Comments welcome.

The Revolving Door: Duration and Recidivism in IMF Programs

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Abstract

Quarterly evidence on participation in IMF programs for the period 1974-2003 is examined statistically using the techniques of hazard analysis and error-correction estimation. Three hypotheses are proposed and tested, and the results support a "revolving door" explanation of participation in IMF programs. First, an increase in cumulative prior participation in IMF programs is found to cause a reduction on average in the length of a new spell of participation. Second, the length of time between participation spells is reduced significantly with an increase in cumulative prior participation in IMF programs. Third, the evolution of reserve adequacy is shown to be significantly and positively affected by participation in IMF programs.

The results depict a revolving door to IMF participation, and for those countries with prior participation the door revolves more rapidly. This result is shown to depend critically upon the mix of countries considered. The increase in recidivism is a phenomenon most strongly observed among the least developed countries, while the reduction in duration is more strongly observed in the emerging and transition economies. These results are derived while controlling for country-specific unobserved heterogeneity, year-specific demand effects, external shocks, and pre-existing policy distortions.

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International Monetary Fund (IMF) activities have been subject to many criticisms from the 1970s to the present. One recurring criticism is that participation in IMF programs leads to continued dependence upon IMF resources among its borrowing members.[1] The evidence on prolonged use of IMF resources indicates that the temporary nature of IMF lending foreseen by its Articles of Agreement is no longer the norm. [2] Is participation in IMF programs causing this prolonged use of IMF lending? This paper provides the answer for a sample of participating countries in the period 1974-2003.

The IMF Articles of Agreement created the IMF purchase/repurchase facility to provide temporary balance-of-payments support to member countries. The framers of the Articles of Agreement were determined that this support be temporary. To operationalize this, a policy of conditionality evolved over time: countries participating in this facility were required to agree to conditions limiting the country's macroeconomic policies. IMF staff members designed these conditions to ensure that the participating country exited quickly from its balance-of-payments difficulties. I will refer to this combination of purchase/repurchase facility and associated conditions on macroeconomic policy as an IMF program.

The number of IMF programs undertaken by developing countries was small in the early decades of IMF operation, but programs proliferated in the 1970s with the twin oil crises. The number of IMF programs with developing countries has been growing ever since. Controversy

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1 Three sources provide a good overview of this argument. The Meltzer Commission (IFIAC 2000, p. 25) writes of "disincentives for debt resolution" of IMF activities in lending to "insolvent sovereign borrowers". Stiglitz (2002, p. 44) describes conditionality that weakens the participating economy so that it cannot service its debts over time. The Independent Evaluation Office (2002, p. 27) of the IMF devoted its first report to the phenomenon of prolonged use of IMF resources by member countries. It cites a number of reasons, including the one presented in the text, for why this phenomenon should be worrisome to the international financial community.

2 Independent Evaluation Office (2002) defines a "prolonged user" as a country that spent at least seven years

about the effectiveness of IMF programs in the developing-country context surfaced in the 1970s as well. Williamson (1982) surveys the early controversy, while Spraos (1986) summarizes the early case in describing the IMF's contribution in these programs as "ineffectual, misguided, mistargeted". Further controversy emerged in the early 1990s around the IMF programs for Russia and other former members of the Soviet Union.[3] Most recently, the debate over the role of IMF programs in precipitating the Asian Crisis of 1998 was quite contentious; many observers attributed the collapse of these economies in part to the effect of conditions associated with IMF programs.[4]

Most of the research on participation in IMF programs (as summarized, for example, by Ul Haque and Khan (1998)) has been static in nature. These studies include Joyce (1992), Edwards and Santaella (1993), Conway (1994), Bird (1995), Knight and Santaella (1997), Thacker (1999), Przeworski and Vreeland (2000), Bird and Rowlands (2001), and Dreher and Vaubel (2001). Typically, a binary dependent variable indicates participation or non-participation in an IMF program; the independent variables included are chosen to reflect both economic and political factors. The goal of these exercises is to define those characteristics most commonly associated with observed participation, and they rely heavily on cross-country differences in discovering the common explanatory factors.

The question raised here is dynamic in nature, and thus requires a different approach. Among recent papers, Bird and Rowlands (2000), Bird, Hussain and Joyce (2001) and Joyce (2001) have searched empirically for the determinants of a country's propensity to extend its use of IMF

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of the preceding 10 in IMF programs.

3 Arbatov (1992) is a good example of this criticism.

4 Martin Feldstein and Jeffrey Sachs were two economists critical of the IMF programs in Asia -- see Feldstein (1998), Sachs (1997) and Sachs (1998) for their arguments. Rosett (1999) provides a good summary of these criticisms.

resources over many programs. Independent Evaluation Office (2002) examined the causes of prolonged use through econometric analysis and case studies. This paper goes beyond those papers in three dimensions. First, the concept of an IMF program is discarded in favor of a "spell" of participation. Countries have been quite successful in negotiating strings of consecutive programs with the IMF, and in this paper each multi-program string will be a single spell. Second, the member government's decision to initiate or continue participation in an IMF program will be modeled explicitly. IMF programs are an important, and in some cases irreplaceable, source of foreign-exchange reserves. The member government will reassess its reserves strategy frequently. While it is common in the literature on IMF program evaluation to use annual, or 5-year average, observations, I will use quarterly data to approximate more closely the decision horizon of the member government. Third, a panel data set will be created for 105 developing and emerging countries during the period 1974-2003. The econometric technique exploits both cross-sectional and time-series variation in the data. Econometric difficulties of unobserved heterogeneity and dynamic after-effects of programs are modeled explicitly. I also consider structural differences in participation dynamics: in the first instance, between least-developed and other developing countries; in the second instance, between pre-1991 episodes and post -1990 episodes.

This paper decomposes prolonged use of IMF programs into two dynamic components: duration and recidivism. The duration of IMF participation is the average length of a participation spell. If IMF-program participation has the weakening effect cited by critics, then it should, ceteris paribus, lengthen the duration of IMF participation. By contrast, an IMF program effective in addressing the causes of balance-of-payments deterioration should shorten the duration of participation in future IMF programs. Recidivism refers to the necessity of a participating country to

begin a new spell soon after having completed a previous spell, and is measured by the length of the period between participation spells. If IMF programs have the weakening effect cited, then the recidivism evident in formerly participating countries should be increased: there should, ceteris paribus, be shorter periods between spells. By contrast, an effective IMF program should reduce the degree of recidivism.

