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**Adoption of an IMF Programme and Debt Rescheduling. An Empirical Analysis**

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# Adoption of an IMF Programme and Debt Rescheduling. An empirical analysis

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## Abstract

The existence of an empirical relationship between the adoption of an IMF programme and the concession of a debt rescheduling by commercial creditors is tested using a bivariate probit model. If countries who have arrangements with the IMF are more likely than others to obtain a rescheduling of their external debt we could conclude that the adoption of an IMF programme could work as a sort of signal of a country's "good willingness", which is thus rewarded with the debt relief. The results confirm the existence of a significant effect of the adoption of an IMF programme on the subsequent concession of a debt rescheduling by creditors.

JEL classification: F34, C35

Keywords: IMF Conditionality, Debt Rescheduling, Bivariate probit.

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# 1. Introduction

This paper aims to test the main implication of the theoretical model presented in Marchesi and Thomas (1999), namely that agreement to follow a programme could be a signal of an indebted country's willingness and ability to successfully reform (and use any new money provided for investment rather than consumption purposes), which is thus rewarded with a debt relief.

Throughout the 1980s and 1990s, many developing countries have struggled to repay large amounts of their external debts to both commercial banks and industrial countries' governments. In the early '80s Paris Club creditors provided reschedulings for low-income countries on non-concessional terms and on market-related interest rates.<sup>1</sup> In the late eighties (1989-'94) the Brady deals addressed commercial bank lending to government debtors (generally middle-income countries) and involved a combination of an IMF agreement and debt and debt-service reduction and rescheduling from commercial banks.<sup>2</sup>

In the same period, Paris Club creditors agreed to provide low-income countries with concessional reschedulings, conditional on the adoption of IMF adjustment programme, under the Toronto (1988), Trinidad (1990), and Naples terms (1994).<sup>3</sup> Since the onset of the debt crisis while the debt situation of middle-

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<sup>1</sup>Paris Club creditors are official (bilateral) creditors of government debt, while London Club creditors are commercial creditors of private international debt.

<sup>2</sup>On 10 March 1988, US Treasury Secretary N.J. Brady announced a new plan for international debt that would shift the strategy from co-ordinated lending to the reduction, or partial forgiveness, of existing debt. The Brady Plan was premised on a voluntary, market oriented approach to debt reduction.

<sup>3</sup>They recognised that most of low-income countries required an actual reduction of their level of debt, more than repeated reschedulings on "standard terms". A "concessional" rescheduling implies a reduction of the net present value of the rescheduled amount.

income debtor countries has improved significantly (Boote and Thugge, 1997), heavily indebted poor countries (HIPCs), most of which are in sub-Saharan Africa, have continued to experience difficulties meeting their external debt service obligations. In order to deal with these countries' specific problems, the World Bank and the IMF have, in September 1996, jointly proposed and implemented the so called HIPCs Debt Initiative.

Very recently, the Fund has been also involved in the East Asian financial crisis and it still seems the case that debt acceptance of a Fund agreement signals something about the country's intentions which somehow reassures the market and in turn makes commercial creditors more willing to accord rescheduling of a country's debt.

The rescheduling process is a mechanism which allows debtors not to default on their loans and to remain in the international financial system. It also prevents creditors from facing the whole consequences of a financial crisis. More specifically, it can be considered as a form of "debt reorganisation", in which payments of a principal and/or interest falling due in a specified interval, are deferred for repayment on a new schedule, following negotiations between creditors and debtors. Since a rescheduling is a postponement of a payment, creditors would like to have some "guarantee" that this postponement will in fact contribute to an improvement in the economic conditions of the debtor country and that it will enable it to better service its external debt. One way to obtain this would be that the debtor country decides to adopt an adjustment programme supported by the IMF (Ebenroth, Maina Peter and Kemner, 1995).

In concrete terms, an IMF programme consists of limitation of money supply growth, decrease in the government budget deficit, credit control, improved exchange rate policy and improvement of the trade balance. More recently, it has also insisted that its borrowers reformed their financial system.

In this article we want to test the existence of a significant effect of the adop-

tion of an IMF programme on the subsequent concession of a debt rescheduling by commercial creditors, using a bivariate probit model to control for the endogeneity of the choice “IMF adoption.” If countries who adopt IMF programmes are more likely than others to obtain a restructuring of their external debt, we could conclude that the adoption of a Fund programme could work as a sort of signal of a country’s “good behaviour” which is then followed by the debt rescheduling. Our results confirm the existence of this effect.

We will consider the following IMF programmes, that is Stand by arrangements, Extended Fund Facility (EFF), Structural Adjustment Facilities (SAF) and Enhanced Structural Fund Facility (ESAF)<sup>4</sup>. These programmes were chosen since they are the most common among IMF programmes. They are set both for the short and the medium-term and are designed for both middle-income (Stand by and EFF) and low-income countries (SAF and ESAF programmes). Our definition of a debt rescheduling includes commercial banks reschedulings (interest and/or principal component).

In Section 2 we provide some background to the empirical studies on the determinants of both Fund arrangements and external debt repayment performance. We then, in Section 3, briefly describe the main features of the theoretical model, while Section 4 develops the empirical one. Section 5 presents the main results and, finally, Section 6 concludes.

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<sup>4</sup>Effective November 1999, ESAF was actually renamed Poverty Reduction and Growth Facility (PRGF).

## 2. Empirical studies on the determinants of Fund arrangements and on external debt repayment performance

### 2.1. Fund arrangements

The existing empirical literature about IMF programmes has mainly focused, so far, on the macroeconomic impact of such programmes (see, for example, the brief survey in Killick, 1995). However, a recent stream of research has also tried to specify and estimate a model including the factors which lead developing countries to borrow from the IMF in the first place. There is a demand for participation by the developing country and there is as well a process of evaluation by the IMF to determine if a lending programme is accepted. The resulting negotiation gives the equilibrium outcome. Actually, the Fund's main target is to enable its members to overcome their balance of payment problems and, in order to gain access to any Fund resources at all, a member has to be able to demonstrate a balance of payment need.

Table 1 below reports a summary of the studies which tried to model the adoption of a Fund programme by developing countries. Some of them estimated the size of loans under Fund arrangement (for eg., Bird and Orme, 1981; Bird, 1995), while some others estimated countries' adoption of a Fund programme using binary-choice models (for eg., Joyce, 1992; Knight and Santaella, 1997).

