

N° 280

Enero 2005



Documento de Trabajo

ISSN (edición impresa) **0716-7334**

ISSN (edición electrónica) **0717-7593**

Catalyzing Private Capital Flows: Do IMF Programs Work as Commitment Devices .

Ashoka Mody
Diego Saravia

PONTIFICIA UNIVERSIDAD CATOLICA DE CHILE
INSTITUTO DE ECONOMIA

Oficina de Publicaciones
Casilla 76, Correo 17, Santiago
www.economia.puc.cl

**CATALYZING PRIVATE CAPITAL FLOWS:
DO IMF PROGRAMS WORK AS
COMMITMENT DEVICES?**

**Ashoka Mody
Diego Saravia**

Documento de Trabajo N° 280

Santiago, Enero 2005

CONTENTS

ABSTRACT

I.	INTRODUCTION	1
II.	THEORETICAL CONSIDERATIONS	5
III.	FINDINGS IN THE EMPIRICAL LITERATURE	9
IV.	METHODOLOGY AND DATA	12
V.	THE ROLE OF COUNTRY FUNDAMENTALS	18
VI.	IMPLICATIONS OF FUND PROGRAM DESIGN	22
VII.	CONCLUSIONS	28

APPENDIX I: DATA SOURCES AND CONSTRUCTION OF VARIABLES

APPENDIX II: BASE REGRESSION

REFERENCES

**CATALYZING PRIVATE CAPITAL FLOWS:
DO IMF PROGRAMS WORK AS COMMITMENT DEVICES? ¹**

Ashoka Mody and Diego Saravia

Abstract

An objective of IMF programs is to help countries improve their access to international capital markets. In this paper, we examine if Fund programs influence the ability of developing country issuers to tap international bond markets and whether they improve spreads paid on the bonds issued. We find that Fund programs do not provide a uniformly favorable signaling effect, i.e., the mere presence of the IMF does not act as a strong seal of good housekeeping. Instead, the evidence is most consistent with a positive effect of IMF programs when they are viewed as likely to lead to policy reform and when undertaken before economic fundamentals have deteriorated significantly. The size of the Fund's program matters, but the credibility of a joint commitment by the country and the IMF appears to be critical.

JEL Classification Numbers: F22, F33, F34

Keywords: IMF programs, signaling, capital market access

¹ We are grateful to Rich Kelly for data and guidance on Fund programs and to Marco Arena, Roger Betancourt, Graham Bird, Michael Bordo, Jim Boughton, Fernando Broner, Patrick Conway, Barry Eichengreen, Kristin Forbes, Federico Guerrero, Enrique Mendoza, Alessandro Rebucci, Carmen Reinhart, John Shea, Antonio Spilimbergo, Jeromin Zettlemeyer, seminar participants at the University of Maryland, and three anonymous referees for helpful comments and suggestions. The views expressed in this paper are those of the authors and should not be attributed to the International Monetary Fund.

I. Introduction

Enhancing its members' access to international capital markets is widely regarded as an important objective of the International Monetary Fund (IMF or Fund). Though the objective is not an explicitly stated purpose in the Fund's Articles of Agreements, the flow of international capital is essential to such stated purposes as the stability of the international monetary system, efficient trade and productive resource use, and to providing confidence when a member country experiences difficulties with its balance of payments.¹ The Fund's interest in private international capital flows has, moreover, increased over the last decade. Reflecting this evolution, the Fund's former Managing Director, Horst Köhler [2001, p. 13] affirmed:

“Because private flows are an indispensable source of financing for development, another crucial function of the IMF's new Capital Markets Department will be to strengthen our ability to help countries gain access to international capital markets.”

Does the Fund succeed in its objective of “catalyzing” capital flows to developing economies? In policy circles, it is often taken as axiomatic that a Fund program stimulates capital flows (Dhonte [1997] and Fisher [1997]). Bird and Rowlands [2001] say it is a “commonly held view” that the IMF helps attract private capital to a country by endorsing the country's economic reform plan. They cite, for example, a UK Treasury Committee report on the IMF that refers to “an all pervasive conventional wisdom” that an IMF program buys a “Good Housekeeping Seal of Approval.”

However, when the question is put to the data, the statistical evidence goes the other way. In a recent review, Bird and Rowlands [2002] infer from the literature that Fund programs not only do not enhance countries' access to capital markets, a program may actually make things worse.

To reconcile the various views and assess the empirical evidence, it is useful to take a step back. What is the basis for expecting an IMF catalytic effect? Recent theoretical contributions focus on different mechanisms through which the Fund may catalyze capital flows. Some focus on the lending role of the IMF in the context of a financial crisis. In a crisis, liquidity provision by the Fund improves the incentives of private creditors to roll over their short-term loans to developing country borrowers (Morris and Shin [2003], Corsetti et al [2003], and Saravia [2003]). The extent of Fund lending can also influence country policy behavior and hence capital market access. Other models emphasize the Fund's "informational" role. The IMF can act as a screening device (Marchessi and Thomas [1999]), serving as an instrument that countries can use to signal to the market their reform commitment. Thus, the IMF, in its role as a delegated monitor, can help complete international capital markets (Tirole [2002]).

Despite their differing perspectives, the theoretical models all point to a non-linearity in the Fund's effectiveness when catalyzing capital flows. Countries that are not vulnerable to external crises have no reason to benefit from IMF programs. Those that are vulnerable—but are not yet perceived as highly illiquid or insolvent—will achieve the greatest catalytic gain from Fund intervention. And those countries that have passed into a state of crisis or insolvency will once again derive limited or no benefit from Fund programs.

In line with the theoretical literature, we find strong evidence for the non-linearity predicted. Specifically, an IMF program is effective when foreign exchange reserves and debt levels make the country vulnerable, but the reserves and debt have not deteriorated to the point where their early restoration to more normal levels has a low probability. Our contribution, then, is to identify empirically the "intermediate" vulnerability zone and, thus,

to provide a more definitive empirical basis for the propositions and conjectures that have been made thus far without solid supporting evidence.

In finding evidence for non-linearity, we cannot conclusively determine in favor of one theoretical perspective or another. However, as distinct from short-term rollover considerations, we lean in favor of a medium-term information and commitment interpretation of our results. First, the data we use is on long-term bonds. We use the term “long-term” in the now commonly accepted sense of maturity longer than one year. The average maturity of bonds in our sample is about 7 years. Moreover, arms-length borrowing through bonds is more prone to informational problems than is the case with “relationship” bank lending. While this focus gives our results a medium-term orientation, we cannot, of course, rule out that even longer-term bond purchases are informed by short-term considerations similar to those involved in rollover.

Second, we attempt to identify Fund program characteristics associated with catalytic effects. Precautionary programs are catalytic. These are programs where a country contracting a program nevertheless declares its intention to not avail itself of available Fund liquidity. In contrast, the amount of Fund lending does not appear to robustly catalyze capital flows. Also, repeated relationships between a country and the Fund facilitate market access, implying value in the commitment to solve structural problems; but diminishing returns set in as use of Fund resources is prolonged, suggesting that beyond a point the commitment and the likelihood of improvement in performance begins to be called into question.

We infer, then, that in the medium-term, a Fund program is catalytic when it allows a country to credibly signal commitment to a course of economic reform under Fund monitoring, alleviating the risk of expropriation under incomplete contracts. In mediating as

a “delegated monitor” between the country and international investors, a Fund program can potentially substitute for missing contracts and act as a joint commitment device that improves access to international capital.

For our empirical analysis, we use an approach developed by Eichengreen and Mody [2000, 2001] to evaluate the determinants of international bond issuance and of spreads charged on bonds at the time of their issuance. The use of transactional data on individual bonds reduces the severity of the reverse causality problem—i.e., the possibility that observed outcomes influence the likelihood of Fund programs. This is so because the feedback from an individual bond issue to explanatory country aggregates is likely to be less serious than when the dependent variable is itself a country aggregate such as growth or capital flows. At the same time, by allowing a more careful consideration of timing than was possible in past studies, transactional data at higher frequency allows us to more precisely consider the date of issuance and spreads paid in the period following the initiation of a Fund program and hence further reduces the problem of reverse causation.

In the next section, we discuss the recent theoretical literature that highlights the conditions under which the Fund may be expected to catalyze capital flows. We then review the empirical findings on the catalytic impact of IMF programs to identify key substantive conclusions and methodological issues. This is followed by a description of our methodology and data. The empirical results focus on the possibility of a differential catalytic response when the country’s external fundamentals are in an “intermediate” zone. We also examine the implications of certain program features to uncover evidence in favor of an information role for the Fund in attracting private capital. The final section concludes.

II. Theoretical Considerations

We use existing theoretical approaches to identify the specific roles that the IMF could play in catalyzing private capital flows and the conditions under which such roles may be effective. In common, the different approaches recognize that the observed outcomes reflect the interaction among three parties: the private lenders (from whom flows have to be catalyzed), the country (which seeks additional foreign capital), and the IMF. In evaluating these interactions, two considerations are of importance. First, is the IMF a substitute for or complement to private lending? Catalysis clearly depends on complementarities. Second, does the IMF change (or reinforce) country incentives to adopt policies conducive to repayment of private debt? Of particular concern is the possibility of “moral hazard,” i.e., the country may take steps that make debt repayment less likely. How the country will respond, the literature suggests, depends on country circumstances.