I. IMF programs.

In the period from the beginning of 1974 to the end of 2003, the IMF offered five types of program agreements.[5] The Stand-by Arrangement (SBA) was an agreement by the IMF to allow the member country to draw down a percentage of its quota, also in hard currency. Repayment (or, more properly, repurchase) under these stand-by agreements occurred usually over a single year, although exceptions were made in some circumstance. The Extended Fund Facility (EFF) was an agreement to allow members to draw down some percentage of their quota, but with repayment scheduled over a longer (often 3-year) period. These agreements were first extended in September 1974. The Structural Adjustment Facility (SAF) and Extended Structural Adjustment Facility (ESAF) were introduced in the 1980s at more concessional payment terms for low-income countries. The SAF had a similar repayment period to the EFF, but was extended to members whose balance of payments difficulties were viewed to be more systemic, or structural, in origin. The ESAF was designed to provide longer repayment periods than the SAF for countries with especially difficult structural adjustments to complete. In 1999 the IMF introduced the Poverty Reduction and Growth

5 In some cases, countries were able to negotiate a hybrid of more than one of these types. There were other facilities offered by the International Monetary Fund as well that provided financing without the notion of conditionality associated with the programs cited. These other facilities included the Compensatory Financing Facility, the Buffer Stock Financing Facility and the Oil Facility, and participation in these is not considered here. The Supplementary Financing Facility, established in 1979, provided added resources (from borrowed funds rather than subscriptions) to participating countries; this facility was only available in tandem with one of the five programs noted in the text.

Facility (PRGF). This facility disbursed jointly with World Bank lending to least-developed countries that had prepared a Poverty Reduction Strategy Paper outlining their long-term approach to poverty reduction and growth.[6]

For the 105 countries considered here, sixty-three percent of the quarterly observations in the sample were characterized by non-participation. Stand-by programs characterized 19 percent of the country-quarters considered, while participation in PRGF (including SAF and ESAF) was 11 percent and in EFF was 7 percent. Unscheduled termination of existing agreements occurred in only 1 percent of the sample, with such failure leading to adoption of a new program in the same quarter in around 70 percent of those cases and to no new program in the remainder.[7]

Participation in IMF programs is not randomly distributed; rather, participation in the preceding quarter is a strong predictor of participation in the present quarter. The transition matrix is given in Table 1. Persistence in non-participation is not surprising, for IMF programs are set up to be used in external-payments crisis situations. The data indicate that in nearly 95 percent of the cases, a country not participating in an IMF program continues its non-participation in the next period. Those adopting an IMF program after not participating the previous period were just over 5 percent of the sample. Table 1 also indicates substantial persistence in participation in IMF programs. Some degree of this is not surprising, given the quarterly nature of the data. The typical SBA has one-year duration, and EFF, SAF and ESAF programs typically have three-year designs. The data indicate that in over 90 percent of the cases, participation in the preceding quarter led to participation in the present quarter.

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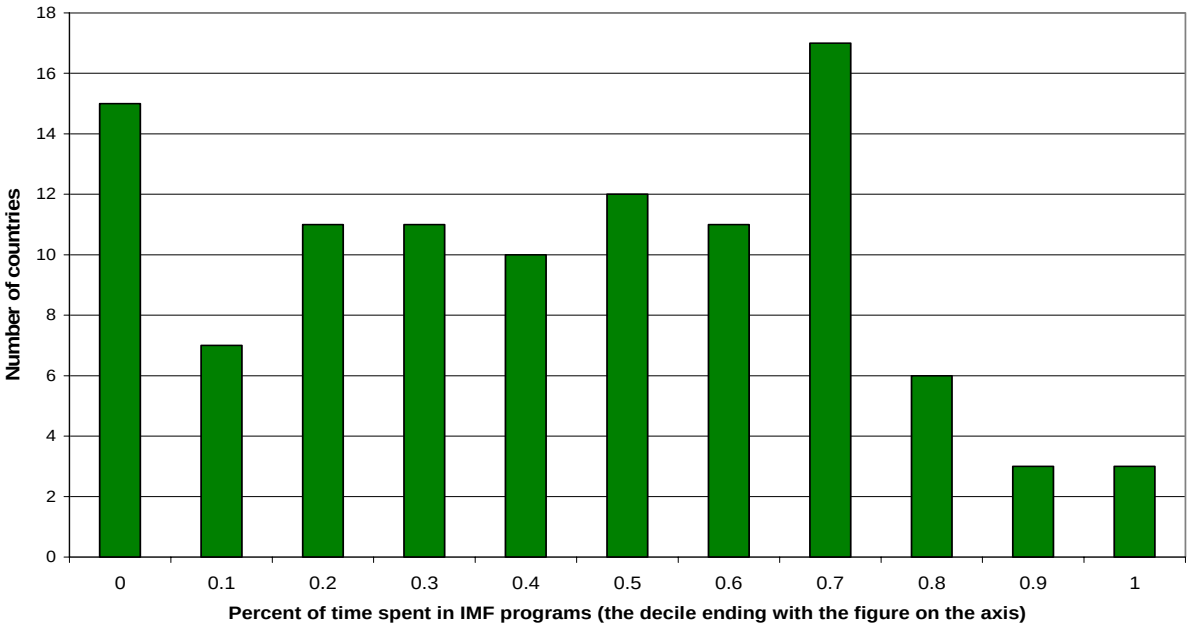
6 The IMF also employed a Structural Transformation Facility (STF) in lending to transition economies. Its characteristics were similar to the ESAF, and thus will not be considered separately here.

7 Unscheduled termination is only one type of possible program failure. A more common failing is the countries' inability to satisfy the conditions attached to the IMF program. This typically did not lead to unscheduled

Figure 1: IMF Participation from 1974 to 2003



The 105 developing countries in the sample can be differentiated as in Figure 1 by the degree of participation with the IMF.[8] Fifteen of the countries did not undertake an IMF program during the sample period. The modal decile, however, was characterized by between 60 and 70 percent of the total period spent in IMF programs. Twelve countries had greater than 70 percent participation, including seven transition economies as well as Mozambique, Kenya, Philippines, Uruguay and Panama.

Programs vs. spells. IMF programs are contracts between the IMF and the member country. As such, the duration of each program is specified as a term of the contract. In practice, however, member countries and the IMF have repeatedly reached agreements over this period to have one IMF program begin just as the previous one has ended, or to terminate one IMF program and replace it

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termination, but to non-disbursement of funds on schedule.

8 The percentages of participation are calculated over the time in membership in the IMF. For the former Soviet economies, for example, this percentage is calculated over the period from 1992. Mozambique, cited in the

with another.[9] Under these circumstances, the duration of the program is not of interest – more important is the set of consecutive agreements between the IMF and the member country. This will be called a "spell".[10] Consider the example of Kenya during the period from 1974 to the present. As Table 2 indicates, Kenya and the IMF agreed upon 14 different programs over this 30-year period. Of the 14 programs, five were terminated prior to the contractual expiration date and two were extended by mutual agreement beyond the expiration date. In each case, the terminated program was replaced immediately (i.e., the next day) by a new IMF program. Kenya's experience with the IMF can be grouped into five spells: July 1975 through February 1986, February 1988 through March 1993, December 1993 through December 1994, April 1996 through April 1999, and August 2000 to the present.[11] Kenya was thus participating in one or another IMF program for 78 percent of the period under consideration. While Kenya's participation in IMF programs can be classified as above-average for the period, its experience is not atypical.

While there were over 600 IMF programs agreed upon for the period 1974:1 to 2003:1, there were only 280 separate spells of IMF participation among the 105 countries considered in this paper. Of these participation spells, two sets are excluded from the analysis that follows: the 16 already begun in 1974:1 and the 40 continuing in 2003:1. Figure 2 illustrates the distribution of the remaining 234 spells by the duration of the spell.[12] There are large numbers of spells with 4

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text, began its membership in 1984.