One early study (Bird and Orme, 1981) uses OLS regression to find a statistical relationship between drawings on the Fund and key country economic characteristics, including the balance of payments, the debt service ratio, the rate of inflation, per capita GNP, the level of reserves, the value of imports and the access to private capital markets (in particular the Eurocurrency market).

Table 1: Economic determinants of IMF loans

Study	Dep. variable	Model/Est. meth.	Significant regressors
Bird and Orme (1981)	Drawings on the IMF	OLS	Current acc./trade Rate of inflation GNP per capita Imports Euro-curr. cred./imports
Cornelius (1987)	Demand for IMF credits	OLS	Debt service GNP per capita Imports Int. reserves Cap. mks. borr.
Joyce (1992)	Fund prog. adoption	Logit	Gov. exp./GDP Int. reserves Dom. cred. growth Current acc./export GDP per capita Year dummies
Conway (1984)	IMF participation (binary choice) (cont. var.cens. at 0 and 1)	Probit Tobit	Prev. adoption Lagg. curr. acc./GDP Terms of trade World real rate Lagg. real GDP growth For. ex. res./imports L-term external debt IMF prog. esp. date Year dummies
Knight and Santaella (1997)	Arrangement approval Demand and supply of a ...nancial arrangement	Probit Bivariate probit	Int. reserves Ext. debt serv./exports GDP per capita Investment/GDP Real exchange rate Prev. adoption Year dummy Gov. revenue growth Gov. expend. growth Nom. depr. > 5%

This model provides a good explanation of drawings by developing countries on the IMF in 1976, but it “breaks down” in the following year. On the basis of the 1976 regression, developing countries seem to draw more from the Fund as their balance of payments deteriorates, their rates of inflation increase and their level of income decreases. It also seems that the IMF and the Eurocurrency market are complementary rather than competing sources of finance. However, the authors’ conclusion is that not only economical factors, but also socio-political (and also information more at the level of single countries), would be necessary to provide a better explanation of IMF loans.<sup>5</sup>

Cornelius (1987) studies the demand for IMF credits focusing only on Sub-Saharan countries (mainly because they made a large use of Fund credit as they were constrained in the access to international capital market). Following Bird and Orme, he assumes that drawings on the IMF increase when economic problems become more serious. The demand for IMF loans is found to be positively affected by the debt-service ratio, the value of imports and deficits of the BOP; while it is inversely related to the per capita GNP (supposed to be a measure of the stage of development), the level of international reserves and of borrowing from foreign and international markets.<sup>6</sup> Using a pooled sample of annual observations for eleven countries, his results are similar to those obtained by Bird and Orme: they provide a good explanation for the initial period (1975-'77) but not for the second one (1981-'83). In particular, (as in the previous work) the results for the second period imply that IMF drawings are not a purely economic phenomenon and therefore other factors, like social, institutional and political ones, should be taken into account.

Among the papers which adopted binary choice models, Joyce (1992) uses a

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<sup>5</sup>A rerun of a similar econometric model for the period 1980-'85 by Bird (1995) produces rather similar results: the coefficients of the inflation, income and balance of payments variables are all statistically significant and with the expected signs.

<sup>6</sup>This would suggest that IMF loans, on one side, and the decumulation of reserves and the level of borrowing from abroad, on the other, are substitutes.



logit analysis to identify what factors characterise 45 developing countries' adoption of an IMF programme, during 1980-'85. He adds domestic credit growth and the government's share of domestic output to the regressors included in previous studies and discovers that countries which enter Fund programmes have higher rates of domestic credit expansion and more expansionary policies than "non-programme countries". Finally, as in previous papers, the current account, international reserves and per capita income all appear with the expected negative coefficients.

Conway (1994) estimates the determinants of participation in a Fund arrangement, where the participation variable is either a binary variable (which is modelled using a probit model) or a continuous variable censored at 0 and 1 (modelled using a Tobit model).<sup>7</sup> He considers a sample of 74 countries, over the period 1976-'86, and shows that the most important variables to explain participation in IMF programmes are past participation in Fund arrangements, lagged values of the real GDP growth rate and of the current account (where a generally bad past economic performance contributes significantly to IMF participation), current values of the world real rate of interest, of the terms of trade and of the outstanding long-term external debt (which have, let's say, the "traditional" impact on IMF participation, that is negative coefficients for the first two variables and a positive sign for the last one).

Finally, Knight and Santaella (1997), in a binary choice framework, reckon that the event of a Fund approval of a financial arrangement is the result of two joint events: both a country's need to obtain an IMF arrangement and the Fund approval of the request (on the basis of an evaluation process of the economic reforms a country intends to adopt). Therefore, they criticise other previous papers for having considered, either explicitly or implicitly, only the so called "demand-side" determinants of Fund arrangements. On the other hand, their

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<sup>7</sup>In the latter case, the variable indicating "participation" is a continuous measure of the percentage of the year that a country has spent under an IMF programme.

aim is to account for both the economic variables that induce a country to ask for an IMF loan ("demand-side") and for the economic policy commitments the Fund examines when decides to approve it or not ("supply-side"). Moreover, they try also to incorporate, in their empirical model, a better specification of the "timing of the events". They argue that economic policy measures, which could provide a country with the Fund approval, are often taken before the arrangement is actually accepted by the IMF. Then, the assumption that the initial date of the programme is at the same time also the initial date of the policy measures' adoption would be misleading.

More specifically, they obtain both bivariate and univariate probit estimates of the approval of an IMF arrangement, for a given country in a given year, using a pooled sample of annual observations for 91 developing countries over 1973-'91. In the bivariate model the two dependent variables are a country's demand for an IMF loan and a country's meeting of the Fund criteria to supply the loan, respectively. In the probit equation, instead, the dependent variable is the IMF joint outcome of the two events. In the "demand side", their estimates suggest that lower level of international reserves, of per capita GDP, of domestic investment and higher values of the external debt service, movements in the real exchange rate, the dummy indicating previous Fund arrangements are significant determinants of a country's interest in a Fund arrangement. Among the "supply factors", they find that policy measures to increase fiscal revenue, to reduce government expenditure, to tighten domestic credit and to adjust the exchange rate, positively affect the Fund approval of an arrangement.

