and high commissions. Reschedulings were generally conducted under the auspices of the IMF. The 1976 Peruvian agreement was an exception since it was achieved without an IMF programme.

The 1980s brought a totally different picture and a challenge for commercial bank lenders. Between January 1980 and June 1981, more than ten Latin American countries experienced repayment difficulties. The lowest spread over LIBOR was charged to Mexico (0.65%) and the highest to Brazil (1.62%). The amortisation period fluctuated from 5 years for Cuba to 9.1 for Uruguay.

The main guidelines for the emerging pattern of bank reschedulings included[12]:

- differentiation between official debt contracted with governments,

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[11] See Devlin (1989) and Plan (1985) for an account of the first experiences in commercial bank reschedulings.

[12] See ECLAC (1985) and Calverly (1982).

multilateral institutions and banks.

- highest priority placed on the servicing of bank debt
- the willingness to consider rescheduling of payments was usually ranked (in decreasing order) as follows: future due principal, arrears of principal, arrears of interest and future due interest. Note that banks wanted to maintain loans as earning assets, hence they were reluctant to reschedule interest payments.
- short-term lines of credit were not rescheduled
- any agreement involved the banks' committees, the country borrower and the IMF.

More than twenty five LDCs began debt negotiations at the beginning of 1983. The focus of attention was in Latin America where not only Brazil and Mexico (the two largest borrowers among developing coutries) but an additional fifteen countries experienced repayment problems. Banks started to be very concerned about the creditworthiness of their customers and demanded substantial payments which is reflected in the positive net cash flow transfers from borrowers to lenders.

Given that ECLAC[19] and Devlin (1989) provide detailed explanations of the four rounds of LAC reschedulings, we will just provide a broad outline and relate them to the 1985 Baker Plan and 1989 Brady Plan.

Tables 8 and 9 summarise the amounts and conditions of bank debt rescheduled in Latin America prior to the Baker initiative. It is

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[19] See Economic Surveys of Latin America and the Caribbean (several issues) and Balance Preliminar de la Economia de America Latina y el Caribe (several issues).

Table 8

Rescheduling of External Debt with Commercial Banks for Selected Latin American Countries

(millions U.S. dollars)

	First Round 82/83		Second Round 83/84	
	Maturities	New loan	Maturities	New loan
Large Borrowers				
Argentina	13000 (82-83)	1500		
Brazil	4800 (83)	4400	5400 (84)	6500
Chile	3424 (83-84)	1300		780
Mexico	23700 (82-84)	5000	12000 (82-84)	3800
Venezuela				
Small Borrowers				
Bolivia				
Costa Rica	650 (82-84)	225		
Dom Rep	568 (82-83)			
Ecuador	1970 (82-84)	441		
Honduras	121 (82-84)			
Nicaragua[1]				
Panama	80 (83)	100		
Peru	400 (83)	450	662 (84-85)	
Uruguay	630 (83-84)	240		

(continued)

Source: ECLAC

Notes : ( ) years of restructured maturities, (...) negligible amount
maturities refer to restructured maturities, new loan refers to medium and long credits.

[1]Nicaragua rescheduled 180 millions in 1981 and 55 millions in 1982.

Table 8 (continued)

Rescheduling of External Debt with Commercial Banks for Selected Latin American Countries

(millions U.S. dollars)

	Third Round 84/85		Fourth Round 86/87	
	Maturities	New loan	Maturities	New loan
Large Borrowers				
Argentina	16500 (82-85)	3700	29500 (86-90)	1550
Brazil[1]	16300 (85-86)	...		
Chile	5700 (85-87)	714	12490 (88-91)	
Mexico	48700 (85-90)		43700 (85-90)	7700
Venezuela[2]	21200 (83-88)		20450 (86-88)	
Small Borrowers				
Bolivia[3]				
Costa Rica	440 (85-86)	75		
Dom Rep	790 (84-89)			
Ecuador	4800 (85-89)			
Honduras	220 (85-86)			
Nicaragua				
Panama	603 (85-86)	60		
Peru				
Uruguay	1700 (85-89)	45	1780 (86-91)	

Source: ECLAC

Notes : ( ) years of restructured maturities, (...) negligible amount maturities refer to restructured maturities, new loan refers to medium and long credits.

[1] Between January and August 1988, Brazil rescheduled 62100 millions and obtained 5200 millions of new credits.

[2] Venezuela restructured and additional 6000 millions in 1988.

[3] In March 1988, Bolivia anounced a debt buy-back for 334 millions at a discount of 89%.

Table 9

Terms of Rescheduling of External Debt with Commercial Banks for Selected Latin American Countries

	First Round 82/83						Second Round 83/84					
	Spread (%)		Amortis (years)		Grace (years)		Spread (%)		Amortis (years)		Grace (years)	
	M	NL	M	NL	M	NL	M	NL	M	NL	M	NL
Large Borrowers												
Argentina	2.13	2.50	7.0	5.0	3.0	3.0						
Brazil	2.50	2.13	8.0	8.0	2.5	2.5	2.0	2.0	9.0	9.0	5.0	5.0
Chile	2.13	2.25	7.0	7.0	4.0	4.0		1.75		9.0		5.0
Mexico	1.88	2.25	8.0	6.0	4.0	3.0		1.50		10.0		6.0
Venezuela												
Small Borrowers												
Bolivia												
Costa Rica	2.25	1.75	8.0	3.0	4.0	2.0						
Dom Rep	2.25		6.0		2.0							
Ecuador	2.25	2.38	7.0	6.0	1.0	1.5						
Honduras	2.25		7.0		1.0							
Nicaragua[i]												
Panama	2.25	2.25	6.0	6.0	2.0	2.0						
Peru	2.25	2.25	8.0	8.0	3.0	3.0	1.75		9.0		5.0	
Uruguay	2.25	2.25	6.0	6.0	2.0	2.0						

(continued)

Source: ECLAC

Notes : Spread=spread over LIBOR, Amortis=amortisation period, Grace=grace period, M=rescheduled maturities or principal, NL=new loans.

[i]The terms of the 1981 and 1982 rescheduling were: 1.5 average spread over Libor, 10 years amortisation period and 5 years grace period. Only one year of upcoming maturities was rescheduled in 1982 while 1.7 years were rescheduled in 1981.