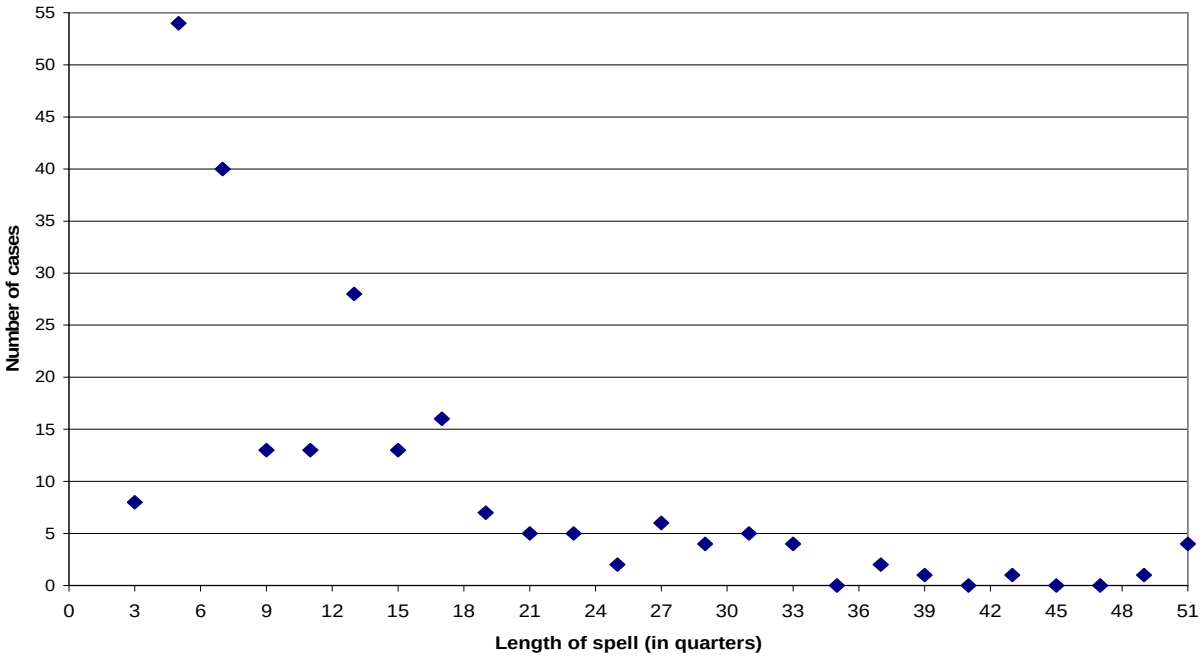
9 Conway (2005a) provides a theoretical rationale for this stringing together of programs based upon cooperative game theory.

10 I define a spell as a period of participation in which the country's acceptance of IMF programs is continuous or broken by no more than one-quarter year of non-participation between IMF programs.

11 There are in some cases multi-month breaks between these programs, but none that led to more than one quarter of non-participation.

12 The data in this figure are organized in groups of two durations: for example, the data point indicating 54 spells with duration 5 summarizes those spells with durations of 4 quarters or 5 quarters. Similarly, the data point indicating 28 spells with duration 13 is the group of spells with durations of 12 or 13 quarters. Those four spells with

Figure 2: Spells in IMF Programs



quarters, and with 12 quarters, as suggested by the typical contractual length of an IMF program. It is striking, though, to note the large number of spells differing from those.

II. Entry or exit from IMF programs.

A country's transition matrix can be summarized in two probabilities: the probability θ_{xct} that country c in an IMF spell in period t will end the spell before t+1, and the probability θ_{nct} that country c not in an IMF program in period t will begin a spell in period t+1. Table 2 provides average transition probabilities of $\theta_x = .085$ and $\theta_n = .052$, but these ignore the time-dependent nature of this transition probability and the spectrum of possible determinants. To derive the impact of cumulative prior IMF participation on current entry and exit from IMF programs, I specify a model of economic determinants of entry and exit based upon a theory of reserves adequacy. I then estimate a model based on that theory including as well an indicator of cumulative prior IMF

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duration greater than 50 quarters are grouped in the last data point: the longest spell is actually 76 quarters.

participation.

A model of entry and exit. Consider a member government in country c evaluating the costs and benefits of an IMF program. The per-period cost of participating in the program is taken as given by K_c, while the per-period benefit from participation is rising (represented by monotonic function $\psi(.)$) with the extent to which an indicator of reserves adequacy R_{ct} falls below a critical level r_{ct}.[13] Since decisions can be reconsidered on a period-by-period basis, the decision to enter a program in period t will require

$$K_c < \psi(r_{ct} - R_{ct}) \tag{1}$$

The reserves-adequacy indicator will evolve through time in response to net exports and random shocks.[14] I represent that evolution as:

$$R_{ct} = R_{ct-1}(1+\rho) + x_{ct} + \varepsilon_{ct} \tag{2}$$

Reserves adequacy today will be an increasing function of adequacy last period. Positive net exports will improve reserves adequacy by increasing reserves, while a random shock ε_{ct} will also alter the country's reserve adequacy. As is evident in (1) and (2) prior participation in IMF programs does

13 The reserves-adequacy indicator includes non-borrowed reserves. The degree to which reserves can be borrowed by the country to meet its demands will be captured in the critical minimum reserves indicator r_{it}.

14 The reserves-adequacy indicator could represent a number of different foreign reserves-based statistics. The reserves/import ratio is a traditional indicator. The reserves/external liabilities ratio is another indicator that has become more relevant in recent years with the importance of capital-market flows to external balance. The concept used here could be operationalized with either of these.

not enter the entry/exit decision directly.

Net exports by country c in period t (x_{ct}) are assumed to exhibit country-specific (χ_{xc}) behavior. There will also be a time-specific (υ_{xt}) component that captures world demand conditions, a positive response to improvement in its terms of trade (T_{ct}) and a positive response to depreciation of its real exchange rate (S_{ct}). There is a posited direct improvement in net exports due to the reforms embodied in the conditionality associated with a current IMF arrangement (D_{ct}), and an indirect improvement conjectured through reforms that alter the real exchange rate. In the discussion that follows, I will treat all movement in the real exchange rate observed during a period as having been a product of policies of that period. The cumulative prior participation in IMF programs (CD_{ct}) is posited to have an effect η_x on x_{ct}: positive in the "traditional IMF" view, and negative in the "dysfunctional IMF" view. The critical reserves indicator (r_{ct}) is assumed to vary with country-specific differences in preferences (χ_{rc}) and to vary by year with world financial capital availability (υ_{rt}). The real Eurodollar interest rate (E_t) is introduced as a proxy for the common cross-country cost of borrowing to meet foreign-exchange needs. CD_{ct} is introduced to indicate the effect on ability to borrow to cover reserve needs: its coefficient η_r will be positive in the "traditional IMF" view, and negative in the "dysfunctional IMF" view..[15]

$$x_{ct} = \chi_{xc} + \upsilon_{xt} + \sigma\, T_{ct} + \xi\, S_{ct} + \varphi_x\, D_{ct} + \eta_x\, CD_{ct} \tag{3}$$