## 2.2. Debt rescheduling

There are many papers dealing with the probability of the occurrence of a debt rescheduling by an indebted country. Typically, in this literature, the occurrence of a debt rescheduling is interpreted (and modelled) either simply as a reflection

of a country's debt repayment difficulties or as equivalent to a country's default.

Table 2 below contains a summary of the studies that tried to explain the occurrence of a debt rescheduling. The common idea in these works is that a limited number of financial, macroeconomic, or socio-political indicators can be identified as the main determinants of debt repayment behaviour. Saini and Bates (1984) provide a survey of the development of the quantitative approaches to "country risk analysis", where the existence of a probability of debt rescheduling is one of the possible "manifestation" of such lending risk. They presented the emergence of probit and logit models as the most used estimation techniques.

The choice of which variables are best to use to predict debt rescheduling has been discussed in this literature at length, so that different approaches have been developed to predict the probability of LDC's debt rescheduling. These are: a "balance sheet approach", a "macro approach" and a "structural approach".

According to the "balance sheet approach" financial variables are considered more relevant to explain the probability of a debt rescheduling. Lloyd-Ellis et al. (1989) include three sets of variables in a logit model used to predict the probability of a debt rescheduling. These are the traditional "ratio variables" (as the debt service to export ratio, the foreign exchange reserves to import ratio, the rate of growth of per capita GDP and the rate of growth of imports) and the so called "balance sheet variables" (as the ratio between short, or medium, or long-term debt over total borrowing from the banks, the proportion of each country's debt relative to total bank lending, total bank borrowing relative to bank deposit, the ratio between the unallocated or undisbursed credit over total banks' lending). Number and value of current reschedulings are included in order to "capture" a general attitude towards rescheduling. With both a sample of 27 countries, during 1977-'81 and of 59 countries, from 1977(II) to 1985(II), they discover that balance sheets variables are more significant than ratio variables (the only one that is significant, the rate of growth of exports, has the "wrong", positive,

sign).<sup>8</sup> In particular, while an increase in banks' loans to assets, in short, long and medium term bank debt to total bank debt lending and in undisbursed credit commitments to total bank lending to that country lead to a rise in the probability of reschedulings, increases in unallocated credit and in foreign exchange reserves lead to a fall in this probability.

Lanoie and Lemarbre (1996) have used the same specification of Lloyd-Ellis et al. Estimating a cross-section of data covering 93 countries in the two years 1989 and 1990, they confirm their results and also that balance sheet variables outperform the two other sets of variables in explaining debt reschedulings.

Bäcker (1992) shows how as the prediction lag is lengthened, the significance of macro-variables (as the ratio between debt service payments and exports, the ratio between imports and reserves, the inflation rate, GDP, interest rates) improves relative to that of the balance sheet data. This might suggest that macro-variables are proxies for more fundamental, longer-term determinants of a country's solvency, while financial variables provide information about the country's current liquidity. More specifically, he uses a logit model to estimate the debt rescheduling probability for 68 debtor countries, with semi-annual data from 1981(I) to 1988(I). He integrates balance sheet variables with macro-variables and discovers that, while the former provided a rather static description of a country's financial situation, the latter are more appropriate to describe the medium-long term economic development of a country and its capacity to fulfill its debt obligations, that somehow have a dynamic aspect.

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<sup>8</sup>These results are also confirmed in a their subsequent paper (Lloyd-Ellis et al., 1990).

Table 2: Probability models of debt rescheduling

Study	Dep. variable	Model/Est. meth.	Significant regressors
Berg and Sachs (1988)	Debt rescheduling	Probit	Income distribution Share of agriculture in GNP GNP per capita
Lloyd-Ellis et al. (1989)	Debt rescheduling	Logit	Rate of growth of exports Bank borr./bank deposits S-t bank borr./tot. bank borr. M-t bank borr./tot. bank borr. L-t bank borr./tot. bank borr. For. exchange res./IMF quota Unall. credit/country's lend. Undis. credit/bank lending Number and value of resch.
Lee (1991)	Debt rescheduling	Logit	Foreign debt/GNP Growth rate of p.c. GDP Interest rate on intern. lend. Ind. countries' GNP growth Variability in p.c. GDP Domestic debt/GDP
Bäcker (1992)	Debt rescheduling	Logit	Undis. credit/bank lending Country's debt/tot. bank lend. Bank borr./bank deposits Growth rate of exports Wtd. av. spreads of resch. Resch. and regional dummies Stock exchange index Wtd. av. G7 gov. bond yield
Lanoie and Lemarbre (1996)	Debt rescheduling Amount of debt rescheduled	Probit OLS (Heckman's two-step estimator)	Unall. credit/total borr. For. exchange res./IMF quota Undis. credit/total bank borr. Wtd. av. grace period of resch. L-t bank borr./tot. bank borr. M-t bank borr./tot. bank borr. Imports/reserves GDP per capita Debt service/exports Total debt/exports Debt amortisation/debt Investments/GDP Current account/GDP

Following the “structural approach”, deeper structural characteristics of a country are related to the probability of a debt rescheduling. Berg and Sachs (1988) develop a cross-section probit model of debt rescheduling, occurred between 1982-'87 to 35 developing countries, which links the occurrence of this event to key structural characteristics of developing countries (like the trade regime, the degree of income inequality, the share of agriculture in GDP and the level of per capita GDP). They argue that outward orientation of trade policy should enhance the growth prospects of developing countries, as well as their capacity to adjust to external shocks, while a high degree of income inequality would increase the political pressure for excessive foreign borrowing.<sup>9</sup> On the other hand, governments which find their political support mostly in the agricultural sector would be politically more stable and, by extension, less subject to external debt crisis. Finally higher income countries may be less likely to reschedule their debt than poorer countries, since the cost of a rescheduling would tend to be higher for more advanced economies. In their model, the degree of income inequality, the share of agriculture in GDP and the level of per capita GDP are significant variables (with a positive and two negative coefficients, respectively).

Finally, Lee (1991) tests a model whose explanatory variables were obtained from a “willingness to pay” model. That is, in his scenario, at each payment, the borrower compares the expected value of his discounted utility of consumption with repayment, against the expected value of his discounted utility of consumption with either default or rescheduling.<sup>10</sup> In his model the probability of default depends positively on the interest rate on international lending, total foreign debt (respect to GNP) and the ratio of government debt held domestically to GDP. Negatively on the growth rate of per capita GDP, the growth rate of industrialised countries and the variability of changes in per capita GDP.