The time frame of analysis has a strong bearing on the interactions between the three parties—and, hence, on the incentives that motivate them. Much of the recent analysis has been motivated by the IMF’s role in the midst of financial crises when the possibilities of substitution between the IMF and private creditors and the concerns about moral hazard become particularly acute. During a crisis, the size of IMF lending in relation to the debt that needs to be rolled over can sometimes be large. In contrast, in a longer-term perspective, IMF lending is not a substitute for financing the developmental needs of a country. As such, the catalytic influence of the Fund is likely to depend on whether the Fund is able to reinforce the country’s commitment to a development program and hence raise the likelihood that long-term lenders will be repaid.

Consider, first, the crisis literature. Morris and Shin [2003] and Corsetti et al [2003] argue that the IMF's provision of liquidity would increase countries' incentives to take a costly adjustment effort and, thereby, catalyze capital flows when countries' fundamentals are in an intermediate zone, i.e., when the fundamentals are "poor but not hopelessly so." IMF liquidity induces complementary private finance, reducing the short-term pain of reform otherwise required by the country. However, if the crisis is extremely severe, then neither IMF funding nor the reform effort will be sufficient to assure lenders that they will be repaid. These models also warn that IMF provision of liquidity when not needed may cause slackening of country reform effort.

Using a different approach, Saravia [2003] also concludes that the effects of IMF lending on other creditors will depend on the country's solvency and liquidity condition. He focuses on the issue of seniority of the IMF. When the solvency and liquidity are relatively sound, the country can cover its financial needs from other non-senior sources and IMF financing is undesirable because it would only dilute existing creditors' claims. When the situation deteriorates, and the country cannot borrow from private (non-senior) lenders because of debt overhang considerations, IMF lending becomes necessary to continue with the valuable projects. Current lenders will be reassured by IMF lending and will have an incentive to continue financing ongoing projects, even though their claims will be diluted by the Fund. However, when fundamentals deteriorate further, exiting creditors would prefer to not continue with project financing and obtain the scrap value of the terminated project rather than see their claims diluted. Thus, this model also predicts a nonlinear effect of IMF lending programs on availability of private finance and hence on risk spreads by private creditors.

But, in addition to lending, the Fund also plays a catalytic role through its monitoring function.² The Fund's knowledge of, and confidence in, the country's policies can help induce private capital flows. The Fund's website describes its role in these very terms:

“In most cases, the IMF, when it lends, provides only a small portion of a country's external financing requirements. But because the approval of IMF lending signals that a country's economic policies are on the right track, it reassures investors and the official community and helps generate additional financing from these sources. Thus, IMF financing can act as an important lever, or catalyst, for attracting other funds. The IMF's ability to perform this catalytic role is based on the confidence that other lenders have in its operations and especially in the credibility of the policy conditionality attached to its lending.”³

Marchesi and Thomas [1999] also argue that contracting with the Fund has an informational role. Having the Fund as a monitor implies that countries are willing to accept some conditionality and this is typically costly to the decision makers themselves and to the economy, at least, in the short run. Thus, countries borrowing from the Fund signal to international markets their willingness or ability to undertake policies necessary for enhancing the probability of future debt repayment and potentially improve, in this way, their access to international markets.

The IMF, Tirole [2002, p. 99] argues, can act as a delegated monitor to “substitute for the missing contracts between the sovereign and individual foreign investors and to thereby help the host country to fully benefit from its capital account liberalization.” He notes that missing contracts are not just a problem when foreigners lend to the sovereign. The problem is serious even when the lending is to private domestic borrowers. The ability of private borrowers to repay is a function of a variety of unpredictable government actions, which can *de facto* expropriate foreign lenders.

In its informational role—as a mechanism for a country to signal policy intentions while the Fund performs a delegated monitoring function—a program’s success in catalyzing capital flow is likely to depend on several factors. Country commitment through the Fund, for example, is likely to be effective when countries are vulnerable but have not yet crossed thresholds that imply inability to service external debts even with Fund assistance. Thus, for example, a Fund program is unlikely to catalyze new capital when solvency is at stake. Even if a country does not “gamble for resurrection,” as some have argued (e.g., Powell [2002]), new shocks will continue to prevent recovery.⁴

These considerations are consistent with the Fund’s own preferred approach to early intervention. For example, in discussing policy towards access to Fund resources, the Fund’s Treasurer’s Department notes:

“Over the years, it has come to be recognized that the efficacy of the mixture of adjustment policies and financing depends largely on the early adoption of corrective policy measures. Early resort to an adjustment program supported by IMF resources can help to avoid more drastic policy actions that may otherwise be required, thereby limiting the impact of the adjustment on other members.” (IMF [2001a, p. 29])

A 1979 decision by Fund’s Executive Board had an almost identical wording: “Members should be encouraged to adopt measures...at an early stage of their balance of payments difficulties or as a precaution against the emergence of such difficulties.”⁵

Complementing country commitment, the Fund can signal its own commitment in a variety of ways. Programs with larger resources (in relation to country debt obligations) can be expected to be associated with better capital market access. However, the joint commitment is even stronger when the country does not actually use those resources. The delegated monitoring function should be particularly valuable in such programs that are “precautionary” in nature. In that situation, a country subjects itself to the discipline implied

by a Fund program without drawing on the available resources. Finally, the Fund can signal commitment by deeper engagement in a country. One measure of deeper engagement is the length of time over which a country contracts a Fund program. Where problems are of a structural nature, markets are likely to value the continued presence of the Fund. However, excessive repetition of Fund programs (“prolonged use”) is likely to reduce the perception of the country’s commitment and the Fund’s ability to resolve matters.⁶

III. Findings in the Empirical Literature

In this section, we briefly review the empirical studies on the catalytic effect of Fund programs. We use the review to identify the key methodological issues that rise in such analysis to provide the context and rationale for our own empirical approach.

Killick, Malik, and Manuel [1992] do a before-after comparison of *net* capital flows and find that these flows decline after an IMF program is put in place. However, this evidence does not speak directly to the question at hand. Much of the decline is due to an increase in repayments rather than to a decline in *gross* inflows.

Bird and Rowlands [1997 and 2001] are especially skeptical of the Fund’s “catalytic effect.” They find no empirical evidence for such an effect, consistent with their priors. IMF programs are a sign of economic distress and they are not persuaded that the country’s macroeconomic balances improve following the start of a program. Similarly, in a regression to explain spreads charged on commercial bank loans, Ozler [1993] finds a positive sign on the dummy variable for an IMF program, suggesting that the program is an indicator of “repayment difficulties.”⁷ These studies, however, have their limitations. Ozler’s results are quite sensitive to the inclusion of other explanatory variables. Once variables are added to

characterize the loan and whether a country achieved sovereign status only recently, the magnitude of the coefficient falls sharply and it is no longer significant at the 5 percent level. The Bird and Rowlands [1997 and 2001] and Ozler [1993] analyses also do not address the possibility that a drop in capital flows may trigger IMF programs.

The one study that finds an indirect impact of IMF programs on capital market access is that by Marchesi [2001]. She examines a country's ability to reschedule its private debt obligations and finds that the presence of a Fund program helps in this respect. She interprets her finding to imply that participation in a Fund program signals a commitment to policy reform that is a precondition to debt rescheduling and continued market access.

In light of the theoretical findings discussed above, it is important to note that the bulk of the literature—not just on the catalyzing effect of the Fund but on the effectiveness of Fund programs more generally—treats IMF programs as undifferentiated. Thus, a single dummy variable represents the presence or absence of a Fund program. However, programs differ in their features and their effectiveness can be expected to depend on conditions prevailing in the country. As such, differences between Fund programs and the relevance of country conditions have recently received some attention. In reexamining the catalytic effect of Fund programs, Edwards [2000] finds that program countries that have a recent history of lack of compliance with the agreed reform agenda are penalized in terms of access to capital markets. Thus, he finds evidence for an asymmetric effect: Fund programs do not necessarily help, but programs with non-compliance appear to hurt. The important point Edwards demonstrates is that the catalytic effect is likely to vary considerably across programs and country circumstances.

Other evidence points to the importance of country conditions in determining IMF program success. Ivanova, Mayer, Mourmouras, and Anayiotos [2001], in explaining the success or failure of Fund programs, distinguish between countries on the basis of internal political competition for resources. Stone [2002] focuses on a number of differences, important among which is a measure of the country's political affinity to the United States as a proxy for the inability of the Fund to discipline domestic policymakers in that country.

Edwards [2000] also considers the possibility that self-selection into Fund programs may bias the results. However, he finds that correction makes no difference to the results. This is not completely surprising. The determinants of Fund program adoption are not well-identified. While the broad determinants of selection into Fund programs seem to be such variables as low growth, low reserves, and high debt, these variables do not do a good job in predicting participation in IMF programs. For example, Garuda [2000] measures the propensity to adopt an IMF program and finds within his low-propensity group several country-year observations that do have IMF programs and within his high propensity groups many country-year observations that do not have IMF programs.⁸ Using a measure of "crisis" based on the level of reserves, Conway [2000] finds a correlation of 0.25 between crisis and IMF program incidence. Hutchison [2001] also finds a low correlation between his measure of crises and IMF programs. Hutchison finds, moreover, in a probit estimate of program participation, that while 80 percent of "no program participation" observations are correctly predicted, only a third of program participation is predicted.