Table 9 (continued)

Terms of Rescheduling of External Debt with Commercial Banks for Selected Latin American Countries

	Third Round 84/85						Fourth Round 86/87					
	Spread (%)		Amortis (years)		Grace (years)		Spread (%)		Amortis (years)		Grace (years)	
	M	NL	M	NL	M	NL	M	NL	M	NL	M	NL
Large Borrowers												
Argentina	1.38	1.63	12.0	10.0	3.0	3.0	0.81	0.88	19.0	12.0	7.0	5.0
Brazil	1.13		12.0		5.0							
Chile	1.38	1.63	12.0	12.0	6.0	5.0	1.0		15.0		6.0	
Mexico	1.13		14.0				0.81	0.81	20.0	12.0	7.0	4.0
Venezuela	1.13		12.5				0.88		14.0		...	
Small Borrowers												
Bolivia												
Costa Rica	1.63	1.75	10.0	7.0	3.0	1.5						
Dom Rep	1.38		13.0		3.0							
Ecuador	1.38		12.0		3.0							
Honduras	1.58		11.0		3.0							
Nicaragua												
Panama	1.38	1.63	12.0	9.0	3.5	3.0						
Peru												
Uruguay	1.38	1.63	12.0	12.0	3.0	3.5	0.88		17.0		3.0	

Source: ECLAC

Notes : Spread=spread over LIBOR, Amortis=amortisation period, Grace=grace period, M=rescheduled maturities or principal, NL=new loans.

apparent that, over the successive rounds, larger amounts of maturities were rescheduled and new loans were drying up for large and small borrowers. The terms of rescheduling during the first round were tougher than before 1982. The margin over Libor was between 1.75% and 2.25%; amortisation periods were between 3 and 8 years and grace periods ranged from 1 to 4 years. According to ECLAC (1985), the increase in the negotiated cost of credit was 242% higher in Ecuador and 217% higher in Argentina relative to the prevailing ones in 1980-81.

The second round of rescheduling meetings started in 1983 and saw some favourable changes although no agreement was reached with Argentina and Venezuela (they were seeking better terms) nor with Bolivia (reluctance to accept the IMF programme). Costa Rica, Panama and the Dominican Republic also found it difficult to negotiate since they had not honoured the conditions of the previous agreement. During this second round, the margin over Libor was between 1.75% and 2.0%, maturities were lengthened to 9 or 10 years and grace periods extended to 5 or 6 years.

The situation for the debtor countries did not improve and the third round of reschedulings started in mid 1984. Most of the Latin American countries restructured their debts but few received new loans. Conditions for rescheduling were eased substantially for all countries. However, the improvement in the terms of indebtedness was more favourable for large borrowers than small borrowers. In most cases reschedulings went beyond two years. The lowest margins over Libor on restructured maturitites were charged to Brazil, Mexico and Venezuela (1.13%) and the highest to Costa Rica (1.63%). Amortisation periods were also lengthened. The maximum was given to Mexico (14

years) and the shortest to Costa Rica (10 years). Grace periods were also extended. Among the biggest borrowers, Chile was granted 6 and 5 years on restructured maturities and new loans respectively and Costa Rica, 3 and 1.5 years.

As we have just pointed out, the cost of rescheduling and new credits decreased from 1980 to mid 1985. Better conditions and new credits were granted to big borrowers rather than to small borrowers. In 1985, the debt/export ratio for LACs was substantially above the 1982 level while the transfers from the region were five times higher.

In this scenario, the U.S. Treasury Secretary James Baker III launched a new proposal at the end of September 1985. The emphasis was put on adequate financing, commitments to adjustment policies, economic reforms, growth and a case-by-case solution. Baker called for a renewal of commercial bank and World Bank lending for the fifteen or so most indebted LDCs[14]. The idea was to secure over the next three years, $20bn of new lending from commercial banks and $9bn from multilateral development banks, especially the World Bank. Despite the recognition of the need for credits to enable debtors to reorientate their economies and grow, the initiative also stressed that interest payments to commercial banks should be paid on schedule and at market interest rates, thus allowing only for principal payments to be rescheduled. It also highlighted the role of the IMF and World Bank as entities charged with supervising the implementation

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[14]The initiative focused explicitly on the following fifteen heavily indebted countries: Argentina, Bolivia, Brazil, Chile, Colombia, Cote d'Ivoire, Ecuador, Mexico, Morocco, Nigeria, Peru, Philippines, Uruguay, Venezuela and Yugoslavia. The World Bank includes Costa Rica and Jamaica and calls all of them the Baker 17 countries. Eleven out of the 17 countries listed are LACs.

of adjustment policies and economic reforms. Finally, it encouraged market-based-debt reduction operations (e.g. debt buybacks, debt-equity swaps, exit bonds, etc.).

Reschedulings under the Baker Plan were more favourable to the borrower. The fourth round of reschedulings was characterised by lower spreads and longer amortisation and grace periods than in the previous rounds. Most of the borrowers restructured their debts but the drying up of funds continued despite efforts to mobilise new credits.

The position of LACs four years after the implementation of the Baker Plan is summarised in table 10 Most of the few new credits were granted to large borrowers. However, as suggested by Sachs (1989b), "new credits" or "new money package" are misleading descriptions because principal and interest payments exceeded disbursements in most of the LACs. That is funds were transfered from borrowers to lenders (see table 11). Therefore, the large flows expected from commercial banks to enhance growth did not materialise and banks continued reducing their exposure. The World Bank (1989) attributes this to the reluctance of commercial banks to lend new money, the fact that only few borrower countries implemented macroeconomic and reform-orientated policies called for and the sales by the banks of their LDC debt.