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<sup>9</sup>The pressure for income redistribution is likely to be greater in economies characterised by higher income inequalities, in which a government could satisfy the internal demand for higher public expenditure through foreign borrowing, without either rising taxes or inflation.

<sup>10</sup>Solvency is not considered a relevant issue since the borrower has the resources to honour its debt obligation.

Moreover, Lee considers separately “official rescheduling” (that is rescheduling payments, on both public and private debt, guaranteed by creditor countries’ government or official agencies) from “commercial bank rescheduling” (that is rescheduling bank loans which are not guaranteed). According to his results, while official rescheduling decisions depend on three factors: the economic performance of borrowers, the level of indebtedness and the level of interest rates, for commercial rescheduling cases (besides the aforementioned factors) the access to international credit markets becomes also significant.

### 3. The Theoretical model

The main idea of the theoretical paper (Marchesi and Thomas, 1999) is that the adoption of an IMF programme can function as a screening mechanism that allows creditors to distinguish between those countries which intend to use the “debt relief” as an incentive to invest and later repay and those which do not (or cannot) do it.

It is assumed that there are two types of country (one with a high return on the investment, and the other with a low return or willingness to invest) and asymmetry of information on the country’s type. In the presence of a debt overhang, the high productivity country may choose not to undertake the investment, despite it being socially efficient to do so. In this case the creditor would like to offer the country some debt relief, but the low productivity type will also benefit from the debt relief. When the country is credit constrained (which seems a plausible hypothesis dealing with indebted countries), this problem can be avoided if the country decides to undertake an IMF programme in return for debt reduction (and possibly new money in the form of an IMF loan): only the high productivity type would be prepared to bear the adjustment costs and thus a separation of the types is achieved.

More specifically, the creditor (the bank) wants to solve two distinct problems at the same time: the first one is the “moral hazard” problem, which directly derives from the “debt overhang”, that is the lack of incentives to invest for the “good type” in the absence of any debt relief. The second problem is the need for the bank to separate between the two types in order not to grant the relief to the “bad” one (that is the one which will never invest).

Notice that, in the theoretical model, our definition of debt relief involved more a debt reduction rather than a debt rescheduling. We believe that a debt rescheduling can be considered as a component of a debt relief initiative (in particular when it is made at concessional terms, as it is the case for low-income countries). However, differently to the aforementioned empirical papers, where it was seen generally as an indicator of a country’s debt servicing difficulties, here debt rescheduling is considered mainly as a debt relief which creditors may either decide to grant or not.

In order to find the “qualitative factors” which can influence the probability of a debt rescheduling, for simplicity, we will focus here only on the first problem, that is on the “moral hazard” aspect.<sup>11</sup> Thus, the main idea is to find the factors which affect the amount of debt relief creditors need to grant in order to make the good type invest and repay. The “moral hazard” condition, which makes the good type country willing to invest (and repay), is that the benefits from the investment are greater than its costs. After some rearrangements that becomes:

$$R \leq D_i \cdot V(m_i - 1) = (1 - q_H) \cdot i \cdot (Q(2) + bS): \quad (3.1)$$

In equation (3.1) R represents the amount of the debt relief and D stands for the total amount of external debt and it is positively correlated with R.  $V(m_i - 1) = (1 - q_H)$  corresponds to the outcome of the investment,  $(m_i - 1)V$ ; divided by

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<sup>11</sup>If we solved the model taking into account both the “participation” and “the self selection” constraint we would find that basically the same factors will affect the probability of a debt rescheduling. For more details on this, see the quoted paper.



the low income probability for the good type ( $1 - q_H$ ); where  $(m - 1)$  is equal to the rate of return on the investment,  $V$  represents the investment's fixed costs in the first period and  $q_H$  is the probability for the good type to have a high income in the second period.

Intuitively, as the probability for the good type to have a high income in the second period increases, it will decrease also its need for the debt relief, since in the event of a high income the good type will always repay its debt. The whole expression is negative, this suggesting the existence of an inverse correlation between a country's investments and the level of the debt relief.

$\alpha(Q(2) + bS)$  represents what creditors could seize in case of default, where  $\alpha$  is the fraction of available resources which can be used to repay the debt,  $Q(2)$  is the country's low income value in the second period and  $bS$  represents the beneficial effect of the programmes adoption on period-two outcomes (where  $1 > b \geq 0$ ):  $S$  is the costs of the IMF adjustment programme and it indicates a direct reduction of welfare rather than a financial cost. It should be viewed as a loss of social welfare due (for example, to adverse social effects such as reduction of social services and adverse shifts in income distribution). In Section 4.1.4 we will discuss better how these qualitative variables will become the control variables of our empirical model.

## 4. The Empirical model

In the empirical model we want to test the existence of an effect of a Fund programme adoption on the subsequent concession of a debt rescheduling. As we saw in Section 3 two different empirical literature have developed, which have considered, independently, IMF arrangements and debt rescheduling. Here, instead, we want to estimate a bivariate probit model for the joint determination of a Fund programme adoption and of the debt rescheduling conditional on the programme

adoption. Our “priori” is that countries which decide to adopt an IMF programme will be more likely than others to obtain a debt rescheduling.

We have taken into account particular kinds of IMF programmes, that is Stand by arrangements, Extended Fund Facility (EFF), Structural Adjustment Facilities (SAF) and Enhanced Structural Fund Facility (ESAF) loans. As we said, they were chosen because they are set both for the short and the medium-term, both for medium and low income countries and they aim at overcoming both temporary and structural balance of payments maladjustments. The adoption of one of these Fund programmes is considered only if it has occurred in the period 1985-'94. The choice of this period is due to the consideration that international debt strategy has shifted towards a policy more oriented to concede debt restructuring (respect to one more oriented to providing new loans) only in the late eighties.