In this paper, we account for country conditions and differences in Fund programs when analyzing the catalytic effect. Moving in this direction, a number of options open up, not all of which we pursue. In considering country conditions, we focus on the non-linearity

in the effectiveness of Fund programs to the level of a country's external vulnerability. Among program characteristics, we examine the implications of the size of lending, precautionary programs, and length of Fund commitment. Thus, we do not pursue other program features, such as degree of completion, which gave inconclusive results.

IV. Methodology and Data

We seek to explain if the risk premium (spread) charged on an emerging market bond and the likelihood of bond issuance are influenced by the presence and characteristics of an IMF program. In doing so, we draw on a dataset of about 3300 bonds, issued between 1990 and 1999 by emerging market and developing country issuers. By design, we focus on longer-term investments rather than rollover of short-term lending. While such distinctions are never clear-cut empirically, the implication is that we are more likely to be testing the IMF's role in alleviating the informational and commitment problems in international capital markets. The bonds included in this paper are of one-year or greater maturity (the one-year mark being conventionally the cut-off for short-term lending). The average maturity of bonds in our sample is [7] years. Also, by focusing on bonds, we place the spotlight on that segment of international capital markets most prone to informational problems. Bond markets tend to be most of an arms-length nature compared to bank lending, where creditors and lenders often have longer-term relationships and where banks are able to themselves undertake monitoring at a level not possible for dispersed bondholders.

We build on a two-equation estimation approach developed in earlier papers (see Eichengreen and Mody [2001]). The "spreads" equation specifies the determinants of spreads charged and the "selection" equation is a probit for the decision to issue the bond.

The spreads equation is a linear relationship:

$$(1) \quad \log(\text{spread}) = \beta X + u_1$$

The dependent variable is the logarithm of the spread. Throughout, the spread we use is the so-called primary or launch spread and is defined as the premium paid at the time of bond issuance over the risk-free rate for a bond of similar maturity and currency denomination. Because we use primary spreads, we do not “follow” a particular bond “over time.” Bond frequency issuance varies over time, resulting in varying numbers of bonds for a given country in any given time period. X is a vector of issue, issuer, and period characteristics; and u_1 is a random error. The X vector contains a dummy variable for an IMF program, other program characteristics, and also interactions between the program and country characteristics, as we discuss below in detail.

Since the spread will be observed only when the decision to borrow and lend is made, we correct for this sample selection problem. Assume that spreads are observed when a latent variable B crosses a threshold B' defined by:

$$(2) \quad B' = \gamma Z + u_2$$

where Z is the vector of variables that determines the desire of borrowers to borrow and the willingness of lenders to lend (and will also contain the IMF program variables and their interactions), and u_2 is a second error term. We further assume that:

$$u_1 \sim N(0, \sigma), \quad u_2 \sim N(0, 1), \quad \text{and} \quad \text{corr}(u_1, u_2) = \rho$$

This is a sample selection model a la Heckman [1979] and equations (1) and (2) can be estimated simultaneously by a maximum likelihood procedure.

Estimating the determinants of market access requires information on those who did not issue bonds. For each country we consider three categories of issuers: sovereign, (other)

public, and private. For each quarter and country where one of these issuers did not come to the market, we record a zero, and where they did we record a one.

Leung and Yu [1996] note that the estimation does not require the variables in the selection equation and the spread equation to be different. What is critical instead is to avoid multicollinearity between the variables in the spreads equation and the “inverse-Mills ratio” constructed from the selection equation. That, in turn, requires the value of the variables not be concentrated in a small range and that the truncated observations (no bond issuance) should not dominate the set of observations. In our case, most variables have a large range and about a third of the observations have a bond issued.⁹

Evaluating IMF Programs: Econometric Issues

While the model described above considers the selection bias on account of the issuance or non-issuance of a bond, it does not deal with the more conventional issue in the IMF programs literature of selection into an IMF program. In our case, there are two key differences relative to the past literature. First, the outcome we observe is an individual bond issue. While a bond issue may be large and reflect broad market sentiment towards the country, a single bond issue is unlikely to trigger an IMF program.

Moreover, our observations are at a much higher frequency than is the case with past studies. Dicks-Mireaux, Mecagni, and Schadler [2000] note that how the timing of IMF programs is specified makes a difference to the empirical results. Similarly, Kaminsky and Schmukler [1999] use daily announcements to track movements in stock markets and find, on average, that stock markets respond positively on the days agreements are reached with international organizations such as the IMF. Figure 1 shows that if the IMF program is initiated at the time shown by the solid vertical line but the dotted line is the starting date that

the econometrician uses, then we are likely to find a positive correlation between IMF programs and spreads, reflecting reverse causation. However, if we take the actual, or more accurate starting time, then we are more likely to observe whether a Fund program was associated with a reduction in spreads. A bond issuance is recorded on the day it occurs and the start of an IMF program is recorded in our data in the month in which it occurs. Since the actual start of a program reflects many considerations, including negotiations between a country and the Fund and internal Fund procedures, this further reduces the likelihood that there is significant feedback from an individual transaction to an IMF program.

As it turns out, the sign on the coefficient of the IMF program in the spreads equation is typically negative, implying that a Fund program is, all else equal, associated with lower spreads. Thus, if poor market sentiment towards a country leads to a Fund program, then our result suggesting that a Fund program lowers spreads would only be strengthened.

Further, explicit consideration of the selection bias problem is not undertaken here because, as the literature review has shown, Fund programs are in place in a variety of circumstances that are not easily captured through a probit equation that forms the first step of the selection bias correction. Edwards [2000] finds that correction for selection bias does little to change his results. With our higher frequency data, predicting Fund programs is likely to be even more difficult (not least because the right hand side variables are often measured at much lower frequencies). In addition, a variable that consistently works well in predicting participation in Fund programs is past participation (see Barro and Lee [2001] and Bagci and Perraudin [1997]). If this is a key omitted variable, then it appears to us that the best approach is to include it directly in the outcome equation. Indeed, our results below show that the history of past participation in Fund programs has a significant bearing on

capital market access. In addition, we include some non-linear terms that also could proxy for some omitted variables.

Variables and Data Sources

The data sources for the dependent and explanatory variables are documented in Appendix I. Details on bonds issued and their characteristics are obtained from Bondware, a commercial data source. *Bond characteristics* included in the spreads equation are: the dollar value of the bond issued, its maturity, whether the issuer was in the public or private sectors, the industrial sector of the issuer, the currency of issue, and whether the bond had a fixed or floating rate.

The *global variables* included in both the spreads and selection equation are: U.S. industrial growth rate during the quarter in which the bond was issued; the daily swap rate (as a measure of liquidity risk); and, as a measure of market uncertainty, the standard deviation of daily Emerging Market Bond Index (a commonly followed index of emerging market spreads) over the relevant quarter.

In both equations, we use several *country characteristics* as control variables. Country credit ratings provided by *Institutional Investor* are a measure of country wealth (being highly correlated with *per capita* income and wealth) and, more generally, an index of the likelihood of debt repayment. As an additional measure of countries' wealth (human capital, in this case), we use the proportion of people older than twenty five years who have completed secondary school. Other more conventional measures of country solvency and liquidity include: external debt relative to GNP, a dummy variable for whether the sovereign has restructured debt within the previous year, the growth rate of real GDP, the variance of

export growth, the ratio of short-term debt to total debt, the ratio of reserves to imports, and the ratio of domestic private credit to GDP. Note that the debt-restructuring variable we use is not the same as debt rescheduling: restructuring reflects a positive effort at debt management and typically involves exchange new debt for old more expensive or inflexible debt. Also, while it is common to use the ratio of reserves to short-term debt as a measure of country liquidity, we use short-term to total debt and reserves to imports since we want to examine separately the influence of short-term debt and reserves.

The IMF variables we use in alternative specifications in the spreads and selection equation are: IMF program dummy, a measure of repeated Fund programs, the size of the program relative to the country's external debt, and whether a program was "precautionary," i.e., if in practice there was no, or limited, drawing down of Fund resources.

Descriptive Statistics

Between 1990 and 2000, over 250 IMF programs were negotiated, with the number of programs varying between 20 and 35 a year, except in 1990 and 2000 when there were less than 20 programs. There is no trend in either the number of programs or the amount of financial support committed by the Fund. In particular, financial support has been large at times of crises: the big jump in 1995 reflects the large package to Mexico and the large commitments in 1997 and 1998 followed the East Asian and Russian crises.

Table 2 shows that between 1991 and 2000, the period covered by this paper, about one-third of all developing country and emerging market bonds were issued by borrowers from countries with IMF programs.¹⁰ The spreads charged (yield to maturity minus the risk-free rate) on the bonds were typically higher for program countries (406 basis points)

compared with countries that did not have such programs at the time the bonds were issued (223 basis points). Also, bonds issued by program countries had shorter maturities (5.44 years versus 6.67 years). The size of an average borrowing is, however, about the same for issuers with and without Fund programs.

It was thus the case that IMF programs were associated with higher spreads and shorter maturities. This is not surprising, since Fund programs were also associated with worse fundamentals: higher debt/GDP ratios, lower recent growth, and greater volatility. Countries with Fund programs appear to have better credit quality in one dimension: among those that issued bonds, those with Fund programs have higher reserves. Also, issuers with Fund programs have had lower ratios of short-term debt to total debt; however, that may reflect their lack of access to short-term credit. In the next section, we examine the relationship between Fund programs and capital market access after controlling for country fundamentals—and also for bond characteristics and global fundamentals.