The debt crisis hit the largest U.S. banks despite the fact that only around 35% of the debt in Latin America was held directly by them. They attracted world attention because they have been the leaders in lending to Latin America, the exposure-to-capital ratio of the top major U.S. banks was above 250% for all LDCs and around 180% for LACs and finally, because there exist strict U.S. acounting and

Table 10

New Money, Interest Arrears and Debt Stock Reductions Between Private Creditors and Selected Latin American Countries

	1985			1986			1987			1988[i]			1989[i]		
	NM	AR	DR	NM	AR	DR	NM	AR	DR	NM	AR	DR	NM	AR	DR
Large Borrowers															
Argentina	Y	Y	Y	N	Y	N	Y	Y	N	N	Y	Y	N	na	na
Brazil	N	N	Y	N	N	Y	N	Y	Y	Y	N	Y	N	na	na
Chile	Y	N	Y	N	N	Y	N	N	Y	N	N	Y	N	na	na
Mexico	N	N	Y	N	N	Y	Y	N	Y	N	N	Y	N	na	na
Venezuela	N	N	N	N	N	N	N	N	N	Y	N	Y	N	na	na
Small Borrowers															
Bolivia	N	Y	N	N	Y	N	N	Y	N	N	Y	Y	N	na	na
Colombia	Y	N	N	N	N	N	N	N	N	N	N	N	Y	na	na
Costa Rica	Y	Y	N	N	Y	N	N	Y	Y	N	Y	Y	N	na	na
Dominican Republic	N	Y	N	N	Y	N	N	Y	N	N	Y	N	N	na	na
Ecuador	N	N	N	N	Y	N	N	Y	Y	N	Y	Y	N	na	na
Honduras	N	Y	N	N	Y	N	N	Y	N	N	N	Y	N	na	na
Panama	Y	Y	N	N	N	N	N	Y	N	N	Y	N	N	na	na
Peru	N	Y	N	N	Y	N	N	Y	N	N	Y	N	N	na	na
Uruguay	Y[ii]	N	N	N	N	N	N	N	Y	N	N	Y	N	na	na

Source: World Bank Debt Tables 1989-90

Notes : NM stands for new money or disbursement of medium and long term concerted loan, AR for interest arrears on long debt outstanding, DR for debt stock reduction, na for not available, Y and N indicate yes and no respectively.

[i] Preliminary.

[ii] Contingent credits.

Table 11

Long Term Net Resource Transfers from Private Creditors[1] to Selected Public-Sector Borrowers

	1985		1986		1987		1988	
	NF	NT	NF	NT	NF	NT	NF	NT
Large Borrowers								
Argentina	2532	-760	579	-2226	888	-2115	-39	-2077
Brazil	380	-4339	-170	3820	-122	-4067	2533	-6387
Chile	696	-188	304	-741	106	-791	-125	-706
Mexico	69	-6865	-689	-6102	3592	-1797	642	-4779
Venezuela	-527	-1929	-863	-2562	-733	-2315	473	-1535
Small Borrowers								
Bolivia	-9	-33	-5	-9	16	11	-32	-38
Colombia	261	-157	950	545	-273	-766	277	-219
Costa Rica	57	-192	-16	-106	2	-51	-15	-78
Dom Rep	24	-66	-7	-134	4	-39	-6	-84
Ecuador	202	-365	365	-120	34	-101	51	-30
Honduras	38	7	26	6	-34	-47	-6	-18
Panama	6	-229	7	-229	36	-107	0	0
Peru	118	-43	38	-17	92	81	255	241
Uruguay	86	-296	81	-189	58	-20	-20	-292

Source: World Bank Debt Tables 1989-90

Notes : NF indicates net flows and NT, net transfers.

[1]Bonds, commercial banks and other private sources.

regulatory requirements (Kuczynsky, 1988; Mortimore, 1989).

The strategy of the U.S. banks was to strenghten their balance sheet, increase loan loss provisions, augment their capital and reduce lending as much as possible. The difficulties in agreeing concerted loans and the regulatory pressure to disclose loans to LDCs reinforced the tendency of banks to cut back lending. Table 12 shows that not only large U.S. banks but also the smaller ones have decreased their LDC and Latin America exposure substantially. At the end of 1987, the top nine U.S. banks were 97% exposed in Latin America while the small U.S. banks decreased their exposure from 78.6% to 31.9%. Sachs (1989b, p.12) emphasises that "...the banks as a group are already out of crisis range with regard to their Latin America exposure".

The continuous deterioration of the valuation of debt in the secondary market signalled an expectation that full repayment would not occur. Market-based-options allowed private creditors to exchange existing debt for new assets and further reduced their exposure. Although the amount traded compared to the debt outstanding is small, debt conversions (and in consequence, debt stock reductions) followed an upward tendency between 1986 and 1988 (table 13). Large borrowers have been more involved in debt conversions than small borrowers and among all debt conversion programmes, debt-equity swaps have been the most popular. Note that much of the secondary market activity is still in interbank trading which does not reduce the outstanding stock of LDC debt.

According to the World Bank's projections, debt conversions in 1989 will end up being 38% less than 1988. Debt-equity programmes in large borrower countries such as Argentina, Brazil and Chile have been

Table 12

Exposure of U.S. Banks in LDCs and LACs as a Percentage of their Primary Capital

	End 1982	Mid 1984	End 1986	End 1987
All U.S. banks				
LDCs	186.5	156.6	94.8	78.1
LACs	118.8	102.5	68.0	57.9
Top major banks				
LDCs	287.7	246.3	153.9	130.9
LACs	176.5	157.8	110.2	97.0
All other banks				
LDCs	116.0	96.1	55.0	43.1
LACs	78.6	65.2	39.7	31.9
Memorandum Item: Total bank primary capital (billions U.S. dollars)				
All U.S. banks	70.6	84.7	116.1	129.2
Top nine banks	29.0	34.1	46.7	51.5
All other banks	41.6	50.6	69.4	77.7

Source: Jeffrey Sachs, New Approaches to the Latin American Debt Crisis (International Finance Section, Department of Economics, Princeton University, 1989)

Notes : Exposure=total amount owed to U.S. banks after adjustments for guarantees and external borrowing
LDCs=OPEC, nonoil Latin America, nonoil Asia, nonoil Africa
LACs=nonoil Latin America plus Ecuador and Venezuela.

Table 13

Secondary Market for Developing Country Debt
(millions U.S. dollars)

	1984	1985	1986	1987	1988	1989[1]
Argentina	31	469	-	35	1330	500
Brazil	731	537	176	1800	9175	4000
Bolivia	-	-	-	1	349	20
Chile	11	313	987	1983	2905	2000
Costa Rica	-	-	7	146	17	10
Ecuador	-	-	-	125	258	-
Jamaica	-	-	-	2	100	-
Mexico	-	769	1023	3804	6670	6000
Nigeria	-	-	-	-	95	200
Peru	-	-	-	-	15	-
Philippines	-	-	43	287	806	300
Uruguay	-	-	-	-	97	-
Venezuela	-	-	-	-	477	-
Yugoslavia	-	-	-	-	50	-
Others	-	-	-	6	15	750
Total conversions[2]	773	2088	2236	8188	22358	13780
Total trading[3]	2000	4000	7000	12000	50000	40000
Total LDC Debt[4]	347630	388650	435759	480563	470105	465071
Memorandum Item: Debt conversions by type of transaction						
Debt-equity swaps	773	1843	1522	3335	9205	
Exit bonds	-	-	-	15	4725	
Buybacks	-	-	-	-	648	
Informal	-	-	-	3500	5414	
Other	-	245	714	1337	2366	

Source: World Bank Debt Tables 1989-90.