$$S_{ct} = S_{co} + s_I\, D_{ct.} \tag{4}$$

$$r_{ct} = \chi_{rc} + \upsilon_{rt} + \tau\, E_t - \eta_r\, CD_{ct} \tag{5}$$

15 A referee suggested that the critical reserves indicator could depend upon official transfers as well. In

The transition probabilities for a given country c at time t can be defined:

$$\theta_{xct} = \Pi(K_c>\psi(r_{ct}-R_{ct})|\ K_c<\psi(r_{ct-1}-R_{ct-1})) = \Pi(\varepsilon_{xct} > \Delta\upsilon_{rt}+\tau\ \Delta E_t - \eta_r\ \Delta CD_{ct} - \rho R_{ct-1} - x_{ct}) \quad (6a)$$

$$\theta_{nct} = \Pi(K_c<\psi(r_{ct}-R_{ct})|\ K_c>\psi(r_{ct-1}-R_{ct-1})) = \Pi(\varepsilon_{nct} < \Delta\upsilon_{rt}+\tau\ \Delta E_t - \eta_r\ \Delta CD_{ct} - \rho R_{ct-1} - x_{ct}) \quad (6b)$$

with the notation $\Pi(.|.)$ defining the conditional probability that the event occurs and Δ the first-difference operator.

A hazard function specification. After substitution from (3) and (4) and collecting terms, these probabilities can be expressed as hazard functions for entry into and exit from IMF programs:

$$\ln(\theta_{xct}) = \mu_{xc} + \alpha_{xt} + \beta_r R_{co} + \beta_s S_{co} + \beta_T CT_{ct} + \beta_E \Delta E_t + \delta_x CD_{xco} + \varepsilon_{xct} \quad (6x)$$

$$\ln(\theta_{nct}) = \mu_{nc} + \alpha_{nt} + \gamma_r R_{co} + \gamma_s S_{co} + \gamma_T CT_{ct} + \gamma_E \Delta E_t + \delta_n CD_{nco} + \varepsilon_{nct} \quad (6n)$$

The θ_{xct} is the hazard function for exiting an IMF spell. An increase in the hazard indicates a reduction, on average, in the duration of the IMF spell. The θ_{nct} is the hazard function for exiting a spell of non-participation in IMF programs (i.e., entering a program). An increase indicates an increase, on average, in recidivism.[16] The time-specific effects υ_{rt}, υ_{rt-1} and υ_{xt} are represented by the α_{xt} and α_{nt}. Initial conditions on the reserves-adequacy indicator and on the real exchange rate (as of the beginning of the participation or non-participation spell) are R_{co} and S_{co}. To reflect the dynamic effects of terms-of-trade changes on exports, the cumulative change in the terms of trade

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this analysis it is captured in the country-specific term, but an extension to include official transfers explicitly is on my agenda for future research.

16 If the probability distribution function for country c to exit its IMF spell in period t is f(c,t) and the probability of the spell continuing up until t is S(c,t) – also called the survivor function – then $\theta_{xct} = f(c,t)/S(c,t)$.

from the beginning of the spell CT_{ct} is included. The effect of Eurodollar borrowing rates on critical reserves adequacy is captured by ΔE_t. The country-specific, time-independent heterogeneity of the theoretical model (χ_{xc}, χ_{rc}) is reflected in the country-specific effects of exiting (μ_{xc}) or entering (μ_{nc}) a spell. Finally, to test the hypothesis of the paper, CD_{xco} is the percent of the three-year period prior to the beginning of the current participation spell that the country participated in IMF programs, and has coefficient $\delta_x = \eta_r+\eta_x$.[17] CD_{nco} is the analogous participation variable for non-participation spells, and has coefficient δ_n analogously defined.[18] The coefficients β_i and γ_i are assumed invariant over time and across countries for each of the entry or exit hazard rates. δ_i is the average effect of a one-percent increase in prior participation on the respective hazard rate.

The central hypothesis of this paper is that δ_x and δ_n will be non-zero. Many researchers have investigated the evidence that reserve adequacy rises with participation in IMF programs. Khan (1990) provides a typical analysis, with the stock of foreign-exchange reserves used as the indicator of reserves adequacy, and subsequent similar research is summarized in ul Haque and Khan (1998). These papers conclude that participation in IMF programs does in fact improve the adequacy of reserves over time relative to reserve holdings in non-participating countries. The central hypothesis of this paper concerns the initial conditions of the spell. The null hypothesis can be stated: once we control for the other determinants of the duration of a participation (or non-participation) spell, the country's participation in IMF programs prior to the spell will have no impact on duration. The alternative hypotheses cover both the remaining possibilities. For the case

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Lancaster (1990) has a useful development of these probability concepts.

17 Given the specification of (3) and (5), there should also be a term in the lagged value of CD_{xco} and CD_{nco}. This was highly collinear with the value used, and thus is excluded in estimation.

18 Note that the coefficients of CD_{nco} and CD_{xco} thus do not measure the impact of adjustments to IMF participation that occur within the spell under observation. Rather, they measure the impact of prior participation in IMF programs in preparing the country to exit a new spell more quickly.

of duration, they are:

H_1: The duration of participation in an IMF program is lengthened, other things equal, by an increase in the extent of prior participation in IMF programs.

H_2: The duration of participation in an IMF program is reduced, other things equal, by an increase in the extent of prior participation in IMF programs.

H_1 is then a restatement of the "dysfunctional IMF" hypothesis, while H_2 is the "traditional IMF" position. Similar null and alternative hypotheses can be stated for recidivism. The tests of these hypotheses reported here are most similar to Joyce (2001) for analysis of duration and to Bird, Hussain and Joyce (2001) for analysis of recidivism. There are differences in empirical implementation, however, as elaborated below.

III. Estimation of the propensity to enter and exit IMF spells.

The conclusions of this paper rely upon hypothesis tests of the values of the coefficients in the vectors β_i, γ_i and δ_i in (6x) and (6n). The time-specific effects (α_{xt}, α_{nt}) and unobservable heterogeneity (μ_{xc} , μ_{nc}) must be controlled for in estimation, but are not of other interest. For that reason, I employ the proportional-hazard estimation technique of Cox (1972) with stratification and with year-specific fixed effects to eliminate the μ_{ic} and the α_{it}.[19]

Duration: the length of spells. The model of reserves adequacy in (6x) includes four testable predictions about the duration of IMF spells: $\beta_T > 0$, $\beta_r > 0$, $\beta_s < 0$, and $\beta_E < 0$. There is in addition the central hypothesis of this paper: controlling for these other factors, the length of the typical spell is significantly changed as the percent of the 3-year period prior to the spell that was

19 Inclusion of fixed effects in estimation allows for different target levels of reserves, or different propensities to hold reserves against future shocks, across countries. In the hazard estimation they control for the differences in average spells across countries. The hypotheses tested in the paper examine behavior at the margin: abstracting from these differences across countries, what are the impacts of IMF programs? In a later section I consider systematic

spent in IMF programs increases. The traditional IMF hypothesis implies $\delta_x > 0$, while the dysfunctional IMF hypothesis is $\delta_x < 0$.