Moreover, since some of these countries have adhered to an IMF programme more than once during the sample period, we have taken into account only their latest arrangement. The variable which denotes whether a country has obtained an IMF programme is  $I$ ; where  $I$  is equal one if the country has got the IMF lending and conditionality package and equal zero otherwise.<sup>12</sup>

As a measure of the debt rescheduling we used the “private interest and principal rescheduled” series.<sup>13</sup> The variable which represents debt reschedulings is  $C$ , where  $C = 1$  if the country has rescheduled a part of its commercial debt within not more than one year since the adoption of the programme (and in any case after the IMF programme has started).<sup>14</sup> One year cut off was chosen

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<sup>12</sup>Actually, the data does not allow us to distinguish between the two alternatives: apply and do not get the loan and do not apply for the loan. So we are able to know only the resulting outcome.

<sup>13</sup>We did not include official reschedulings as adoption of an IMF programme is actually a formal pre-requisite for obtaining them and this would introduce a bias in our results.

<sup>14</sup>If a country actually gets a debt concession only before adhering to the IMF programme (but not after the adhesion),  $C$  will be set equal 0. Moreover, if, in the case of no adoption, a country gets more than one concession, we considered only the most recent.

since the shorter the period of time since the adoption occurred the stronger the signalling effect is compared to others possible reasons for the rescheduling. In this model timing is crucial. In the first place, the indebted country could either receive or does not receive the IMF loan (and accept the IMF conditionality that goes with it). Then, creditors decides whether or not to grant the debt rescheduling to the country.

The bivariate probit specification is the following:

$$I^* = Xb + u \quad I = 1 \text{ iff } I^* > 0; 0 \text{ otherwise} \quad (4.1)$$

$$C^* = Zg + Id + v \quad C = 1 \text{ iff } C^* > 0; 0 \text{ otherwise} \quad (4.2)$$

The disturbances are assumed to be bivariate normally distributed.

$$\begin{pmatrix} u \\ v \end{pmatrix} \sim N \left( \begin{pmatrix} 0 \\ 0 \end{pmatrix}; \begin{pmatrix} 1 & \frac{1}{2} \\ \frac{1}{2} & 1 \end{pmatrix} \right)$$

Equation (4.1) of the bivariate specification describes the IMF adoption. The latent variable for the IMF adoption,  $I^*$ , is a linear function of the countries' macroeconomic characteristics (vector  $X$ ) which affect the probability to adopt an IMF programme (they will be specified more carefully in Section 4.1.3). Since, after the adoption of the IMF programme, these macro-variables would be affected by the implementation of the programme itself (and thus they would become endogenous), we take their values two year before the programme is adopted, in order to make sure they are predetermined.

$I^*$  occurs both in the observed dichotomous form in equation (4.2) and in the latent-variable form in equation (4.1). The sign of the coefficient of the dichotomous variable  $I$ , in equation (4.2), will measure the role of the IMF in debt concessions schemes and our prior expectation is that it will be significantly greater than zero.

Equation (4.2) describes the "concession" of a debt rescheduling. The latent variable for the debt rescheduling,  $C^*$ , is a linear function of the countries' macro

variables (vector  $Z$ ), and their values are taken two years before the occurrence of the debt rescheduling as well. Notice that, in order to input a value of the control variables, when either  $I$  or  $C$  is zero, we calculated the average year of both events (adoption and concession) in our sample and took the control variables' values two years before that year.

#### 4.1. The identification problem

This two simultaneous equations model contains both a reduced form, equation (4.1), and a structural form, equation (4.2). Notice that while there would be no problem with the estimation of (4.1) as a univariate probit, we would not model the impact of the adoption on the rescheduling estimating just a single probit equation for the probability of the debt rescheduling and adding a dummy (equal one in case of IMF adoption) to the regressors since this dummy would be endogenous. More formally, it would be correlated with the error term of the probit equation (4.2). Thus, unobserved factors influencing both IMF adoption and debt rescheduling would be interpreted as part of the "IMF adoption" effect.

The structural form is identified if at least one variable in  $X$  is not included in  $Z$ .<sup>15</sup> This identification problem was not an easy question to solve. To identify the parameters of the model we use both the dummy "previous Fund arrangement" (BEF) and the rate of change of the "general government consumption" (GGC). Our assumption here is that, conditional on the programme adoption, these two variables do not affect the probability of obtaining a debt rescheduling.

This choice is justified on an economic ground. Regarding the dummy BEF, it is plausible that countries that have had Fund arrangements in the past will be more likely than others to enter into an arrangements in the future, because both the authorities of that countries are already familiar with the Fund operating procedure, and they have already gained a sort of "reputation" with the Fund.

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<sup>15</sup>See Maddala (1983), p.122.

Therefore, we expect to find a significant and positive sign for the coefficient of this dummy). Instead, for the way in which we have constructed variable C, past Fund arrangements (that is arrangements which have been made many years before the debt rescheduling) should not influence debt rescheduling in the present. More specifically, we assumed that when reschedulings are conditional on IMF programmes, only recent ones are assumed to influence them.

The growth of government consumption is one of the variables which determines the so called “supply side” of a Fund arrangement, that is the probability that the Fund would approve the request of a loan, rather than affecting the probability that a country would ask for IMF intervention. This distinction between a “demand” and a “supply side” on IMF arrangements was made first in the paper by Knight and Santaella (1997) in Section 2.1. Unfortunately, we could not use here the other three variables in their paper as three more “instruments”; that is “nominal depreciation exceeding 5%”, “two year change in government revenues” and “two year change in real domestic credit”. The first two due to the unavailability of these data and the last one because, at the start of the analysis we could not find a significant effect.

Restraint on central government expenditure is a key element for the Fund to approve an arrangement (and thus we would expect to find a significant and negative sign for the coefficient of this variable) while, as far as we know, there is not such an explicit requirement to obtain a debt rescheduling (as confirmed in the literature survey on the determinants of a debt rescheduling in Section 2.2).