Notes : [1]Projected.

[2]Debt for equity and domestic swaps, loan to bond conversions, debt repurchases and other transactions excluding interbank trading.

[3]Total conversions including interbank trading.

[4]Goverment long term debt outstanding to private creditors

suspended in 1989. This decision was partly taken because of concerns about the adverse fiscal and monetary consequences with inflationary implications, the possible negative effects on net foreign exchange (in particular, "round-tripping") due to diversion of funds, and the influence on creditworthiness[15].

Has the Baker Plan been successful? Yes in the sense that it has bought time for the banks to move away from insolvency risk associated with their LDC exposure; but despite the massive resource transfers to private creditors, the situation of LACs did not improve much.

Interest arrears of the Baker 17 countries to all long term creditors increased from $1.9 billion in December 1985 to $9.6 billion in December 1989 while over the same period, arrears owed to commercial banks increased from $1.0 billion to $6.5 billion (World Bank, 1989). Argentina, Bolivia, Costa Rica, Ecuador and Peru were among the countries in arrears. Moreover, from 1985 to 1988, six out of the eleven LACs included within the Baker 17 countries, experienced a modest fall of the debt/export ratio and only two (Chile and Costa Rica) ended 1988 with debt/export ratios slightly lower than in 1982.

The need for a review of the debt strategy was apparent and in March 1989, the U.S. Treasury Secretary Nicholas Brady outlined a new plan to cope with the debt problem. The proposal confirmed that the impediments to a succesful resolution of the debt crisis remained. External financial flows were scarce. Growth, investment and savings

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[15]See World Bank (1989) and Krugman (1988). A discussion of debt-equity conversions in Chile is provided by Schinke (1990) and Livingston (1988); for Bolivia and Mexico, see Laudany (1989) and for Venezuela, see Velasquez (1989).

in debtor countries did not show much improvement. Debt reduction through market mechanisms showed progress but the pace was still too slow for borrowers to regain creditworthiness. It also recognised that further stretching out of debt repayments without debt reduction was unlikely to solve the debt impasse because of the large stock of bad debts. In view of these shortcomings, Brady put forward a new initiative containing the following key elements: growth is essential to easing debt problems, economic reforms are necessary to achieve this growth, debtor countries are in need of external financial resources and the solution of the debt problem should be pursued on a case-by-case basis.

Besides the strong emphasis on debt reduction (Brady Plan), another difference between the Brady Plan and the Baker Plan lies in the role of the World Bank and IMF. They were not only going to serve as a "catalyst" to debt rescheduling and new financing but "...support and encourage the debt reduction process by redirecting a portion of the funds which they have currently available" (Department of the U.S. Treasury, 1989, p.26). Debt service reduction through voluntary schemes would remain in the marketplace and not under World Bank or IMF management. However, they will help to accelerate debt conversions by providing funds for some debt reduction transactions (e.g. financing to collateralise debt-for-bonds exchanges, replenishing foreign exchange reserves after a cash buyback, etc.).

Debt analysts have expressed concern about the Brady Plan. The Institute of International Finance criticises the Brady initiative for potentially creating "a loss of discipline in the (international financial) system and the build-up of payment arrears to commercial banks and official agencies" (Financial Times, 4/5/90). The institute estimates that total arrears to commercial banks rose to $18.15bn at

the end of March 1990, up sharply from $14.37bn and $6.45bn at the end of 1989 and 1988 respectively. They argue that one of the mistakes of the Brady Plan is the changing policy of the IMF since it will tolerate payment arrears to the banks[16]. In contrast, they suggest the the IMF should revert to its traditional policy and make sure arrears are paid before countries can borrow from the fund.

Dil (1989) argues that the two major components of the Brady Plan, new money and debt relief, are contradictory. On the one hand, new money assumes that debtors are capable of handling not only their current level of indebtedness but higher levels. On the other hand, debt relief assumes that debtors are insolvent and unable to service their current level of indebtedness. Therefore, Dil proposes that the Baker Plan should be modified to distinguish between debtor countries which require debt relief and those which require new money.

From a different perspective, Sachs (1989a) and Dornbusch (1989) commented on the limitations of voluntary debt reduction schemes. One limitation is related to the debt overhang and free rider problem. Participation in debt reduction plans must be no worse for the banks than carrying the original claim. If debt relief is sufficient to restore creditworthiness, then all the claims of the debtors (even the portion not involved in the debt reduction operations) will increase in value to face value. Therefore, banks have an incentive to hold out until creditworthiness is restored and therefore the aims of debt reduction will not be achieved. This incentive is reinforced by the fact that major commercial banks see an advantage in waiting for

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[16]For a discussion of the new role and policies of the IMF towards heavily indebted countries, see Camdessus (1989).

bailouts from the official creditor community.

Next is the resistance of the U.S. money centers to debt reduction operations. Given that their exposure in Latin America was still above 80% of capital at the end of 1988, a massive debt write-down would in general require book losses because banks are still holding the debt at book values. Note that although the debt reduction operation might raise the market value of banks' stock of debt, many banks will be obliged to report losses because the capital adequacy standards are based on book values. Note as well that a substantial reduction operation will also wipe out loan loss reserves and capital and will require banks to create new capital and reserves, hence there will be little scope for new lending. If multilateral agencies are going to support a large debt reduction program, then huge funds would be required, say, to collaterise exit bonds or increase reserves in countries buying back their own debt. The largest five public Latin American borrowers owed more than $203bn to private creditors in 1988. If all these debts were reduced to their secondary market price, then more than $79bn in guarantees would be required.

Finally, it is not clear what action should be taken in the case of "good" debtors. For example, Colombia has never been in interest arrears but its debt was traded at 57 cents in the dollar at the end of July 1989. Should the debt be written off even though they have not been in arrears? There may be other difficulties, for instance if the Brady Plan is interpreted as only providing relief to countries with a "bad" debtor record, what is to prevent other LDCs deliberately suspending repayments in order to gain debt relief?