The complete panel includes 224 incidences of exit from a spell of IMF participation drawn from 84 countries. Data sources and construction are outlined in the appendix. All regressions include year-specific effects and control for unobserved country-specific heterogeneity.[20] The initial twelve observations of the sample were excluded to allow for consistent construction of the CD_{xco} indicator. Left- and right-censored participation spells were excluded. The ratio of foreign exchange reserves to imports (R^m_{ct}) is used as the index of reserve adequacy.[21] Table 3 reports the results of proportional-hazard estimation with the theoretically suggested explanatory variables and with controls for country-specific and year-specific unobserved heterogeneity.

The specification suggested by theory is reported in the first column of Table 3. The predictions of the reserves-adequacy model for exit from IMF spells ($\beta_T > 0$, $\beta_E < 0$, $\beta_S < 0$, $\beta_r > 0$) cannot be rejected. The parameter estimates of β_T (0.07) and β_r (0.93) are both positive and significantly greater than zero, indicating a significant reduction in the duration of an IMF spell for a typical country for improvements in the terms of trade and for an increased initial level of reserves. The parameter estimate of β_E (-0.03) is negative as expected, although it is not significantly different from zero: higher real interest rates are associated with longer duration of IMF spells. The parameter estimate of β_S is also negative (-0.37) as expected, though insignificantly different from zero: an initially appreciated real exchange rate leads to an increased duration of IMF spells.

The test of the central hypotheses of IMF participation is given in the coefficient δ_x (0.20).

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differences between the least-developed and other developing countries.

20 The initial specification of the equations followed (6x) and (6n) in including the first difference in the real Eurodollar rate (ΔE_{t-1}). This proved to be insignificant in all cases, and was replaced by E_t in what follows.

21 The impact of alternative specifications of R_{ct} on the results reported here are found in Conway (2001).

This is significantly greater than zero, indicating a rejection of the dysfunctional hypothesis. The duration of IMF spells is reduced significantly with increased cumulative prior participation. The hazard ratio for this coefficient is 1.225, indicating that a country that spent the previous 3 years in IMF programs will on average have a 22 percent quicker exit from a subsequent IMF spell than a country that spent none of the previous 3 years in IMF programs.

Using the theoretically desired specification is rather costly in terms of lost observations. The number of spells for which the real exchange rate is available is only 139, as opposed to the 187 spells available when that variable is excluded. The results from an analysis excluding the real exchange rate are reported in the second column of Table 3. The reserves-adequacy model is once again consistent with the data, although in this case the sign of the coefficient on E_t becomes positive, contrary to prediction, but remains insignificantly different from zero. Most importantly, the coefficient on cumulative participation in IMF programs (0.25) remains positive and significant, and even larger than in the previous case. The hazard ratio in this case is 1.28.

When all regressors other than the cumulative participation variable are excluded, there are 224 spells available for 84 countries. In this case, the coefficient on cumulative IMF participation (0.15) remains both positive and significantly different from zero, with hazard ratio of 1.09.

The results of Table 3 offer consistent support to the reserves-adequacy model and a consistent rejection of the "dysfunctional IMF" hypothesis in favor of the "traditional IMF" hypothesis.[22] Joyce (2001) also examined duration of IMF programs, but his results are not directly comparable. He does not test the central hypothesis of this paper, as he does not consider the

22 These results are examined for robustness to inclusion of country-specific effects. When those effects or time-specific effects are omitted, the coefficient estimate of δ_x retains the same sign and significance, but is smaller in absolute value. Testing rejects the hypothesis that the country-specific and year-specific effects are jointly insignificant. These results are available in Conway (2005b).

possibility of repeated spells of participation. His empirical analysis of the determinants of duration is not based in a choice-theoretic model, as here, but in a more eclectic specification: he finds, for example, that poor countries, land-locked countries and countries with greater percentage rural population will have longer duration. He also does not control for country-specific heterogeneity or time-specific effects.

Recidivism: returning to the revolving door. The periods between IMF spells provide information on the recidivism in IMF programs. The model of reserve adequacy in (6n) makes four predictions about the period between IMF spells: $\gamma_T < 0$, $\gamma_r < 0$, $\gamma_s > 0$, and $\gamma_E > 0$. There is in addition the central hypothesis of this paper: controlling for these other factors, the length of the typical non-participation spell is significantly affected as the percent of the 3-year period prior to the spell that was spent in IMF programs increases. The traditional IMF hypothesis is $\delta_n < 0$, while the dysfunctional IMF hypothesis is $\delta_n > 0$. Table 4 reports the results from hazard regressions of (6n). The initial twelve observations of the sample were excised to allow for consistent construction of the CD_{nco} indicator. Left-censored spells of non-participation were excluded as well. The panel data includes 247 non-participation spells drawn from 85 countries.[23]

The first column of Table 4 reports the theoretical specification, but it is not strong in its support of the theory. R^m_{co} enters with the opposite sign to expectation, though insignificantly so. Real exchange rate appreciation at the onset of the non-participation spell (S_{co}) is significantly and negatively correlated with the propensity to enter a new IMF program, contrary to theory. By contrast, both CT_{nco} and E_t have coefficients with the sign predicted by theory, and for CT_{nco} the

23 Spells of non-participation outnumber spells of participation because the spells observed at the beginning and end of the sample are excluded to avoid censoring bias.

coefficient is significantly different from zero. The estimate of δ_n is positive, though insignificant, leading to rejection of both hypotheses in favor of the null: IMF programs in this specification have no impact on recidivism.

The other columns of Table 4 report results from regressions with restricted sets of explanatory variables and larger numbers of spells. In the second column the regression coefficient are in line with the reserves-adequacy model, and those for CT_{ct} and R^m_{co} are significantly different from zero. CD_{nco} has a positive coefficient, once again, and this time it is significantly different from zero. When CD_{nco} is used alone as regressor, this positive coefficient is intensified. The positive and significant coefficient on cumulative participation represents a rejection of the traditional-IMF hypothesis in favor of the dysfunctional-IMF view. This effect grows larger in quantitative terms as the other regressors are dropped and the sample size grows. These effects of IMF programs on recidivism are also in evidence when country-specific and year-specific effects are excluded..[24]

The empirical analysis of recidivism by Bird, Hussain and Joyce (2001) is similar to that of this paper. While there is no choice-theoretic model, the authors include similar regressors in a count-data model and conclude that recidivist borrowers have lower reserve-import ratios and less favorable terms of trade, just as in this paper. They include other variables as well, including indicators of governance that turn out to be significant. They do not investigate the key hypothesis of this paper; nor do they use an econometric methodology that controls for unobserved heterogeneity or year-specific effects.

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24 The results from this robustness check are available in Conway (2005b). Testing rejects the hypothesis that

IV. Characteristics of the "Revolving Door".

The preponderance of evidence in the preceding section suggests the following conclusions:

- The duration of IMF programs is reduced, on average, by an increase in the cumulative participation in IMF programs in the three years preceding the beginning of the program. This effect is significantly different from zero in all specifications.
- The recidivism of IMF programs is increased, on average, by an increase in the cumulative participation in IMF programs in the three years preceding the beginning of a non-participation program. This effect is not significant in the theoretically based specification, but is significant in more restricted models.