## 4.2. Definition of the variables

This model is estimated as a cross section using annual observations, the overall period goes from 1983 to 1995. There are values corresponding to all the four possible combination of C and I. The data are taken from the International Financial Statistics (IFS), the World Bank Tables, the World Development Indicators and

the Global Development Finance. All these sources have presented many lacks in the data in their series, forcing us quite often to choose between the number of countries in the sample and the number of variables to include in the equations. In fact, according to the IFS definition, the total number of “developing countries” would be 157: of those 64 had to be excluded due missing data, both in the control and in the dependent variables. We assume that the resulting countries selection is not endogenous. The variables we have decided to use are described in Table 3 below. We decided to choose among the most significant regressors we found in the literature on both IMF arrangements and debt rescheduling, that is:

Table 3: Variables definition (a)

Variable	Definition	Units	Expctd. sign
IMF	Approval of an IMF arrangements	Binary	
DRES	Total amount of Debt Rescheduled	Binary	
BB	Baker and Brady countries	Binary	+
BEF	Previous Fund arrangement	Binary	+
GDPPC	GDP at market prices per capita	% Pop.	-
GDI	Gross domestic investment	% GDP	-
EDT	Total external debt stock	% GDP	+
TDS	Total debt service	% exports	+
RES	Total reserves minus gold	% imports	-
INFL	Consumer price index	% rate of change	+
BOP	Balance of Payment	% GDP	-
CA	Current Account	% GDP	-
EXP	Exports of goods and services	% imports	-
IAR	Interest arrears on long-term debt	% exports	-/+
PAR	Principal arrears on long-term debt	% reserves	-/+
GGC	General government consumption	% rate of change	-

(a) the Appendix contains all the calculation details.

As for the control variables they are basically traditional “ratio variable”, quite common regressors among those we have found in other studies on the determinants of both IMF arrangements and debt rescheduling. These variables capture both domestic and external factors. They will be more carefully analysed in the next two subsections.

#### 4.2.1. Determinants of Fund arrangement

The variables that enter in the equation which determines a Fund arrangement are policy target variables, whose values are taken two years before the adoption of the IMF programme.

As the external factors are concerned, countries with a structural unbalance in their Balance of Payments (BOP) and Current Account (CA) will be likely to need Fund financial assistance. Thus, we expect that both BOP and CA enter with a negative sign in the regression. We also expect that a country which experiments a low value of its exports (EXP) and of its reserves (RES) will be more likely to ask for a Fund arrangements. This need for financial assistance will also be reflected in a high external indebtedness (EDT) and in a high value of total debt service (TDS). Thus, we expect to find a positive correlation between the dependent variable and both EDT and TDS. We have also included other two variables, corresponding to arrears in interests payments (IAR) and in the principal component (PAR), as general indicators of a country's financial difficulty.<sup>16</sup> However, these two variables should enter with a negative sign in the Fund equation since the IMF prefers not to grant new loans to a country which is already in arrears with its payments.

As the domestic factors are concerned, countries experiencing relatively low levels in per capita Gross Domestic Product (GDPPC), low investments (GDI) and high inflation (INFL) will also be more likely to seek Fund assistance. Therefore, we expect to find a negative correlation between IMF and both GDPPC and GDI. As we saw in Section 4.1, the growth of government consumption (GGC) is one of the two instruments in the reduced form, where the rate of change in the government consumption is used to capture the behaviour of the variable "fiscal policy" two years before the programme begins. As we said above, we expect to

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<sup>16</sup>For this reason these variables are expected to enter with a positive sign in the equation of the debt rescheduling.

...nd a negative coefficient for this variable.

We then defined the dummies. The first one is BEF whose coefficient should be significant and greater than zero. The other one is BB, which equals one for a country which has adopted the Baker (1986-'88) and/or the Brady plan (1989-'94).<sup>17</sup> Baker and Brady plan have generally involved middle-income developing countries. We expect the coefficient of this dummy to be significantly greater than zero indicating that those countries which adhered to these plans were more likely than other countries to adopt an IMF programme and accept the conditionality that goes with it.

Compared to the papers of the related literature on IMF arrangements, we generally opted for a more parsimonious specification (given the limited number of our observations). We did not include either a regressor for the terms of trade or for the foreign real exchange rates (we actually tried to insert the latter but we found many missing data in those series). Besides, we believe that the external factors are already "captured" by the variables we included (like CA, BOP and EXP).

We did not include a variable for Eurocurrency credit (i.e., private capital market, in particular the Eurocurrency market), which was considered by Bird and Orme in order to investigate whether the Fund and the Eurocurrency market were substitutes or complementary sources of finance. However, in earlier estimates, we had a quite similar regressor (i.e., "non fund financing flows") but it was not found to be significant. The variable "government revenue" could be one of the possible instruments to be used to identify the equation of IMF determinants and we have already explained in Section 4.1 (on the identification problem) why we could not use it.

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<sup>17</sup>The Baker plan set targets for bank and official lending, called for structural reforms in debtor economies and, in its latter part, experimented market based debt restructuring. The Brady plan shifted the attention from a co-ordinated lending to the reduction and rescheduling of the existing debt.



Finally, among our regressors, we included two variables which were not examined in the related literature. They are both interest and principal arrears on long-term debt. We decided to incorporate them because we thought that developing countries' debt repayment difficulties could have been an important component to consider, beside their other, more traditional, economic characteristics.

#### 4.2.2. Determinants of debt rescheduling

In Section 3 we have described the factors which affect the probability of a debt rescheduling, according to the theoretical model. They reflect both domestic and external components.  $R$  is represented here by the total amount of the debt rescheduling (DRES) while  $D$  is now captured by both the total amount of external debt (EDT) and total debt service (TDS). The choice to invest is represented by the variable corresponding to the investments (GDI). Then, we assumed that  $q_H$  (the probability to have a high income for the good type) depends somehow on the degree of openness of the economy that would be captured by the ratio of the exports over the imports (EXP).  $Q(2)$  was the country's income in period two (in the low income case) and in the empirical model it corresponds to the per capita GDP (GDPPC).  $\beta_S$  represented the beneficial effect on period-two outcomes of the adoption of the programme but we can not take it into account since we do not consider what happens to the control variables after the programme is adopted.

As in the "Fund equation" above, we included two variables corresponding to arrears in both interests and principal repayments (IAR), (PAR) (which explicitly stand for a country's financial difficulty) and a variable for the rate of inflation (INFL).<sup>18</sup> The behaviour of the BOP, the CA and the level of reserves (RES) could be other indicators of the severity of a country's problems. Dummy BB

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<sup>18</sup>For example, in official reschedulings, for a debtor country to be allowed into the rescheduling process with the Paris Club, it has to prove that it will default on its external payment obligations in the absence of any relief.

is included. Finally, dummy IMF stands for the role of the IMF in the debt rescheduling process and it is expected to be positive and significant.