4. Conclusions and Lines for Further Research

The economic performance of Latin America has shown very little (if any) improvement after the debt crisis. Although our empirical results should be taken cautiously, they show that some Latin American borrowers (Nicaragua, Peru, Bolivia, Costa Rica and Ecuador at least at 15% level of significance) were suffering from debt overhang in December 1988.

The successive rounds of reschedulings show improved renegotiation conditions (spread over Libor and amortisation and grace periods) in particular for the large Latin American borrowers. However, these settlements have not involve provision of "fresh" money nor substantial debt relief. The strategy followed has been one of credit rationing and increase in provisions for possible loss.

Can we expect voluntary debt reductions to provide sufficient debt relief? The answer seems to be a provisional no. Debt equity conversions have been halted in several LACs and other types of transactions such as exit bonds and buybacks require guarantees, money donations or new concessional loans. LACs have a resource constraint which, we suggest, seems to be binding and it is unlikely that they would direct their international reserves to purchase their own debt if no new loans are forthcoming.

One way of resolving some of the problems mentioned above is the establishment of an International Debt Facility (IDF) as urged at the beginning of the 1980s by both Kenen (1983) and Rohatyn (1983) and reconsidered by Dornbusch (1989) and Sachs (1989a, 1989b).

An IDF would be created by the goverments of the creditor nations

and/or international institutions like the World Bank. This new institution would borrow money from creditor governments in order to purchase debt from commercial banks at a discount and then pass along some or all of that discount to the debtor countries.

There are several ways in which the scheme might be implemented: a) The IDF might raise cash through bond issues guaranteed by creditor governments, use this money to buy the existing debt at secondary market prices and then provide some relief through interest or principal reduction (Kenen, 1983). b) If banks and debtors negotiate a reduction on interest payments on a bilateral basis, the IDF could offer to guarantee (part or all) of the future interest payments accrued to banks (Rohatyn, 1983). c) The IDF could donate money directly to debtors to repurchase debt in the secondary market as in the Bolivian case. d) The IDF could buy debt from banks in exchange for low interest loans and then pass the same low interest rate onto debtors (Weinert, 1986-87). e) The IDF could guarantee exit-bonds. That is, a debtor country could repurchase old debt by issuing senior claims to future income which would be guaranteed by the IDF.

Advocates of the IDF suggest that alleviating the debt overhang through debt forgiveness might help country borrowers generate enough income to repay the remaining debt obligations. In other words, any form of debt relief which decreases expected payments but increases the probability of full repayment and thus, the market valuation of the debt, would benefit debtors and creditors. Therefore, the IDF stands a chance of making everyone better off.

The above statement is controversial. Firstly, forgiving a portion of the debt does not imply that the remaining debt would be

paid off. It just says that in borrower countries, the "willingness" to repay would be greater than if debt is not forgiven. Nothing ensures that the remaining debt would be paid and that the IDF would have its money returned. Secondly, some researchers believe that schemes such as debt buybacks might not benefit the debtors.

Bulow and Rogoff (1990a) acknowledge that buybacks stimulate investment by relieving the debt overhang; but, they argue, it is likely to be an inefficient cure for the debt overhang. A highly indebted country with good investment projects has two strategies: either use its endowment to invest and consume or use part of it to repurchase some of its commercial bank debt. The latter strategy has two effects. On the one hand, it not only reduces total resources available for investment (and consumption) but also alleviates perverse investment incentive effects; hence, the net effect on investment might be positive. On the other hand, the buyback increases the probability of repayment of the remaining debt and raises its market price. Therefore, a substantial amount of this efficiency enhanced investment (gained trough the buyback) will end up in the creditors' pockets without benefiting the debtors[17]. In other words, for the debtor, the buyback strategy might be suboptimal since a debtor country could always do better (relative to what they would have achieved from a buyback) by using the resources earmarked for a buyback to increase investment (and consumption). Lenders who sell would benefit since they would sell only if the return from selling equals the return of the non-sellers. Lenders who do not sell would also benefit since the debt-income ratio would be lower.

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[17] In fact, in the model developed by Bulow and Rogoff, the net effect of buybacks on investment is positive and creditors reap more than 100% of the efficiency-enhancing gains from investment.

In the the case of buybacks financed by the IDF, a similar reasoning might apply. A substantial amount of the IDF funds would probably go to private creditors with little (if any) benefit to the debtors. If this is so, why should "taxpayers" money be used for debt buybacks instead of new lending? Even if this was not the case, would the amount of total aid provided by the developed countries need to be curtailed in order to provide funds for the IDF? Assuming that the IDF is not a substitute for "traditional" aid, would it be socially desirable to transfer funds from the IDF to middle-income countries with large bank debts instead of using it in alternative projects in low-income countries? (see Bulow and Rogoff, 1990b).

Besides welfare considerations we may need to question how the facility would be financed and in particular, the extent to which taxpayers' money of the creditor nations paticipating in the IDF would be put at risk. Among other queries raised about the implementation of an IDF-type scheme are: At what price would the IDF buy loans from banks? How large would the write-down by banks be? How much debt relief would the IDF provide? Would the IDF be able to eliminate (or at least) decrease the free rider problem? Note that if debt relief is provided and creditworthiness of the debtor improves, then creditors that stayed out of the IDF agreement would benefit from capital gains. These, we believe, are also valid questions in the event that the IDF proves to be a viable institution and this is an area where further research is necessary.

References

Abbasi, B. and Taffler, R.J., 1984, "Country Risk: A Model for Predicting Debt Sevicing Problems in Developing Countries", Journal of the Royal Statistical Society, 147, 541-568.

Alesina, A. and Tabellini, G., 1988, "External Debt, Capital Flight and Political Risk", NBER Working Paper No.2610.

Amemiya, T., 1981, "Qualitative Response Models", Journal of Economic Literature, 19, 1483-1536.

Banks, A., 1980, 1986, "Political Handbook of the World"

Bazant, J, 1968, "Historia de la Deuda Exterior de Mexico", Mexico,

Berg, A. and Sachs, J., 1988, "The Debt Crisis: Structural Explanations of Country Performance", NBER Working Paper No. 2607.

Bienen, H.S. and Gersovitz, M., 1985, "Economic Stabilization, Conditionality and Political Stability", International Organization, 39, 729-754.

Binmore, K. et al, 1985, "The Nash Bargaining Solution in Economic Modelling", STICERD No.112, LSE.

Bradford, S. and Kucinski, B., 1988, "The Debt Squads: The U.S., the Banks and Latin America", Zed Books Ltd., London.