While the first result is consistent with the "traditional IMF" hypothesis, the second result favors the "dysfunctional IMF" hypothesis. Consider the analogy to a revolving door to IMF participation. A country enters the revolving door, participates in one or more IMF programs, and then exits IMF participation. Some time later, it repeats the experience. For those countries with little experience with the IMF, this door revolves slowly: participation spells are relatively longer, but so also are spells of non-participation. In countries with extensive experience in IMF programs the revolving door turns more quickly. Each spell of participation is relatively shorter, given the initial conditions, but the time between spells is shorter also.

The overarching empirical question remains. More countries are participating in IMF programs currently than participated in previous decades. If IMF programs are not dysfunctional, then what is the reason for this? Two competing explanations make good sense. The first explanation is based in the evolving mix of countries participating in IMF programs. If there are two

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the true model excludes country-specific and year-specific effects.

types of countries with different determinants of entry and exit. The first type can be one with a shorter "time to enter" an IMF program, other things equal, and the second type can be one with longer "time to enter". If there is growth in the number of countries of the first type over time, then total participation could go up even though cumulative participation may be discouraging re-entry at the margin. The second explanation is based upon changing IMF criteria over time. Suppose that the "traditional IMF" hypothesis describes country behavior in its initial years. If country behavior (and IMF standards) shifted over time to a more permissive stance vis a vis participation, then the results of Tables 3 and 4 represent an effect that averages a traditional earlier period with a much different later period. Our policy concern should be at the margin, and so the most recent behavior is of greater interest to us.

To address the first explanation the countries are divided into two groups -- PRGF eligible and PRGF ineligible – based on their country characteristics. While the PRGF structure is a relatively new initiative of the IMF and World Bank, the notion of devising separate, and differently conditioned, programs for the least developed countries dates back to the Structural Adjustment Facilities introduced in 1980. Thus, a division of the sample of countries into PRGF-eligible and PRGF-ineligible will provide a test for relatively different participation characteristics across the two groups.[25] To address the second explanation, the time period is divided into two parts at the end of 1990. The year 1991 marked a watershed in the activities of the IMF with the emergence of the transition economies. If the borrowing countries' *modus operandi* changed in 1991 then there will be a significant difference in the hazard functions of the pre-1991 and post-1990 periods.[26]

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25 The PRGF status of the countries in the dataset as of 2005 is indicated in Annex A. This classification is maintained for all periods in estimation.

26 This watershed will be properly thought of as a similar, though not identical, change in country behavior. If the IMF were to change its handling uniformly of all participants, then the changes observed would be captured in the

The results in Table 5 provide a test of these two competing explanations in explaining the duration of IMF programs. The table is split into two panels. The top panel reports the results from the theoretical specification for PRGF-eligible countries in the first column and PRGF-ineligible countries in the second column. (The third column restates the results from Table 3 for the complete sample.) The bottom panel reports the results for pre-1991 programs in the first column and post-1990 programs in the second column. If there are significant differences between the two groups of countries in the duration of IMF spells, it will be evident in comparison of the χ^2 value with the critical value, both reported in the last row of each panel.

In the top panel there is little support for the reserves-adequacy model in predicting the duration for PRGF-eligible countries; only the coefficient on reserves is significant and of the correct sign, while the coefficient on initial real exchange rate is significant and of the wrong sign. Further, while the cumulative-participation coefficient is positive, it is not significantly different from zero. For these countries, both "traditional" and "dysfunctional" hypotheses must be rejected in favor of the null that past IMF participation doesn't matter to the duration of a program. The PRGF-ineligible countries are the ones in the sample that validate the theoretical model, and underpin the aggregate results.

The bottom panel makes a similar point, but this time based on a temporal division of the sample. The coefficient signs are the same, and are consistent with the reserves-adequacy model, for both pre-1991 and post-1990 samples. The cumulative participation coefficient is larger and significantly different from zero in the pre-1991 period, but smaller and insignificant in the post-1990 period. The support for the "traditional IMF" hypothesis on duration in the data, in other

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year-specific effects.

words, is largely drawn from the earlier period. These differences are not large, however, as the test of joint significance reported in the last two rows of the panel rejects the explanation that there was a structural change in the hazard function in 1991.[27]

Possible differences in recidivism across countries and across time are addressed in Table 6. The upper panel examines the differences in propensity to return to an IMF program for PRGF-eligible and PRGF-ineligible countries. For the PRGF-eligible countries in the sample, the one significant theoretical determinant is the cumulative terms of trade. The recidivism in IMF programs is reduced significantly by an improvement in the cumulative terms of trade since the last program. There is also a large and significant positive coefficient of cumulative participation in IMF programs. For PRGF-ineligible countries the cumulative participation in IMF programs has an insignificant coefficient. Thus, the significant increase in recidivism for IMF programs evident in the full data set due to prior IMF participation is almost totally due to the behavior of PRGF-eligible countries. This will be true by definition in the current PRGF structure of IMF lending. This table demonstrates, though, that the pattern is also evident in IMF lending from the 1970s on. The test of coefficient stability indicates that the estimated equations for PRGF-eligible and –ineligible countries are significantly different, with a major difference in the contribution of prior participation in IMF programs.

In the pre-1991 period the only significant determinant of the recidivism in IMF participation was the cumulative terms of trade: as this improved, the country was less likely to restart IMF participation. Past participation had limited and insignificant impact on recidivism. In the post-1990

27 This conclusion from the bottom panel is contingent upon the control for year-specific effects. If those year-specific effects are excluded then the explanation of differences in exit probability based on PRGF eligibility is rejected but the hypothesis that the probability of exit has changed in the post-1990 environment is not rejected by the data. See Conway (2005b) for details.

period, the significant difference is found in this estimate of δ_n : it changes from 0.07 to 2.44, and becomes significantly different from zero. Once again, the test of coefficient stability rejects the hypothesis that these two equations are identical, and once again a primary reason is the difference in estimates of δ_n.

The significance of both the time dimension and the PRGF dimension in dividing the sample suggests a third possible explanation for the results observed here. The results in Tables 5 and 6 could simply reflect the shifting make-up of countries in the sample over time. To test this alternative, I redid the previous analysis using 68 countries for which data are available throughout the sample period.[28] The results for duration reinforce the earlier conclusions. The reserves-adequacy model fits the data well for the duration behavior of this sample of countries, but especially for the PRGF-ineligible countries. The dysfunctional-IMF hypothesis is rejected for both groups, but the reduction in duration is greater for the PRGF-ineligible. The estimated δ_n coefficient in the recidivism analysis is negative for this sample, though insignificantly different from zero. The distinction between PRGF-eligible and –ineligible countries in recidivism remains striking: for the PRGF-ineligible countries the "dysfunctional IMF" hypothesis is rejected, while in the PRGF-eligible countries the "traditional IMF" hypothesis is rejected. There are also important differences in the reserve-adequacy determinants of the recidivism of IMF programs: in the 1980s the deterioration of the terms of trade was the most significant cause of increased recidivism, while in the 1990s the increase in international interest rates was the most significant cause of increased recidivism. In both periods in this balanced sample the estimates of δ_n were negative, as predicted by the "traditional IMF" hypothesis, but insignificantly different from zero.