In sum, regarding the external factors, we should find a positive correlation between the dependent variable and both EDT and TDS and a negative relation between DRES and the variables BOP, CA, EXP and RES. The sign is instead expected to be positive for the coefficients of both IAR and PAR. As the domestic factors are concerned, per capita GDPPC, INFL and GDI should have negative coefficients (as a consequence of the debt overhang effect and also because we are dealing, generally, with countries in troubles). We expect to find a significant and positive coefficient for the dummy BB, meaning that those countries which have adhered to these plans are more likely than others to obtain a rescheduling of their debts.

This equation did not include any of the so called "balance sheet" variables (see Section 2.2). This is the case because we are more interested in more fundamental, longer-term determinants of a country's solvency and macro-variables are better proxies for this type of information, while financial variables tell more about a country's current liquidity. The only two variables which give an indication on a country's financial situation we considered are the interest and principal arrears on long-term debt.

As dummies variables are concerned, we have no regional dummies (in earlier regressions we have actually tried to insert them, in both equations, but they were not significant). We included a dummy for Backer and Brady plans countries (BB), that we did not find in the related literature.<sup>19</sup>

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<sup>19</sup>In a broader sense, BB could also be interpreted as a dummy for middle-income countries.

## 5. Estimation results

In Table 4 are presented the estimation results for the final specification of our model estimated as a bivariate probit. We have also estimated other specifications of the model (not reported here for reasons of space). Overall the estimates are good, in the sense that most of the economic factors enter the estimated equations with the expected sign and many are significant at conventional 5% significance level.

In the Fund arrangement equation, the expected signs are all confirmed except that of EDT which is negative rather than positive (but not significant). All the coefficients' P-values are at least 0.09, with an exception made for GDPPC, EDT and BOP whose P-values are 0.27, and 0.15, respectively. The two identifying variables GGC and BEF have a P-value of zero and 0.05, respectively. Thus, as expected, it emerges a strong negative relation between the dependent variable and the rate of growth of government consumption (GGC), the level of investment (GDI), the level of exports (EXP), the presence of arrears in interests payment (IAR) and a positive relation with a disequilibrium in the BOP. It is confirmed the existence of a strong and positive relation between the dependent variable and the dummy corresponding to the adoption of an IMF programme in the past (BEF).

In the equation for the debt rescheduling, the expected signs are all confirmed with an exception made for EXP, BOP which are both positive instead of negative, but not significant. In this equation as well all the coefficients' P-values are at least 0.09, with an exception made for GDPPC, BOP and EXP which are highly insignificant. What emerges is a close relation between a debt rescheduling and (lack of) investments (GDI), the level of a country's indebtedness and the existence of arrears in the payment of interest (IAR). Finally, the coefficient of the dummy IMF is positive and highly significant (P-value equal zero) as expected. This

confirms our intuition about the effect of IMF adoption on a debt rescheduling.

Finally, Rho has a P-value equal to zero and with a negative sign, which means that the unobservables in the two equations are negatively correlated. Thus, it seems that the event IMF adoption positively affect the debt rescheduling only when we explain both of them using our control variables, that is variables that capture only structural/macro factors and not short-term or stochastic factors (as shocks are).

In the other specifications of the model we included five more variables among the control variables. The rate of inflation (INFL), as another indicator of a country's economic performance and the total debt service (TDS), the total value of reserves minus gold (RES), the current account (CA), the principal arrears (PAR), as general indicators of a country's financial difficulty and the dummy BB. None of them was found to be significant.<sup>20</sup> The rate of inflation, total debt service, dummy BB and the total value of reserves had the correct signs (the first three positive in both equations and the last one negative in the first equation and positive in the second one, respectively) while the coefficient of CA was negative in the first equation and positive in the second. Dummy BB was found significant, in both equations, in a specification where the dependent variable of the second equation included both official and private debt rescheduling (i.e., it was used the "total debt rescheduled" series).

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<sup>20</sup>Variable PAR was actually significant in the equation for the IMF arrangement (with a negative sign) but not in the equation of the debt rescheduling.

Table 4: Bivariate Probit Model estimates

	Exp. Sign	Coeff.	Std. Err.	z	P value
IMF					
BEF	+	2.916	0.707	4.126	0.000
GDPPC	-	-0.0002	0.0002	-1.105	0.269
GDI	-	-3.926	1.997	-1.966	0.049
EDT	+	-0.935	0.649	-1.439	0.150
GGC	-	-3.455	1.803	-1.916	0.055
EXP	-	-2.450	1.201	-2.040	0.041
BOP	-	-14.391	8.535	-1.686	0.092
IAR	-	-0.687	0.259	-2.648	0.008
CONS		3.208	1.123	2.857	0.004
DRES					
GDPPC	-	-0.00004	0.0001	-0.313	0.754
GDI	-	-4.788	2.019	-2.372	0.018
EDT	+	0.883	0.520	1.699	0.089
EXP	-	0.846	0.688	1.231	0.218
BOP	-	0.805	3.991	0.202	0.840
IAR	+	3.226	1.348	2.393	0.017
IMF	+	1.610	0.417	3.863	0.000
CONS		-1.817	0.830	-2.189	0.029
$\frac{1}{2}$		-3.272	0.074	-44.297	0.000
Log-Likelihood			-56.650		
Pseudo-R <sup>2</sup>			0.45		
No. observations			93		

## 6. Conclusions

The results of this paper confirm that the adoption of an IMF programme (and the conditionality that goes with it) could work as a sort of signal of a country's good behaviour that may, therefore, induce other creditors to concede a rescheduling of the country's external debt. Our estimates of a bivariate probit model, which is used to control for endogeneity, assigns a positive and significant value to the coefficient of the dummy "IMF adoption" in the equation which determines the probability of a debt rescheduling.