V. The Role of Country Fundamentals

As noted above, we jointly estimate the decision to issue a bond and the determination of the spread on the bond. A complete set of results for the base equation with the full set of control variables is reported in Appendix II. In the rest of this paper, we continue to use the controls in this base equation but, to conserve space, report only the coefficients on the relevant IMF variables and their interactions with other determinants of bond issuance and spreads.

Fund presence at the time of bond issuance is seen in the selection equation to significantly improve market access, raising the frequency of bond issuance (Table 3). This is

a very robust finding across a variety of specifications. Fund programs are also associated with reduced spread. The point estimate suggests that the presence of a Fund program reduces spreads by about 8 percent. The size and statistical significance of this coefficient does vary by the exact specification, but it almost always remains negative. Put together, the *prima facie* evidence is that, on average, the presence of a Fund program is associated with an increased demand by international investors for the issuing country's bonds—the demand curve shifts outwards, resulting in more bonds issued at a higher price (and hence lower spread).

Our primary interest is not in the average effects but in examining if the IMF catalytic effect varies by country conditions. However, before turning to that central question, note briefly the implications of these results for the problem of “reverse causality,” which so vexes all studies of IMF programs. If “reverse” causation was dominant, with market aversion causing a Fund program, we would have found a negative coefficient on the Fund program dummy in the selection equation and a positive coefficient in the spread equation. If we repeat this regression with all control variables other than the country characteristics (i.e., if we keep the bond features and the global variables but drop the country controls such as the debt to GDP ratio), then we *do* find that the IMF dummy is negative and highly significant in the selection equation and positive and significant in the spreads equation. Clearly, the failure to control for the country variables results in this misattribution of the country weakness to IMF programs. The omission of relevant country controls in some of the studies cited above could be the reason for their reaching a bleaker conclusion on IMF programs than is warranted.

Before considering the non-linear effects highlighted by theory, we briefly report on interactions between IMF programs with domestic and external volatility faced by the country. When entered independently, the volatility of the country's exports (the standard deviation of the monthly growth of exports) is associated with higher spreads and lower probability of bond issuance suggesting that volatility shifts the supply of funds to the left (see Appendix II). This is consistent with the Catao and Sutton [2002] finding that under conditions of macroeconomic volatility sovereign debt defaults are more likely and hence will result in reduced access and higher spreads. When we interact export volatility with the IMF program dummy, the interaction term enters with a negative and significant sign in the spread equation. The evidence supports the possibility, discussed above, that the Fund program acts a commitment mechanism that counteracts the effect of domestic volatility. In contrast, the interaction, for example, of Fund programs with the volatility of the Emerging Market Bond Index (the EMBI) is statistically insignificant in the selection and spreads equation, suggesting that a country with a Fund program is not insulated from high volatility in international capital markets.

To examine the nonlinearity of interest, we specified a piece-wise linear function. We split the reserves-to-imports ratio at the median, creating two variables: the reserves-to-imports in the low range and in the high range. Column 3 of Table 3 reports the coefficients for the IMF dummy intercepts and the interaction terms for low and high ranges of country reserves-to-imports. For countries with low reserves, the results suggest that spreads are higher with a program rather than without a program. The IMF effect improves with reserve availability and a Fund program turns beneficial when the reserves cover at least 4 months of imports. At the median value of reserves to imports (about 4.5 months of imports), the

effective coefficient on the Fund program is -0.16, i.e., a Fund program lowers spreads by about 16 percent. However, past the median value of reserves to imports, the Fund effect worsens again, and turns to a small positive effect on spreads when reserves are larger than about a year's worth of imports. The effects on probability of issuance are also non-linear and we find, in particular, that the IMF's assistance in improving the probability of issuance declines after the median value of reserves-to-imports, though the magnitude of the effects are not large in this case.

The evidence, therefore, suggests that if a country's reserves are very low, Fund programs are unable to compensate for the economic difficulties faced by the country. In contrast, when reserves are low—but have not yet fallen to the extremely low levels that signify deeper structural problems—Fund programs can be very effective. The results further suggest that as reserves increase Fund effectiveness falls off, as may be expected.

We repeated the same methodology with debt-to-GNP ratio, with similar results.¹¹ Thus, once more we created two variables, one with the debt-to-GNP ratio in the low range (below its median value) and another in the high range. We interacted these two variables with the IMF dummy to test if these interactions vary with the range in which the debt-to-GNP ratio falls. The results support the analysis above. The estimates presented in Column 4 of Table 3 imply that IMF programs are effective in reducing spreads when the debt-to-GNP ratios are between 36 and 54 percent. For debt-to-GNP, interactions with IMF programs are also strongly non-linear in influencing the probability of issuance, with the favorable effects on issuance lying in the range of 24 to 63 percent. Interestingly, Pattillo, Poirson, and Ricci [2002] find that an external debt to GDP ratio of about 35 percent marks the threshold beyond which additional debt accumulation has a negative effect on growth. This threshold is

at the lower end of our estimated range in which the Fund has a catalytic effect. Thus, once a country has crossed the threshold, the Fund can counteract the negative impact of the high level of debt, but at a diminishing rate.

In summary, the results clearly support the idea that the IMF is catalytically effective when external fundamentals are in an intermediate range, as predicted by models focusing on the lending role of the IMF (Morris and Shin [2003], Corsetti et al [2003] and Saravia [2003]). These empirical findings can, however, also be interpreted in the context of the IMF's informational role, allowing countries to signal reform efforts via the IMF as a commitment device. The value that the market places on the IMF's ability to act as commitment mechanism would also depend on countries' fundamentals and we would expect, once again, that the IMF would catalyze capital flows when the country fundamentals were in an intermediate range. In other words, the IMF would be effective when the restoration of the external imbalances had a reasonable likelihood.

V. Implications of Fund Program Design

In this section, we explore three dimensions of IMF programs: (i) size of lending (normalized by country debt); (ii) whether a program was "precautionary" or not; and the (iii) "prolonged" use of Fund resources.

Increased Fund lending may improve access to bond markets either because markets believe that available IMF resources will facilitate repayment of private debts or because a larger lending size reflects greater commitment to economic reforms and, hence, improved capacity to honor new contractual obligations. In column 1 of Table 4, we replace the IMF program dummy with the amount committed (as a percentage of the country's long-term

debt). The results suggest that program size is possibly important, though the result is not robust. Larger programs both increase the probability of bond issuance and lower spreads. The results imply that an additional program size equal to 10 percent of the country's long-term debt lowers spreads by about 10 percent. However, the effect on spreads is not robust to the inclusion of other program characteristics (columns 2 and 3). While availability of IMF funds may relieve short-term difficulties in repayment of private funds, over a more medium-term, the Fund also has to be repaid and so over that longer time horizon, the country's repayment capacity is not improved by the mere fact of an IMF loan. In fact, to the extent, the IMF is a preferred creditor, it is possible that some private creditors may take the view that their repayment prospects have in fact become worse.

The amount committed in a Fund program is not necessarily disbursed—programs may be “precautionary.” In these cases, the country is willing to accept the Fund's monitoring (and its implied costs) without using the available funds, although the committed resources are available for use, if necessary. Countries pay the Fund a commitment fee to keep alive the option of using the agreed upon resources and, at the same time, voluntarily accept the Fund's conditionality. Such precautionary use could signal to the market a country's willingness to undertake necessary reforms and repay debt obligations to private creditors. Referring to the program contracted by Brazil in 2001, the Fund (IMF [2003a, p. 7]) states: “The authorities considered that they could achieve a more positive market signal if they did not draw the resources made available under the arrangement, although these remained available should the need arise.” The Fund's Board of Directors describes the signaling potential of these programs in following terms (IMF [2003a, p. 24]): “Directors felt that precautionary arrangements had been a useful instrument to signal the Fund's

endorsement of a member's policy. Such arrangements helped to foster close collaboration between the Fund and the member...and had helped boost the confidence of the international financial community....”

Programs may be precautionary in two senses. First, at the time the program is agreed upon, the borrowing country may declare its intention to not draw on the resources made available. While this is not a contractually binding restriction, and the country can change its mind with no penalty, declaration of the intent to not borrow implies that Fund resources are not critical. Rather the country is volunteering to subject itself to the discipline of the Fund's program. Second, the country may negotiate a Fund program and draw on Fund resources initially but thereafter voluntarily halt disbursements while keeping the IMF program in place. Such programs may be referred to as “turned precautionary.”¹² Programs that “turn” precautionary are larger in size than the “outset” precautionary programs and, presumably, have more demanding policy conditionality. Of the 245 programs between 1991 and 2000 covered in this analysis, only 38 were precautionary at the outset and 13 “turned” precautionary. However, of the bonds issued while a country was in a Fund program, over 45 percent were during precautionary programs (18 percent were during precautionary at outset and 33 percent were during “turned” precautionary).

How do precautionary programs fare? Column 2 of table 4 shows that precautionary programs of the two varieties (“outset” and “turned” precautionary) have differing implications. The results suggest that “declared” precautionary programs do not have a significant effect. In contrast, turned precautionary programs add significantly to the value of the IMF's presence both in terms of spreads and access.

Recall, that “turned” precautionary programs are significantly larger than the “outset” precautionary programs.¹³ Thus, the highly significant sign on the “turned” precautionary dummy reflects the benefits deriving both from the precautionary nature of the program and the large resource size associated with it. Thus, the size of the amount coefficient and its significance falls when considering these programs. The evidence suggests, therefore, that those subjecting themselves to the Fund’s discipline can benefit even when the resources are not drawn—the available cushion helps.