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28 These statistics are not reported here but are available in Conway (2005b).

The preceding results took the initial ratio of foreign-exchange reserves to imports (R^m_{co}) as the indicator of reserve adequacy of importance to countries considering participation in IMF programs. While this is a standard indicator, two others can also be used: the ratio of foreign-exchange reserves plus gold to total external obligations of the country (R^l_{co}) and the ratio of exchange reserves plus gold to imports (R^g_{co}). These series are attractive for what their more complete coverage, but are available for only a subset of the sample used above. The correlations of R^m_{ct} with R^g_{ct} and R^l_{ct} are strong but not perfect, with corr(R^m_{ct}, R^g_{ct}) = 0.93, corr(R^m_{ct},R^l_{ct}) = 0.80, and corr(R^g_{ct},R^l_{ct}) = 0.79. When used in hazard estimation similar to that of Tables 3 and 4, the results are qualitatively identical in this smaller sample.[29] The small number of spells, however, is cause for concern in interpreting the coefficient estimates.

IV. The Evolution of Reserve Adequacy with and without IMF Programs

The hazard estimation of the preceding section tests a relatively limited hypothesis on the impact of prior participation. There is another possible contribution of prior participation: that the speed of adjustment of reserve adequacy to past imbalances will be increased by participation. I investigate this by specifying an error-correction equation in the indicator of reserve adequacy derived from equations (2) through (5).

$$\Delta R_{ct} = \alpha_c + \gamma_t - \Sigma_{i=1}^{n} (\eta_i + \varphi_i D_{ct-i}) \Delta R_{ct-i} - (\eta_L + \varphi_L D_{ct-i}) R_{ct-1} + \varphi_C CD_{ct-1}$$
$$+ \Sigma_{i=1}^{n} (\mu_{Ti} + \tau_{Ti} D_{ct-i}) T_{ct-i} + \Sigma_{i=1}^{n} (\mu_{Si} + \tau_{Si} D_{ct-i}) S_{ct-i} + \varepsilon_{ct} \quad (7)$$

The error-correction specification is one that nests the standard auto-regressive specification but in

29 The statistics are available on request.

addition admits the possibility that the variable responds as well to deviations from long-run values of the time series.[30] If participation in IMF programs improves reserves adequacy over time, then φ_i, φ_L and φ_C should all be positive.

Table 7 reports the results of estimation of (7) with n=4 for the quarterly data available from 1978:1 through 2003:1. There are 6284 usable quarterly observations in the sample in an unbalanced panel from 103 countries. Coefficient estimates for three separate panel regressions are reported. The first two columns report estimates from a regression including both year-specific and country-specific fixed effects.[31] The second set of columns reports the coefficient results from the specification excluding time-specific effects. The third set of columns reports the results from a specification excluding both year- and country-specific effects. The variables T_{ct-i} and $D_{ct-i}T_{ct-i}$ were included as regressors, but were found to be jointly and individually insignificant and were excluded from the regressions reported here. The F statistic reported in the bottom two rows of the table indicates that the third specification is rejected in favor of the second, and the second rejected in favor of the first.

It is evident from the first set of columns that the posited error-correction structure describes the data well.[32] In the absence of an IMF program, reserve adequacy evolves as a simple

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30 Consider the AR(2) function $R_{ct} = a_o + a_1 R_{ct-1} + a_2 R_{ct-2} + \varepsilon_{ct}$. Define $R_c^L = (a_o/(1-a_1-a_2))$. The function can be rewritten $\Delta R_{ct} = - a_2 \Delta R_{ct-1} - a_o (R_{ct-1} - R_c^L)/R_c^L + \varepsilon_{ct}$

31 The coefficients on these fixed-effect terms are not reported, but are available from the author on demand.

32 The simplified error-correction equation estimated is equivalent to an AR(4) model $R_{ct} = a_{co} + a_1 R_{ct-1} + a_2 R_{ct-2} + a_3 R_{ct-3} + a_4 R_{ct-4} + \varepsilon_{ct}$. The coefficients a_i are assumed time- and country-invariant. For those observations not in programs, the implied coefficient values are $a_1 = .63$, $a_2 = .05$, $a_3 = .07$ and $a_4 = .04$. For those observations in programs in the appropriate previous period, the coefficient values are $a_1 = .10$, $a_2 = .02$, $a_3 = .02$ and $a_4 = .02$. For a country with intercept $a_{co} = .20$, these coefficients imply long-run target values of the reserves indicator of (.20/.21) = .95 when there is no program, and (1.41/.84) = 1.68 when in the midst of an IMF spell.

autoregressive variable with significant error-correction adjustment to a long-run level.[33] The lagged difference terms enter with negative and significant signs, as was expected. The coefficient (-0.21) on the lagged indicator R^m_{ct-1} is both negative as expected and significant: it indicates that following a shock to reserves that causes a deviation from the long-run value, the countries reverse 21 percent of the shock per quarter. Put differently, countries will on average return to their long-run reserves-adequacy value within 5 quarters after a shock.

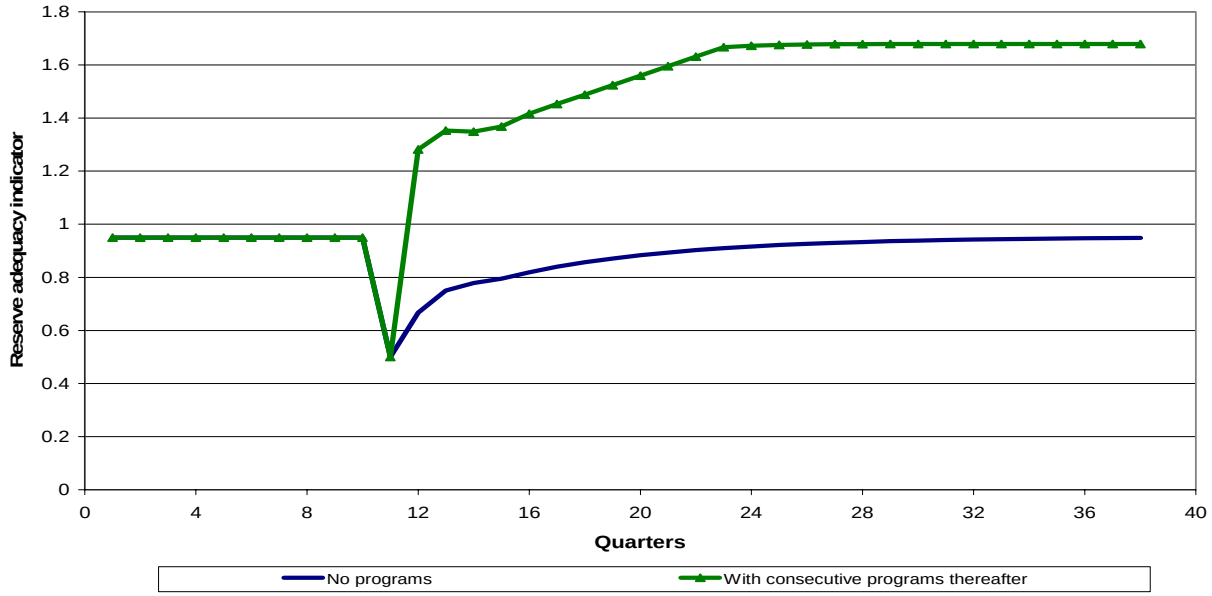
The multiplicands including D_{ct-i} measure the contribution of participation in IMF spells to the evolution of reserves adequacy. Five of these are significantly different from zero. First, the coefficient on D_{ct-1} (0.85) indicates that participation in an IMF spell is worth an increase in reserves in the next period of just under 1 quarter of imports. Second, the coefficient on the error-correction term (-0.63) indicates that adjustment to deviations from long-run reserves-adequacy level are much more rapid for those countries in IMF spells: instead of 5 quarters to adjust, the adjustment takes just over one quarter (i.e., 1/(.21+.63)) : The third and fourth effects work through the appreciation of the real exchange rate. Real appreciation works with a lag (0.39) to increase reserves only in countries that were participating in IMF programs at the time. Countries participating in IMF programs also have lower long-run reserve-adequacy levels (-0.18). The fifth effect is a direct test of the hypotheses put forward in this paper: cumulative participation in IMF spells over the previous three years has the effect of increasing reserve adequacy independently of the other channels mentioned previously. This too is a rejection of the "dysfunctional IMF" hypothesis in favor of the "traditional IMF" hypothesis. All these significant effects tend to reduce any spell of inadequate