Bulow, J. and Rogoff, K., 1988, "The Buyback Boondoggle", Brookings Papers on Economic Activity, 2, 675-698.

Bulow, J. and Rogoff, K., 1988, "Multilateral Negotiatios for Rescheduling Developing Country Debt: A Bargaining-Theoretic Framework", IMF Staff Papers, 35, 644-657.

Bulow, J. and Rogoff, K., 1989, "Sovereign Debt: Is to Forgive or Forget?", American Economic Review, 79, 43-49.

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

Camdessus, M., 1989, "Strengthening the Debt Strategy: The Role of the IMF and of the Banks", The Journal of International Securities Market,

Summer, 123-130.

Canto, V., 1986, "Latin Crisis and IMF Intervention", Columbia Journal of World Business, 17, 81-89.

Cardoso, E.A., 1989, "Deficit Finance and Monetary Dynamics in Latin America", mimeo, Fletcher School of Law and Diplomacy, Tufts University.

CEPAL, 1985, "External Debt in Latin America: Adjustment Policies and Renegotiation", Lynne Rienner Publishrs, Inc., Colorado.

CEPAL, 1988, "Balance Preliminar de la Economia de America Latina y El Caribe 1988", in "Notas Sobre la Economia y el Desarrollo", No.470/471.

CEPAL, 1989, "Balance Preliminar de la Economia de America Latina y El Caribe 1989", in "Notas Sobre la Economia y el Desarrollo", No.485/486.

CEPAL, several issues, "Economic Survey of Latin America"

Citron, J. and Nickelsburg G., 1987, "Country Risk and Political Instability", Journal of Development Economics, 25, 385-392.

Cline W.R., 1984, "International Debt: Systematic Risk and Policy Response", Institute for International Economics, Washington DC.

Cohen, D. and Sachs, J., 1982, "LDC Borrowing with Default Risk", NBER Working Paper No.925.

Cohen, D., 1988, "Is the Discount on the Secondary Market a Case for LDC Debt Relief?", CEPREMAP Working Paper No.8823.

Cohen, D., 1988, "Debt Relief and Secondary Market Discount", CEPR Discussion Paper No.312.

Congdon, T., 1985, "The Link Between Budget deficits and Inflation: Some Contrasts Between Developed and Developing Countries", L. Messeland Co., London.

Corden, W.M., 1988, "An International Debt Facility?", IMF Staff Papers, 35, 401-421.

Corden, W.M., 1988, "Debt Relief and Adjustment Incentives", IMF Staff

Papers, 35, 628-643.

Cumby, R. and Levich, R., 1987, "On the Definition and Magnitude of Recent Capital Flight" in D.R. Lessard and J. Williamson eds., "Capital Flight and Thirld World Debt", Institute from International Economics, Washington D.C.

Cuddington, J.T., 1987, "Macroeconomic Determinants of Capital Flight: An Econometric Investigation" in D.R. Lessard and J. Williamson eds., "Capital Flight and Thirld World Debt", Institute from International Economics, Washington D.C.

Dale, R. and Mattione, R., 1983, "Managing Global Debt", The Brooking Institution, Washington D.C.

Darity Jr., W., 1986, "Did the Commercial Banks Push Loans on the LDCs?", in M. P. Claudon ed., World Debt Crisis: International Lending on Trial, Cambridge, Massachusetts.

Devlin, R., 1989, "Disyuntivas Frente a la Deuda Externa", Revista de la CEPAL, 37, 29-49.

Devlin, R., 1989, "Debt and Crisis in Latin America: The Supply Side of the Story", Princeton University Press, Princenton.

Department of the U.S. Treasury, 1989, "First Report to the Congress Concerning World Bank Strategy and Lending Program in Debtor Countries".

Dhonte, P., 1975, "Describing External Debt Situation: A Roll-Over Approach", IMF Staff Papers, 22, 159-186.

Diaz Alejandro, C., 1983, "Stories of the 1930s for the 1980s", in P. Aspe Armella et al., eds. Financial Policies and the World Capital Market: The Problem of Latin American Countries, University of Chicago Press.

Diaz Alejandro, C., 1984, "Latin American Debt: I Don't Think We Are in Kansas Anymore", Brookings Papers on Economic Activity, 2, 1984.

Dil, S.F., 1989, "The Debt Debacle: Can the Brady Plan Help?", Journal of Commercial Bank Lending, Nov., 46-58.

Donaldson, T.H., 1981, "Lending in International Commercial Banking", Macmillan Press, London.

Dooley, M.P., 1988, "Buy-Backs and Market Valuation of External Debt", IMF Staff Papers, 35, 215-229.

Dornbusch, R., 1984, "External Debt, Budget Deficits and Disequilibrium Exchange Rates", NBER Working Paper No. 1336.

Dornbusch, R., 1984, "On Muddling through the Debt Crisis", The World Economy, June.

Dornbusch, R., 1985, "Dealing with the Debt Crisis in the 1980s", Thirld World Quarterly Review, 7, 532-551.

Dornbusch, R., 1986, "Dollar, Debts and Deficits", MIT Press, Massachussets.

Eaton, J. and Gersovitz, M., 1981, "Debt with Potential Repudiation: Theoretical and Empirical Analysis", Review of Economic Studies, 48, 289-309.

Eaton, J. and Gersovitz, M., 1981, "Poor-Country Borrowing in Private Financial Markets and Repudiation Issue", Princeton Studies in International Finance, 47, Princeton University, Princeton.

Eaton J. et al., 1986, "The Pure Theory of Country Risk", European Economic Review, 30, 289-309.

Eaton, J. and Taylor, L., 1986, "Developing Country Finance and Debt", Journal of Development Economics, 22, 209-265.

Edwards, S., 1983, "LDCs Foreign Borrowing and Default Risk: An Empirical Investigation", NBER Working Paper No. 1172.

Edwards, S., 1986, "The Pricing of Bonds and Bank Loans in International Markets: An Empirical Analysis of Developing Countries' Foreign Borrowing", European Economic Review, 30, 565-589.

Eichengreen, B. and Portes, R., 1985, "Debt and Default in the 1930s: Causes and Consequences", CEPR Discussion Paper No.75.

Eichengreen, B., 1989, "The U.S. Capital Market and Foreign Lending, 1920-1955", in J. Sachs ed., op. cit.