Another Fund facility that combines large resource size and precautionary intent—and a potentially powerful signaling effect—is the “Supplemental Reserve Facility (SRF).” This Facility was created to provide assistance to countries experiencing exceptional balance of payments difficulties arising from a sudden and disruptive loss of market confidence. Substantial resources under the facility are made available “if there is a reasonable expectation that the implementation of adjustment policies and adequate financing will result, within a short period of time, in an early correction of such difficulties” (IMF [2003b, p. 12]). The premise is that a country in the midst of a crisis is subject to a loss of confidence even though the fundamentals are relatively sound. The goal is to bring back confidence to the country and, at the same time to prevent “contagion” or the loss of confidence from spreading to other countries. The SRF often overlaps with programs that turned precautionary.¹⁴ As such, in Column 3 of Table 4, we find that when including SRF programs the coefficient of “turned precautionary” falls from 0.15 to 0.09.

These findings can be linked back to our discussion of country fundamentals. Though the fundamentals in countries with “turned precautionary” programs are worse than in non-program countries, they are superior to those in countries with other forms of IMF

programs. In particular, “turned precautionary” countries do better than other program countries with respect to lower debt/GDP ratios, higher growth, and lower volatility. In contrast, their reserves/import ratios are not very different from those in countries with other programs. Thus, an interpretation of our results is that “turned precautionary” countries are vulnerable to external pressures and that the vulnerability has further led to a liquidity problem. However, because the underlying fundamentals are not yet beyond a point of no return in the short-run, a reform program with IMF support carries credibility.

Finally, we ask if there may be diminishing returns to a country’s repeated interactions with the Fund. Two opposing forces may be at work here. Repeated Fund involvement may be warranted in light of medium-term problems that the country faces and may reflect a joint commitment on the part of the country and the Fund to resolve the problems. However, it may be the case that “prolonged” use of Fund resources implies an inability to resolve the problems at hand and is an indicator, therefore, of more deep rooted problems. The term “prolonged” use has many different indicators but one of them recently proposed by the IMF’s new Independent Evaluation Office is the existence of a program for more than 70 percent of the time over a given period.

Thus, we examine if repeated Fund presence in a country makes a difference to its effectiveness in this non-linear manner. The measure of repeated Fund presence we use is the number of months that a Fund program was in place in the country just prior to the start of the 1990s, during the four-year (48 month) period from 1987 to 1990. Use of a prior time period ensures that we do not pick up a reverse causation from poor market access to a high frequency of Fund programs. It turns out that there is a high correlation between the number of months the country had a program in the late 1980s and the number of months a program

was in place in the 1990s. This persistence suggests that our measure of the Fund's ongoing involvement in a country reflects a combination of continuing economic difficulties and the inability of the Fund and the country to work together to achieve the necessary reforms. Since we have already controlled for external indicators such as debt and reserves, the number of months that the Fund program was in place in the late 1980s proxies for these other (unobserved) country characteristics and the Fund-country relationship. With this interpretation in mind, the result supports the speculation above (see Column 4). Continued Fund presence helps up to a point. These results suggest that the "turning point" is at about 18 months out of the 48-month window over which our measure of repeated interaction is taken. Beyond that length of time, continuing Fund effectiveness in helping with market access begins to decline and at about 35 months, or about 75 percent of the time window, continued presence raises spreads. At that point, investors apparently believe that the problems are either deep-rooted or that the Fund is unable to exercise the necessary influence to resolve them. These results and interpretation are consistent with Conway's [2001] conclusion that a continuing Fund-country relationship reaches diminishing returns (see also Bird and Rowlands [2002]).

To summarize the findings in this section, the evidence suggests that constructive engagement between the Fund and the member country can be demonstrated in different ways. Credibility may be established by the size of the program, and thus resources made available do matter but not robustly for spreads. However, the results also show that voluntary country commitment under so-called "turned" precautionary programs help by signaling country intentions under Fund discipline. The programs under the Supplemental Reserve Facility (SRF) have also been of this nature. Finally, while continued relationship

with the Fund helps, where Fund programs are excessively repeated, the credibility of effective reforms seems to be called into question by the market.

VII. Conclusions

By taking into account country conditions and program features, we take forward the agenda on the catalytic effectiveness of Fund programs. In light of the negative conclusions of much of the earlier research, we approach the empirical challenge in light of the recently proposed theoretical frameworks that recognize the interplay between the country, private creditors, and the Fund. A common prediction of the differing theoretical perspectives—emphasizing the Fund’s liquidity provision and informational roles—is that IMF programs will be most effective in catalyzing private capital flows when the country’s external fundamentals are in an “intermediate” range. We find strong confirmation of that predicted non-linearity. We also examined the implications of some features of IMF programs to distinguish between its lending and information roles in catalyzing capital flows. Though the distinction is difficult to identify, the evidence for an independent or complementary informational role appears strong.

We infer from the non-linear influence of country fundamentals and the informational role of the Fund (allowing a country to signal its reform efforts while the Fund acts as a delegated monitor) that a joint commitment of the country and the Fund to the reduction of vulnerability is crucial to the operation of a catalytic effect. Thus, a Fund program is not an automatic or standardized “good housekeeping” seal of approval.¹⁵ Investors appear to value the Fund’s participation in resolving the country’s external payment difficulties but only when they view it as likely that the effort will be successful.¹⁶

Table 1: Frequency of IMF Programs

Number of Programs per year
(Size of programs in billions of SDRs)

	SBA	EFF	ESAF	Total
1990	12 (1.70)	0 (0)	3 (0.56)	15 (2.25)
1991	19 (5.30)	2 (2.34)	8 (0.69)	29 (8.33)
1992	15 (2.74)	4 (4.59)	6 (0.44)	25 (7.78)
1993	13 (1.64)	2 (1.42)	7 (0.28)	22 (3.34)
1994	18 (2.61)	4 (1.49)	13 (2.19)	35 (6.29)
1995	21 (19.09)	2 (1.28)	7 (1.20)	30 (21.57)
1996	12 (3.52)	6 (14.25)	14 (1.30)	32 (19.07)
1997	10 (28.02)	4 (1.03)	7 (1.37)	21 (30.42)
1998	6 (11.71)	4 (10.01)	11 (1.06)	21 (22.77)
1999	7 (9.94)	4 (2.80)	9 (0.86)	20 (13.60)
2000	10 (7.36)	2 (3.66)	0	12 (11.02)
1990-2000	143 (93.62)	34 (42.87)	85 (9.95)	262 (146.45)

SBA: Stand-by

EFF: Extended Fund Facility

ESAF: Extended Structural Adjustment Facility (includes Structural Adjustment Facility and the now renamed Poverty Reduction Growth Facility).

Table 2: Bond Issuance, Terms, and Country Characteristics

	No Program	Fund Program	Total
	A: Bond Issued		
Number of bonds	2156	1139	3295
Spread (basis points)	223	406	282
Maturity (years)	6.67	5.44	6.25
Amount (\$ millions)	154	177	162
Debt/GDP	0.27	0.43	0.32
Annual GDP growth (percent)	5.04	3.29	4.40
Short-term/total debt	0.66	0.50	0.56
Reserves/imports (months of imports)	5.91	6.78	6.21
Volatility of exports	0.08	0.11	0.09
	B: No Bond Issued		
Debt/GDP	0.39	0.56	0.46
Annual GDP growth (percent)	4.00	2.65	3.30
Short-term/total debt	0.55	0.49	0.52
Reserves/imports (months of imports)	4.89	4.68	4.83
Volatility of exports	0.14	0.18	0.16

Table 3: Interaction of Country Characteristics with Fund Programs

	Log of Spreads at Time of Issue			
	(1)	(2)	(3)	(4)
IMF program, low range	-0.079 (-2.63)	0.042 (0.66)	0.502 (2.74)	0.695 (2.00)
IMF program, high range			-0.113 (-1.07)	-0.316 (-2.49)
IMF program interacted with:				
EMBI volatility		-0.260 (-0.09)		
Export growth volatility		-1.178 (-3.36)	-1.245 (-3.59)	-1.440 (-4.00)
Low range of Debt/GNP				-1.907 (-1.74)
High range of Debt/GNP				0.587 (2.45)
Low range of Reserves/Imports			-0.418 (-2.46)	
High range of Reserves/Imports			0.049 (1.59)	
	Probability of Issuance			
	(1)	(2)	(3)	(4)
IMF program, low range	0.269 (8.03)	0.082 (0.76)	-0.366 (-2.10)	-1.935 (-5.56)
IMF program, high range			0.902 (8.46)	1.316 (8.02)
IMF program interacted with:				
EMBI volatility		-1.850 (-0.56)		
Export growth volatility		2.005 (2.42)	2.003 (2.41)	2.703 (3.26)
Low range of Debt/GNP				6.609 (6.15)
High range of Debt/GNP				-2.555 (-9.23)
Low range of Reserves/Imports			0.023 (0.17)	
High range of Reserves/Imports			-0.217 (-7.88)	
Number of observations	7772	7772	7772	7772
Number of bonds	2952	2952	2952	2952
Log of likelihood	-5863.2	-5847.3	-5775.7	-5756.5