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# Appendix

## Data sources

The basic data set used in this study consists of annual observations of data for 93 developing countries over the period 1983 - '95. All the variable were taken from the International Financial Statistics (IFS), the World Bank Tables, the World Development Indicators and the Global Development Finance. They were constructed in the following way:

### Endogenous variables

$$\begin{aligned} \text{IMF} &= \begin{cases} 1 & \text{if a country had an arrangement approved during the period 1985-1993.} \\ 0 & \text{otherwise} \end{cases} \\ \text{DRES} &= \begin{cases} 1 & \text{if a country had its debt rescheduled within not more than two years since the IMF adoption.} \\ 0 & \text{otherwise} \end{cases} \end{aligned}$$

### Determinants of the demand for an arrangements

$$\text{GDPPC} = \frac{\text{Gross Domestic Product (GDP) at market prices (cur. US\$)}}{\text{Population}}$$

$$\text{GDI} = \frac{\text{Gross Domestic Investment (cur. US\$)}}{\text{GDP at market prices (cur. US\$)}}$$

$$\text{EDT} = \frac{\text{Total external debt stocks (EDT) (cur. US\$)}}{\text{GDP at market prices (cur. US\$)}}$$

$$\text{TDS} = \frac{\text{Total debt service (TDS) (cur. US\$)}}{\text{Exports of goods & services (cur. US\$)}}$$

$$\text{RES} = \frac{\text{Total reserves minus gold (cur. US\$)}}{\text{Imports of goods & services (cur. US\$)}}$$

$$\text{GGC} = \frac{\text{General Government Consumption}_t}{\text{General Government Consumption}_{t-1}} - 1$$

$$\text{INFL} = \frac{\text{Consumer Price Index}_t}{\text{Consumer Price Index}_{t-1}} - 1$$

$$\text{EXP} = \frac{\text{Exports of goods and services (curr. US\$)}}{\text{Imports of goods and services (curr. US\$)}}$$

$$\text{IAR} = \frac{\text{Interest arrears on long-term debt outstanding (LDOD) (cur. US\$)}}{\text{Exports of goods & services (cur. US\$)}}$$

$$\text{PAR} = \frac{\text{Principal arrears on long-term debt outstanding (LDOD) (cur. US\$)}}{\text{Total reserves minus gold (cur. US\$)}}$$

$$\text{BEF} = \begin{cases} 1 & \text{if } \text{IMF}_{t,j} = 1 \text{ for any } j > 1 \\ 0 & \text{otherwise} \end{cases}$$

$$\text{BB} = \begin{cases} 1 & \text{if a country adhered either to the Baker or to the Brady plan} \\ 0 & \text{otherwise} \end{cases}$$

Table 5: Countries in the basic sample

Algeria: stand-by 1994/95	Ghana: esaf 1988/92	Panama: stand-by 1985/87
Argentina: ex.arr. 1992/95	Grenada: none	P. New Guinea: stand-by 1991/92
Bangladesh: esaf 1990/93	Guatemala: stand-by 1992/94	Paraguay: none
Barbados: stand-by 1992/93	Guyana: esaf 1994/97	Peru: ex.arr. 1993/96
Belize: stand-by 1984/86	Haiti: stand-by 1989/90	Philippines: ex.arr. 1994/97
Bolivia: esaf 1994/97	Honduras: esaf 1992/95	Poland: stand-by 1994/96
Botswana: none	Hungary: stand-by 1993/94	Romania: stand-by 1994/97
Brazil: stand-by 1992/93	India: stand-by 1991/93	Rwanda: saf 1991/94
Burkina Faso: esaf 1993/96	Indonesia: none	Senegal: esaf 1994/97
Burundi: esaf 1991/94	Jamaica: ex.arr. 1992/95	Seychelles: none
Cameroon: esaf 1994/97	Jordan: ex. arr. 1994/97	Sierra Leone: esaf 1994/97
Cape Verde: none	Kenya: esaf 1993/94	Solomon Islands: none
Centr. Afr. Rep.: stand-by 1994/95	Korea Rep.: stand-by 1985	Somalia: saf 1987/89
Chad: stand-by 1994/95	Lao Dem. Rep.: esaf 1993/96	Sri Lanka: esaf 1991/94
Chile: stand-by 1989/90	Lesotho: stand-by 1994/95	St. Kitts and Nevis: none
China: stand-by 1986/87	Madagascar: esaf 1989/92	St. Lucia: none
Colombia: none	Malawi: esaf 1988/94	Sudan: none
Congo Dem. Rep.: stand-by 1989/90	Malaysia: none	Swaziland: none
Congo Rep.: stand-by 1994/95	Maldives: none	Tanzania: esaf 1991/94
Costa Rica: stand-by 1993/94	Mali: esaf 1992/95	Thailand: stand-by 1985/87
Côte d'Ivoire: esaf 1994/97	Malta: none	Togo: esaf 1994/97
Dominica: saf 1986/89	Mauritania: esaf 1992/95	Trin. & Tobago: stand-by 1990/91
Dominican Rep.: stand-by 1993/94	Mauritius: stand-by 1985/86	Tunisia: ex.arr. 1988/91
Ecuador: stand-by 1994/96	Mexico: ex.arr. 1989/93	Turkey: stand-by 1994/96
Egypt Arab Rep.: ex. arr. 1993/96	Morocco: stand-by 1992/93	Uganda: esaf 1994/97
El Salvador: stand-by 1993/94	Mozambique: esaf 1990/93	Uruguay: stand-by 1992/93
Equatorial Guinea: esaf 1993/96	Nepal: saf 1987/90	Vanuatu: none
Ethiopia: saf 1992/95	Nicaragua: esaf 1994/97	Venezuela: ex.arr 1989/93
Fiji: none	Niger: stand-by 1994/95	Western Samoa: none
Gabon: stand-by 1994/95	Nigeria: stand-by 1991/92	Zambia: stand-by 1986/88
Gambia: esaf 1988/91	Pakistan: esaf 1994/97	Zimbabwe: ex.arr. 1992/95

Table 6: Baker (1986-'88) and Brady plan (1989-'94) countries

Baker plan (1986-'88) countries	Brady plan (1989-'94) countries
Argentina	Argentina: 1992, '93
Bolivia	Bolivia: 1993
Brazil	Brazil: 1992, '94
Chile	Bulgaria: 1993
Colombia	Costa Rica: 1989, '90
Costa Rica	Dominican Republic: 1993
Côte d'Ivoire	Ecuador: 1994
Ecuador	Guyana: 1992
Jamaica	Jordan: 1993
Mexico	Mexico: 1989, '90
Morocco	Mozambique: 1991
Nigeria	Niger: 1991
Peru	Nigeria: 1992
Philippines	Philippines: 1989, '92
Uruguay	Poland: 1994
Venezuela	Uganda: 1993
Yugoslavia	Uruguay: 1990, '91
	Venezuela: 1990

Source: Cline, 1995