Feder, G and Just, R.E., 1977, "A Study of Debt servicing Capacity Applying Logit Analysis", Journal of Development Economics, 4, 25-38.

Feder, G. and Just, R.E., 1980, "A Model for Analysing Lender's Perceived Risk", Applied Economic, 12, 125-144.

Feder G. et al., 1981, "Projecting Debt Service Capacity of Developing Countries", Journal of Financial and Quantitative Analysis, 16, 651-669.

Felix, D, 1987, "Alternative Outcomes of the Latin American Debt Crisis: Lessons from the Past", Latin American Research Review, 22,

Fisher, S., 1989, "Resolving the International Debt Crisis", in J. Sachs, ed., op. cit.

Fishlow, A., 1986, "Lessons from the Past: Capital Markets During the 19th Century and the Interwar Period", in M. Khaler ed., "The Politics of International Debt", Cornell University Press, Ithaca and London.

Folkerts-Landau, D, 1985, "The Changing Role of International Bank Lending in Development Finance", IMF Satff Papers, 32, 317-363.

Frank, C.R. and Cline, W.R., 1971, "Measurement of Debt Servicing Capacity: An Application of Discriminant Analysis", Journal of International Economics, 1, 327-344.

Friedman, J., 1986, Game Theory with Applications in Economics, Oxford University Press.

Friedman, I., 1983, The World Debt Dilemma: Managing Country Risk, Council for International Banking Studies, Washington D.C. and Robert Morris Asssociates, Philadelphia.

Froot K.A. et al., 1989, "LDC Debt: Forgiveness, Indexation and Investment Incentives", The Journal of Finance, 44, 1335-1350.

Genotte, G. et al., 1987, "A Valuation Model for Developing Country Debt with Endogenous Rescheduling", The World Bank Economic Review, 1, 237-271.

Genotte, G., 1986, "Sovereign Debt: A Study of Alternative Repayment Schedules", mimeo, School of Business Administration, University of California, Berkeley.

Glick, R. and Kharas, H., 1986, "The Costs and Benefits of Foreign Borrowing: A Survey of Multi-Period Models, The Journal of Development Studies, 22, 279-299.

Griffith-Jones, S., 1987, "Bargaining in the Debt Crisis: Past Trends and Proposals for the Future", mimeo, Institute of Development Studies, University of Sussex.

Grossman, H. and Van Huyck, J, 1985, "Sovereign Debt as a Contingent Claim: Excusable Default, Repudiation and Reputation", NBER Working Paper No.1673.

Gulati, S.K., 1987, "A Note on Trade Misinvoicing" in D.R. Lessard and J. Williamson eds., "Capital Flight and Thirld World Debt", Institute from International Economics, Washington D.C.

Gupta S. and Livne, Z., 1986, "Resolving a Conflict Situation with a Status Quo Outcome: An Axiomatic Model", Research Working Paper No.8, Columbia Business School.

Guttentag, J. and Herring, R., 1983, "The Lender-of-Last-Resort Function in an International Context", Essays in International Finance, 151, Princeton University, Princeton.

Guttentag, J. and Herring, R., 1984, "Credit Rationing and Financial Disorder", The Journal of Finance, 34, 1359-1382.

Guttentag, J. and Herring, R., 1989, "Accounting for Losses on Sovereign Debt: Implications for New Lending", Essays in International Finance, 172, Princenton University, Princeton.

Haggard, S., 1985, "The Politics of Adjustment: Lessons from the IMF's Extended Fund Facility", International Organization, 39, 505-534.

Haggard, S. and Kaufman R., 1989, "The Politics of Stabilization and Structural Adjustment" in J. Sachs ed., op. cit.

Hajivassiliou, V.A., 1986, "Two Misspecification Tests for the Simple Switching Regressions Disequilibrium Model", Economic Letters, 22, 343-348.

Hajivassiliou, V.A., 1987, "The External Debt Repayments Problems of LDC'S: An Econometric Model Based on Panel Data", Journal of Econometrics, 36, 205-230.

Hahn, F., 1978, "On Non-Walrasian Equilibrium", Review of Economic Studies, 45, 1-17.

Hardy, C.S., 1982, "Rescheduling Developing-Country Debts, 1956-1981:

Lessons and Recommendations", Overseas Development Council, 15, Washington DC.

Heffernan, S.A., 1985, "Country Risk Analysis: The Demand and Supply of Sovereign Loans", Journal of International Money and Finance, 4, 389-413.
Heffernan, S.A., 1986, "Sovereign Risk Analysis", Allen and Unwin Publishers, London.

Helpman, E., 1989, "Voluntary Debt Reduction Schemes", IMF Staff Papers, 36, 580-611.

IMF, 1981, "External Indebtedness of Developing Countries", Occasional Paper, 3, Washington DC.
IMF, 1983, "Recent Multilateral Debt Restructurings with Official and Bank Creditors", Occasional Paper, 25, Washington DC.
IMF, 1984, "International Capital Markets: Developments and Prospects, 1984", Occasional Paper, 31, Washington DC.
IMF, 1985, "Recent Developments in External Debt Restructuring", Occasional Pape, 40, Washington DC.
IMF, (several issues), "Annual Report", Washington DC.

Jaffe, R. and Russell T., 1976, "Imperfect Information, Uncertainty and Credit Rationing", Quarterly Journal of Economics, 90, 651-666.

Johnson, C., 1985, "External Debt Assessment", Lloyds Bank, London.

Jorge A. et al., 1983, "Foreign Debt and Latin American Economic Development", Pergamon Press, New York.
Jorge A. et al., 1985, "External Debt and Development Strategy in Latin America", Pergamon Press, New York.
Jorgensen, E. and Sachs, J., 1988, "Default and Renegotiation of Latin American Foreign Bonds in the Interwar Period", NBER Working Paper No.2636.

Kaufman, R., R., 1985, "Democratic and Authoritarian Responses to the Debt Issue", International Organization, 39, 473-503.

Kaletsky, A., 1985, "The Cost of Default", Priority Press Publications, New York.

Kettel, B. and Magnus, G., 1986, "The International Debt Game: A Study in International Bank Lending, Graham and Trotman Limited, London.

Kletzer, K., 1984, "Asymmetries of Information and LDC Borrowing with

Sovereign Risk, Economic Journal, 94, 287-307.

Kisic, D. et al., 1985, "El Peru y America Latina Frente al Club de Paris", Centro de Investigaciones de la Universidad del Pacifico, Lima.