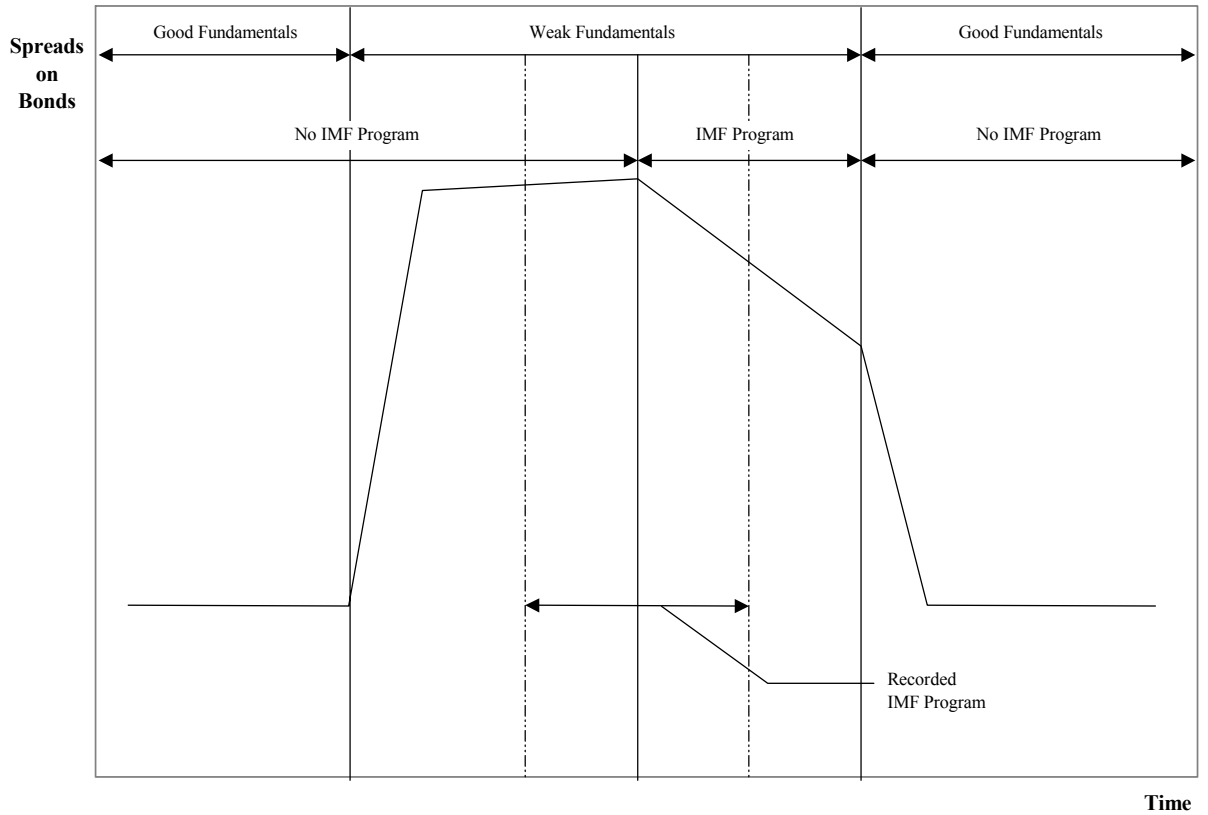
Note: These regressions all have bond, global, and country controls as specified in the full regression presented in Appendix II. z-statistics are presented in the parentheses.

Table 4: Influence of Program Features on Bond Market Spreads and Issuance

	Log of Spreads at Time of Issue			
	(1)	(2)	(3)	(4)
IMF amount/debt	-1.033 (-2.78)	-0.468 (-1.26)	-0.032 (-0.08)	-0.957 (-2.51)
Precautionary program:				
Outset		0.047 (0.87)	0.019 (0.33)	
Turned		-0.150 (-3.82)	-0.091 (-2.14)	
Supplemental Reserve Facility			-0.162 (-2.66)	
Number of months in IMF program, 1987-90				-0.035 (-6.67)
Square of Number of months in IMF program, 1987-90				0.001 (6.32)
	Probability of Issuance			
	(1)	(2)	(3)	(4)
IMF amount/debt	4.806 (12.58)	4.031 (9.53)	2.651 (5.60)	4.876 (12.49)
Precautionary program:				
Outset		-0.112 (-1.67)	-0.071 (-1.08)	
Turned		0.258 (5.30)	0.146 (2.49)	
Supplemental Reserve Facility			0.479 (5.76)	
Number of months in IMF program, 1987-90				0.076 (17.91)
Square of Number of months in IMF program, 1987-90				-0.002 (-15.45)
Number of observations	7772	7772	7772	7772
Number of bonds	2952	2952	2952	2952
Log of likelihood	-5840.0	-5829.6	-5820.9	-5696.5

Note: These regressions all have bond global, and country controls as specified in the full regression presented in Appendix II. z-statistics are presented in the parentheses.

Figure I. Econometric Implications of Timing IMF Programs



APPENDIX I: DATA SOURCES AND CONSTRUCTION OF VARIABLES

Bond characteristics

The bond data set, obtained from Bondware, supplemented by the former Emerging Markets Division of the International Monetary Fund for the early 1990s, covers the period 1991 to 1999 and includes: (a) launch spreads over risk free rates (in basis points, where one basis point is one-hundredth of a percentage point) (b) the amount of the issue (millions of US\$); (c) the maturity in years; (d) whether the borrower was a sovereign, other public sector entity, or private debtor; (e) currency of issue; (f) whether the bond had a fixed or floating rate; (g) borrower's industrial sector: manufacturing, financial services, utility or infrastructure, other services, or government (where government, in this case, refers to subsovereign entities and central banks, which could not be classified in the other four industrial sectors).

Global variables

United States industrial production growth rate: average of month-month growth rate over a quarter.

United States ten-year swap spread.

Emerging Market Bond Index: standard deviation of difference in log of daily spreads.

Country Characteristics

Variable	(billions)	Periodicity	Source	Series
Total external debt (EDT)	US\$	Annual	WEO	D
Gross national product (GNP, current prices)	US\$	Annual	WEO	NGDPD
Gross domestic product (GDPNC, current prices)	National	Annual	WEO	NGDP
Gross domestic product (GDP90, 1990 prices)	National	Annual	WEO	NGDP_R
Total debt service (TDS)	US\$	Annual	WEO	DS
Exports (XGS)	US\$	Annual	WEO	BX
Exports (X)	US\$	Monthly	IFS	M#c 70_dzf
Reserves (RESIMF)	US\$	Quarterly	IFS	q#c _11_dzf
Imports (IMP)	US\$	Quarterly	IFS	q#c 71_dzf
Domestic bank credit (CLM_PVT) ¹	National	Quarterly	IFS	q#c 32d_zf
Short-term bank debt (BISSHT) ²	US\$	semi-annual	BIS	
Total bank debt (BISTOT) ³	US\$	semi-annual	BIS	
Credit rating (CRTG)	Scale	semi-annual	Institutional Investor	
Years of education	Percentage of the population older than 25 years with secondary school complete.	1990 value	Robert Barro's website ⁵	
Debt restructuring ⁴	Indicator	Annual	WDT/GDF	

¹Credit to private sector.

² Cross-border bank claims in all currencies and local claims in non-local currencies of maturity up to and including one year.

³ Total consolidated cross-border claims in all currencies and local claims in non-local currencies.

⁴ Indicator variable, which is equal to 1 if a debt rescheduling took place in the previous year and zero otherwise.

⁵ <http://post.economics.harvard.edu/faculty/barro/data.html> (Educational Attainment data).

Constructed Variables

Debt/GNP	EDT/GNP
Debt service/exports	TDS/XGS
GDP/growth	$0.25 * \ln[\text{GDP90}_t / \text{GDP90}_{t-1}]$
Standard deviation of export growth	Standard deviation of monthly growth rates of exports (over six months)
Reserves/imports	RESIMF/IMP
Reserves/GNP	RESIMF/GNP
Reserves/short-term debt	RESIMF/BISSHT
Short-term debt/total debt	BISSHT/BISTOT
Domestic credit/GDP	CLM_PVT/(GDPNC/4)

Sources: International Monetary Fund's *World Economic Outlook (WEO)* and *International Financial Statistics (IFS)*; IMF program data from the IMF's Executive Board Documents and Staff Estimates; World Bank's *World Debt Tables (WDT)* and *Global Development Finance (GDF)*; Bank of International Settlements' *The Maturity, Sectoral, and Nationality Distribution of International Bank Lending*. Credit ratings were obtained from *Institutional Investor's Country Credit Ratings*. Missing data for some countries was completed using the US State Department's Annual Country reports on Economic Policy and Trade Practices (which are available on the internet from http://www.state.gov/www/issues/economic/trade_reports/). U.S. industrial production: Federal Reserve Swap rates and EMBI from Bloomberg.

Countries included in the sample: Argentina, Bangladesh, Barbados, Bolivia, Brazil, Bulgaria, Chile, Colombia, Costa Rica, Croatia, Czech Republic, Dominican Republic, Ecuador, Egypt, El Salvador, Estonia, Ethiopia, Guatemala, Hong Kong, Hungary, India, Indonesia, Jamaica, Kazakhstan, Kenya, Korea, Kuwait, Latvia, Lithuania, Malaysia, Mexico, Morocco, Nigeria, Oman, Pakistan, Papua New Guinea, Paraguay, Peru, Phillipines, Poland, Romania, Russia, Singapore, Slovak Republic, Slovenia, South Africa, Sri Lanka, Thailand, Trinidad and Tobago, Tunisia, Turkey, Ukraine, Uruguay, Venezuela, Vietnam.

APPENDIX II: BASE REGRESSION

As discussed in the main text, the data on bond spreads is analyzed in a two equation framework, the spread equation of interest and a “selection equation,” which measures the likelihood of bond issuance. While there are statistical reasons to correct for selection bias, the information from the selection equation can be used jointly with the results of the spread equation to interpret the influence of the explanatory variables in a supply-demand framework (Eichengreen and Mody [2000]). Thus, for example, a higher credit rating raises the likelihood of bond issuance and lowers spreads (the risk premium) charged. We interpret this finding as an increase in demand for bonds as ratings rise. In contrast, a higher debt-service ratio is associated with more frequent bond issuance and with higher spreads, suggesting that larger debt-service obligations lead to a greater supply of bonds for which a higher premium is typically required.

In tables 3 and 4 of the main text, where we use this framework, we present only the variables of direct interest to this paper. In this appendix, we present the full details of the base regression, which corresponds to the Column 1 of table 3. The signs and significance of the controls variables presented here remain very similar across the various variations in tables 3 and 4. The first two columns of the table in this appendix present the coefficient and z-statistic for the variables in the “selection equation,” the probit; and the next two columns refer to the spreads equation.

While much of the table is self explanatory, a few comments are in order. In earlier work (e.g., Eichengreen and Mody [2001]), we used the United States 10-Year Treasury Rate as one of the “global” variables. That variable gave ambiguous results. In ongoing work, we find that U.S. industrial growth rate gives a consistent sign and also has an intuitive explanation in terms of U.S. higher growth improving credit quality for emerging market borrowers. Thus, a higher U.S. growth is associated with lower spreads and more frequent bond issuance, as if the demand

for emerging market bonds shifts to the right when the United States grows more rapidly. Another new variable used in this analysis is the standard deviation of the daily log change of the EMBI index. A higher standard deviation implies greater market uncertainty with respect to pricing of bonds. We find that such uncertainty reduces bond issuance significantly and raises spreads (though the effect on spreads is not always significant at the 5 percent level).

Among country variables, the credit rating measure correlates strongly with country *per capita* income and wealth and, hence, the ability to repay debts. A higher rating increases the frequency of bond issuance and reduces spreads. We also add a measure of human capital (percentage of population above 25 with secondary education), which is similarly associated with more frequent issuance and lower spreads. Thus, increased wealth in both forms is seen to increase the demand for an emerging market's bonds. In contrast, a higher debt-servicing needs increase bond issuance but at a higher cost (though the coefficient in the spreads equation is positive, it not significant in this specification; however, in some specifications, the coefficient does achieve statistical significance).

Notice also that "lambda," the inverse-Mills ratio is negative and significant. Thus, thus bond and issuer characteristics unobserved by the econometrician but favorable to bond issuance also result in lower spreads. Correction for sample selection bias is thus relevant since the omitted (unobserved) variables are statistically relevant in the determination of spreads.

BASE REGRESSION RESULTS

	Probability of Bond Issuance (Selection Equation)		Log of Spread at the Time of Issue	
	Coefficient	z-statistic	Coefficient	z-statistic
Bond Characteristics				
Log amount			-0.028	(-1.94)
Maturity			0.010	(4.92)
Yen			-0.328	(-7.14)
Deutsche Mark			-0.098	(-2.25)
Euro			-0.074	(-1.54)
Other currencies			-0.204	(-4.70)
Fixed rate			0.365	(10.88)
Global Variables				
U.S. growth rate	50.058	(10.18)	-24.582	(-5.12)
Log swap rate	-0.387	(-9.71)	0.485	(11.29)
EMBI volatility	-17.624	(-11.36)	6.148	(4.24)
Country Characteristics				
Credit rating	0.029	(23.39)	-0.044	(-23.62)
Proportion of educated people	0.017	(9.28)	-0.006	(-2.86)
Debt/GNP	-1.041	(-12.85)	0.805	(8.22)
Debt service/exports	1.329	(25.04)	0.096	(1.17)
Debt restructured dummy	1.117	(15.42)	-0.497	(-10.26)
GDP growth	1.601	(1.56)	-9.559	(-6.60)
Short-term debt/total debt	-0.675	(-8.73)	0.852	(7.41)
Export growth volatility	-2.200	(-5.54)	0.778	(3.39)
Reserves/imports	0.102	(11.09)	-0.010	(-0.86)
Bank credit stock/GDP	-0.000	(-0.84)	0.001	(1.62)
Sector				
Public	0.040	(1.01)	0.018	(0.29)
Finance			-0.129	(-1.96)
Services			0.484	(3.12)
Utilities			-0.081	(-1.20)
Private	0.677	(19.89)	0.072	(1.49)
Finance			-0.203	(-6.21)
Services			0.123	(2.49)
Utilities			-0.129	(-3.13)
Latin America Dummy			-0.046	(-1.22)
IMF program dummy	0.269	(8.03)	-0.079	(-2.63)
Constant	-0.176	(-0.93)	5.245	(27.79)
Lambda			-0.522	(-10.94)
Number of observations			7772	
Number of bonds			2952	
Log of likelihood			-5,863.2	

REFERENCES

- Bagci, P., Perraudin, W., 1997, "The Impact of IMF Programs". The Institute For Financial Research Working Paper, IFR35 (Birkbeck College: University of London).
- Barro, R. J., Lee, J. W., 2001, "IMF Programs: Who is Chosen and What are the Effects?" Presented at the Second Annual IMF Research Conference, www.imf.org/external/pubs/ft/staffp/2001/00-00/arc.htm.
- Bird, G., Rowlands, D., 1997, "The Catalytic Effect of Lending by the International Financial Institutions". *The World Economy*, 20, 7, pp. 81-97.
- Bird, G., Rowlands, D., 2001, "Catalysis or Direct Borrowing: The Role of the IMF in Mobilising Private Capital". *The World Economy*, pp. 81-97.
- Bird, G., Rowlands, D., 2002, "Do IMF Programmes have a Catalytic Effect on Other International Capital Flows?" *Oxford Development Studies* Vol. 30, No. 3, pp. 229-249.
- Bordo, M. and H. Rockoff, 1996, "The Gold Standard as a 'Good Housekeeping Seal of Approval'," *Journal of Economic History*, Vol. 56, pp. 389-428.
- Bordo, M., Edelstein, M., Rockoff, H., 1999, "Was adherence to the gold standard a "Good Housekeeping seal of approval" during the interwar period? NBER, Working Paper No. 7186.
- Boughton, J.M., 2001, *The Silent Revolution: The International Monetary Fund: 1979-1989*, Washington D.C.: The International Monetary Fund.
- Catao, Luis A. and Bennett W. Sutton Sovereign Defaults: The Role of Volatility, IMF Working Paper No. 02/149, Washington D.C.
- Conway, P., 1994, "IMF lending programs: Participation and Impact". *Journal of Development Economics*, Vol. 45, pp. 365-391.
- Conway, P., 2000, "IMF Programs and External Balance: the Crisis-Participation Dynamic". University of North Carolina, Mimeo.
- Conway, P., 2001, "Evaluating Fund Programs". University of North Carolina, Mimeo.
- Dell'Ariccia, Giovanni, Isabel Schnabel, and Jeromin Zettelmeyer, 2002, *Moral Hazard and International Crisis Lending: A Test*, IMF Working Paper 02/181, Washington D.C.
- Dicks-Mireaux, L., Mecagni, M., Schadler, S., 2000, "Evaluating the effect of IMF lending to low-income countries". *Journal of Development Economics* 61, pp. 495-526.
- Dhonte, P., 1997, "Conditionality as an Instrument of Borrower Credibility". IMF paper on Policy Analysis and Assessment , No. 2.

- Eaton, J. and M. Gersovitz, 1981, "Debt with Potential Repudiation: Theoretical and Empirical Analysis," *Review of Economic Studies*, Vol. 48, pp. 289-309.
- Eichengreen, B. and A. Mody, 2000, "What explains Changing Spread on Emerging Market Debt: Fundamentals or Market Sentiment?" In Sebastian Edwards, ed., *Capital Flows and the Emerging Economies: Theory, Evidence, and Controversies*, Chicago: The University of Chicago Press.
- Eichengreen, B. and A. Mody, 2001, "Bail-ins, bail-outs, and borrowing costs," *IMF Staff Papers*, Vol. 47, pp.155-87.
- Edwards, M. S., 2000, "Reevaluating the Catalytic Effect of IMF Programs". Presented at the Annual Meeting of the American Political Science Association, www.rci.rutgers.edu/~mse.
- Edwards, S., 1989, "The International Monetary Fund and the Developing Countries: A Critical Evaluation." NBER Working Paper 2909.
- Fisher, S., 1997, "Applied Economics in Action: IMF Programs". *The American Economic Review* 87, pp. 23-27.
- Garuda, G., 2000, "The Distributional Effects of IMF Programs: A Cross-Country Analysis". *World Development* 28, No. 6, pp. 1031-1051.
- Goldstein, M., Montiel, P., 1986, "Evaluating Fund Stabilization Programs with Multicountry Data: some methodological pitfalls". *IMF Staff Papers* 33, pp. 304-344.
- Heckman, James, 1979, "Sample Selection Bias as a Specification Error," *Econometrica*, Vol. 47, pp.153-161.
- Hajivassiliou, V., 1987, "The External Debt Repayment Problems of LDC's: An Econometric Model Based on Panel Data". *Journal of Econometrics* 36, pp. 205-23.
- Hale, D., 1998, "The IMF, Now More than Ever: The Case for Financial Peacekeeping". *Foreign Affairs* 77, No. 6, pp. 7-13.
- Hutchison, M., 2001, "A Cure Worse Than The Disease? Currency Crises and the Output Costs of IMF-Supported Stabilization Programs". NBER, Working Paper No. 8305.
- International Monetary Fund, 2001a, "Financial Organization and Operations of the IMF". Treasurer's Department, Washington D.C