Korner P. et al., 1986, "The IMF and the Debt Crisis: A Guide to the Thirld World's Dilemmas", Zed Books Ltd., London.

Krayenbuehl, T., 1985, "Country Risk Assessment and Monitoring", Woodhead-Faulkner, Cambridge.

Kuczynsky, P., 1988, "Latin American Debt", The Johns Hopkins University Press, Baltimore and London.

Krugman P., 1985, "International Debt Problem in an Uncertain World", in G. W. Smith and J. T. Cuddington eds., "International Debt and the Developing Countries", The World Bank, Washington D.C.

Krugman, P., 1988, "Financing vs. Forgiving A Debt Overhang", NBER Working Paper No.2486.

Krugman, P., 1988, "Market-Based Debt-Reduction Schemes", NBER Working Paper No.2587.

Lamdany, R., 1989, "Voluntary Debt Reduction Operations, Bolivia, Mexico and Beyond...", Revista de Analisis Economico, 4, 25-38.

Lee L. and Porter R.H., 1984, "Switching Regression Models with Imperfect Sample Separation Information-with an Application on Cartel Stability", Econometrica, 52, 391-418.

Lindert, P.H. and Morton, P.J., 1989, "How Sovereign Debt Has Worked" in J. Sachs ed., "Developing Country Debt and Economic Performance", Vol 1, The University of Chicago Press, Chicago and London.

Livingston, J.M., 1988, "Chile and Debt Equity Conversion" in R. Wesson ed., "Coping With the Latin American Debt", Praeger Publishers, New York.

Maddala, G.S., 1983, "Limited-Dependent and Qualitative Variables in Econometrics", Cambridge University Press, Cambridge.

Maddala, G.S., 1986, "Disequilibrium, Self-Selection, and Switching Models", in Z. Griliches and M.D. Intriligator eds., Handbook of

Econometrics, Vol III, Elsevier Science Publishers.

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

McCauley, R.,1986, "IMF: Managed Lending", in M. P. Claudon ed., op. cit.

McDonald I. and Solow R. M., 1981, "Wage Bargaining and Employment", American Economic Review, 71, 896-908.

McDonald, D., 1982, "Debt Capacity and Developing Country Borrowing: A Survey of the Literature", IMF Staff Papers, 29, 603-643

McFadden D. et al., 1985, "Is There Life After Death? An Econometric Analysis of the Creditworthiness of Developing Countries" in G.W. Smith and J.T. Cuddington eds., op. cit.

Milivojevic, M., 1985, "The Debt Rescheduling Process", Frances Pinter Publishers, London.

Morgan, J.B., 1986, "A New Look at Debt Rescheduling Indicators and Models", Journal of International Business Studies, 17, 37-54.

Morgan, J.B., 1987, "A Note on Eaton and Gersovitz's Model of Borrowing", Journal of Developing Economics, 25, 251-261.

Nagy, P.J., 1979, "Country Risk: How to Assess, Quantify and Monitor it", Euromoney Publications, London.

Plan, R., 1985, "External Debt Rescheduling", Law, Economics and International Trade, 8, Manzsche Verlags-und Universitatsbuchhandlung, Viena.

Pastor Jr., M, 1987, "The International Monetary Fund and Latin America: Economic Stabilization and Class Conflict", Wstview Press, Boulder and London.

Pastor Jr., M, 1989, "Current Account Deficits and Debt Accumulation In Latin America: Debate and Evidence", Journal of Development Economics, 31, 77-97.

Quandt, R.E., 1978, "Tests of the Equilibrium vs. Disequilibrium Hypothesis", International Economic Review, 19, 435-452.

Sachs, J., 1982, "LDC Debt in the 1980s: Risk and Reforms" in P. Watchel ed., "Crisis in Economic and Financial Structure", Lexington Books,

Sachs, J., 1984, "Theoretical Issues in International Borrowing", Princeton Studies in International Finance No.54, Princeton University, Princeton.

Sachs, J. and Huizing, H., 1987, "U.S. Commerical Banks and Developing Country Debt Crisis", NBER Working Paper No.2455

Sachs, J., 1988, "Comprehensive Debt Retirement: The Bolivian Example", Brookings Papers on Economic Activity, 2, 705-715.

Sachs, J., 1989, "New Approaches to the Latin American Debt Crisis", Essays on International Finance, 174, Princeton University Press, Princenton.

Sachs, J., 1989, "Making the Brady Plan Work", Foreign Affairs, Summer, 87-104.

Saini K. and Bates P., "A Survey of the Quantity Approaches to Country Risk Analysis", Journal of Banking and Finance, 8, 341-357.

Schinke, R., 1990, "Debt Equity Swaps, Investment and Creditworthiness: The Chilean Example" in M. Borchert and R. Schinke eds., "International Indebtedness", Routledge, London.

Schmidt, R., 1984, "Early Warning of Debt Rescheduling", Journal of Banking and Finance, 8, 357-371.

Stalling, B. and Kaufman R. ed., 1989, "Debt and Democracy in Latin America", Westview Press, London.

Stiglitz, J. and Weiss, A., 1981, "Credit Rationing in Markets with Imperfect Information", American Economic Review, 71, 393-410.

Suttle, P., 1988, "The Problem of Forecasting Debt Servicing Difficulties", paper presented in the conference "The Thirld World Debt: The Next Stage" at the University of Surrey.

Thorp, R. and Whitehead, L., 1987, "Latin American Debt and Adjustment Crisis", Macmillan Press, London and St. Antony's College, Oxford.

Velazquez, E.J., 1989, "Debt Conversion Program in Venezuela", Revista

de Analisis Economico, 4, 85-90.

Wallich, H., 1982, "Rescheduling as Seen by the Supervisor and the Lender of Last Resort", in P. Watchel ed., op. cit.

Weintraub, R., 1975, "Conflict and Cooperation in Economics", Macmillan Press, London.

Williamson, J., 1988, "Voluntary Approaches to Debt Relief", Policy Analysis in Internatioal Economics, 25, Institute of International Economics, Washington D.C.

Williamson, J., 1989, "The Brady Initiative: Alternatives and Evaluation", The Journal of International Securities Market, Summer, 131-135.

Wionczek M. S., 1985, "Politics and Economics of External Debt Crisis: The Latin American Experience", Westview Press, Boulder and Praeger Publisher, London.

World Bank, (several issues), "The World Bank Debt Tables", Washington DC.