- International Monetary Fund, 2001b, “Selected Decisions and Selected Documents of the International Monetary Fund”. Washington D.C.
- International Monetary Fund, 2002, “Evaluation of the Prolonged Use of Fund Resources”. Volumes I and II, Washington D.C.
- International Monetary Fund, 2003a, “Adapting Precautionary Arrangements to Crisis Prevention”. Policy Development and Review Department, Washington D.C. Available at: <http://www.imf.org/external/np/pdr/fac/2003/061103.htm>
- International Monetary Fund, 2003b, “Access Policy in Capital Account Crises—Modifications to the Supplemental Reserve Facility (SRF) and Follow-up Issues Related to Exceptional Access Policy”. Policy Development and Review and Treasurer’s Departments, Washington D.C. www.imf.org/external/np/tre/access/2003/pdf/011403.pdf
- Ivanova, A., Mayer, W., Mourmouras, A., Anayiotos, G., 2001, “What Determines the Success or Failure of Fund-Supported Programs? IMF Working Paper.
- Kaminsky, G.L. and S.L. Schmukler, 1999, “What Triggers Market Jitters: A Chronicle of the Asian Crisis”. *Journal of International Money and Finance* 18, pp. 537-560.
- Khan, M., 1990, “The Macroeconomic Effects of Fund-Supported Adjustment Programs”. IMF Staff Papers 37, pp. 195-231.
- Killick, T., M. [Malik](#), and M. Manual, 1992, What can we know about the effects of IMF programmes? *World Economy (U.K.)* Vol. 15, pp. 575-97.
- Köhler, Horst, 2001, “[Promoting Stability and Prosperity in a Globalized World](#)”. Remarks by IMF Managing Director, Council of the Americas, Washington, DC, May 7, 2001. <http://www.imf.org/external/np/speeches/2001/050701.htm>
- Krueger, A., 2000, “Conflicting Demands on the International Monetary Fund”. AEA papers and proceedings 90, No. 2, pp. 38-42.
- Lane, T., Phillips, S., 2000, “Does IMF Financing Result in Moral Hazard”. IMF working Paper 168.
- Leung, S. F., Yu, S., 1996, “On the choice between sample selection and two-part models”. *Journal of Econometrics* 72, pp. 197-229.
- Marchesi, S., 2001, “Adoption of an IMF Programme and Debt Rescheduling. An Empirical Analysis”. Centro Studi Luca D’ Agliano, Development Studies Working Papers, No. 152.
- Marchesi, S., Thomas, J. P., 1999, “IMF Conditionality as a Screening Device”. *The Economic Journal* 109, pp. 111-125.

- Mussa, M., Savastano, M., 1999, "The IMF Approach to Economic Stabilization". IMF Working Paper 104.
- Obstfeld, M. and A. M. Taylor, 2002, "Sovereign Risk, Credibility and Gold Standard: 1870-1913 Versus 1925-1931," National Bureau of Economic Research Working Paper 9345.
- Ozler, S., 1993, "Have Commercial Banks Ignored History?" The American Economic Review 83, pp. 608-620.
- Pattillo, Catherine, Helen Poirson, and Luca Ricci, 2002, "External Debt and Growth". IMF Working Paper WP/02/69, Washington DC.
- Powell, A, 2002, 'Countries in payments' difficulties: what can the IMF do?' International Monetary Fund Seminar Series (International); No. 2002-66:1-[36], May 2. http://www-intapps.imf.org/Res/Seminars/SemPapers_all.asp?scope=res
- Prezeworski, Adam and James Raymond Vreeland, 2000, "The effect of IMF programs on Economic Growth", Journal of Development Economics, Vol. 62, pp.385-421.
- Saravia, D., 2003, "On The Role and Effects of IMF Seniority", PhD Dissertation, Chapter 1. University of Maryland at College Park.
- Schadler, S., et al., 1995, "IMF Conditionality: Experience Under Stand-By and Extended Arrangements", Part I: Key Issues and Findings. IMF Occasional Paper 128 and Part II: Background Papers. IMF Occasional Paper 129.
- Stone, R., 2002, Lending Credibility, Princeton: Princeton University Press.
- Tirole, J. 2002, "Financial crises, liquidity, and the international monetary system." Princeton: Princeton University Press.

ENDNOTES

-
1. Article I of the International Monetary Fund's Articles of Agreement lists a number of objectives ("purposes") for the Fund. These include international monetary cooperation, facilitation of international trade to enable productive use of resources, exchange rate stability, establishment of a multilateral system of payments, and confidence to its members by making available the general resources of the Fund to permit "correction of maladjustments" in their balance of payments without a high cost to the domestic or international economy.
 2. Each member country is required by Article IV of the Articles of Agreement to, among other things, foster orderly growth, price stability, and orderly monetary and financial conditions. Article IV authorizes the Fund to oversee compliance of member countries with these obligations. The Fund is asked—and has agreed in the past—to monitor and certify a country's policy program without any commitment of resources. A distinction may be made, in this context, between the role of the Fund's staff and that of its Board. A positive staff report can signal to investors a professional judgment that the country has a credible adjustment program. The Board's approval sends a signal that the international community is prepared to support the country's program. At least in theory, these two signals can be distinct and separable. The Fund's Board "expressed some degree of reservation" about unbundling policy certification (or "enhanced surveillance") from the use of its resources (Boughton [2001, p. 413]).
 3. <http://www.imf.org/external/pubs/ft/exrp/what.htm>
 4. Powell [2002] suggests that a country's response to a Fund program is likely to weaken as its economic situation deteriorates. Supporting that notion, Ivanova, Mayer, Mourmouras, and Anayiotos [2001] find that larger government fiscal deficits, which they believe reflect internal political competition, are associated with more frequent program failure.

-
5. Decision No. 6056-(79/38), March 2, 1979 in IMF [2001b, pp. 167-168.]
 6. In light of results obtained by Stone [2002], loss of credibility when there is a high incidence of program repetition may also reflect that such repetition reflects, in part, political affinity with the United States, which serves to reduce the incentive to undertake demanding reform measures.
 7. Hajivassiliou [1986] has the same interpretation as Ozler [1993] in his estimate of a supply function for capital where he finds that a dummy variable representing IMF programs (and also instances of debt rescheduling) is associated with reduced capital flows.
 8. He classifies countries by a “propensity” score, i.e., by a measure of the likelihood that may be in a Fund program. A country’s propensity is derived from a probit as the probability of IMF program participation and is a function of such variables as growth, inflation, reserves, and current account balances of current and past periods.
 9. Dell’Ariccia, Godde, and Zettelmeyer [2000] follow a similar research strategy but also add as instruments in the probit equation the bonded debt issued in the previous year, the number of bonds issued in the previous year, the natural logarithm of per capita GDP in 1993, and a dummy variable for countries directly affected by the Asian crisis. Ideally, the instruments should influence the issuance decision but not the spreads. It is not obvious that these four variables fulfill that objective and, in practice, it is hard to find such variables. For example, Asian crisis countries were rationed during specific years but also paid higher spreads in those years. Hence, it is not sufficient to rely on exclusion conditions.
 10. Of the 3295 bonds issued during this period, spreads are available on 3066 bonds. We “lose” another 76 bonds due to absence of complementary information. The ratio of bonds

issued by countries in IMF programs is almost the same whether we consider all bonds or only those that have the necessary information required for the analysis.

11. Results were similar also when considering short-term to total debt.

12. The country chooses to continue the arrangement and pay the commitment fee rather than simply canceling it.

13. The median size of “outset” precautionary programs is about 40 million SDRs whereas that for “turned” precautionary programs is almost 10 times larger at 330 million SDRs. When normalized by country debt, the “turned” precautionary programs are still much larger.

14. The analysis here includes those loans that were made under “exceptional circumstances” and were thus similar in intent to the SRF. Countries that have contracted an SRF and used it as precautionary include Brazil (1998), Korea (1999), Mexico (1995 and 1997) and Thailand (1997).

15. The gold standard, which apparently did provide a “good housekeeping seal,” was associated with a narrow range of prudential macro policies (Bordo and Rockoff [1996]). In contrast, the current range of IMF member countries—and the variety of economic challenges facing them—leads to a much larger variation in appropriate economic policy measures.

Obstfeld and Taylor [2002] conclude even in the case of the gold standard that its credibility was diminished in the interwar period (1925-1931) and unlike Bordo, Edelstein, and Rockoff [1999], they find that only those who devalued before reentering the gold standard benefited in the form of lower spreads. The implications of the Obstfeld and Taylor analysis is, thus, similar to ours: country conditions matter in determining the credibility of policy actions.

16. It is not straightforward to distinguish a “good” catalytic effect from a “bad” one in which moral hazard predominates. We find that Fund effectiveness in catalyzing flows declines as the

country's own repayment capacity becomes less credible, which suggests that moral hazard is not dominant. Moreover, moral hazard is likely to reflect itself in cross-country effects rather than a renewed burst of imprudent lending to the country that enters into a Fund program (Lane and Philips [2000]).