33 The long-run level of reserves adequacy is country-specific. It is not separately identified, but is a component of the country-specific effect estimated by the model.

reserves, or to prolong any spell of greater-than-adequate reserves. [34]

Figure 3 illustrates the evolution of reserves in the economy characterized by the estimated equation of the first column of Table 7 in the aftermath of a one-time negative shock in period 10 leading to a near-halving of reserves. The lower curve represents the adjustment over time in the absence of participation in IMF programs. The economy converges once again to its long-run level of 0.95, but the process is gradual. The upper curve represents the effect indicated in the data of participating in consecutive IMF programs from period 11 through the end of the simulation. There is a rapid elimination of the negative reserve shock, followed by accumulation of reserves to end at a new, higher, long-run ratio. Both the speed of adjustment and the steady-state ratio are adjusted upwards by IMF participation.

Figure 3: **Adjustment to Adverse Reserve Shock**



34 In Conway (2001) I investigated this evolution using the three different definitions of reserve adequacy. The impact of participation in IMF programs has qualitatively similar effects for error-correction and lagged difference terms. The impact of cumulative participation for the other indicators is positive, rather than negative, but is once again insignificantly different from zero. The number of observations for which data are available for these two other

This pattern is an average over all periods and all economies in the sample, and thus cannot explain the phenomenon of increased participation in IMF programs. However, the results of hazard estimation suggested that the PRGF-eligible countries will respond differently than PRGF-ineligible countries to IMF participation. This hypothesis is investigated in Table 8. The first set of columns replicates those of Table 7. The second set of columns includes only PRGF-eligible countries, while the third set of columns includes only PRGF-ineligible countries.[35] Three conclusions follow from comparison of these results:

- The autoregressive evolution of the reserve-adequacy variable is a significant feature of the PRGF-ineligible countries. It is evident in the PRGF-eligible countries – but the effects for the PRGF-ineligible are larger and statistically significant.
- The large error-correction effects observed in the total sample are largely driven by the PRGF-eligible countries. While such effects exist and are significant for the PRGF-ineligible countries, they are smaller. For example, a PRGF-eligible country not participating in IMF programs will make up 34 percent of any deviation from long-run levels of reserve adequacy within one quarter; a PRGF-ineligible country will make up only 7 percent within one quarter.
- The positive effect of cumulative IMF participation on reserve adequacy in the total sample is driven by its effect in PRGF-eligible countries. The corresponding effect in PRGF-ineligible countries is insignificant and of the wrong sign.

Figure 4 illustrates the evolution of reserve adequacy in two countries with identical long-run reserve

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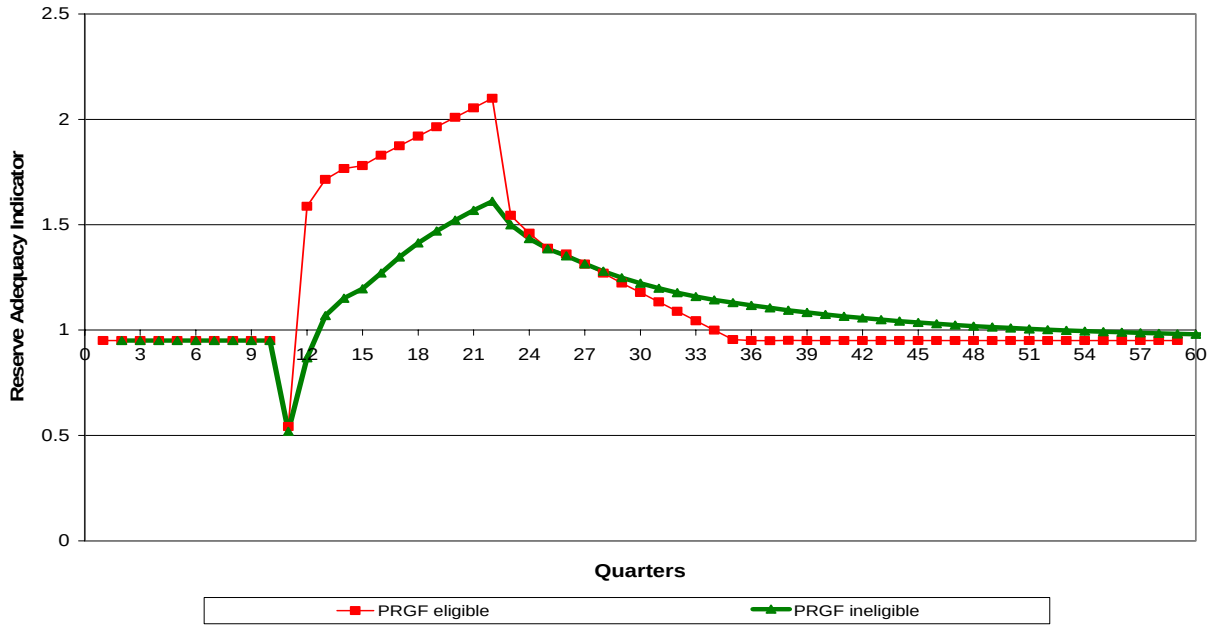
specifications is quite a bit smaller, especially for ΔR^1_{ct}

35 The number of observations in the second and third columns together exceeds that in column one. This is due to the insignificance of real exchange rate effects in PRGF-eligible countries. When these regressors are excluded,

ratios. The first is characterized by the reserves equation from Table 8 for PRGF-eligible countries, and the second by the equation for PRGF-ineligible countries. In this simulation, the same negative shock occurs in period 10. Then the two countries participate in IMF programs for 12 quarters and exit the revolving door. Participation for the PRGF-eligible country leads to more rapid and more positive adjustments to reserve adequacy in the quarters just after the shock. Participation for the PRGF-ineligible countries leads to a bit slower adjustment in reserves adequacy, although for these as well the level of reserves rises above its steady-state level within three quarters after the shock.

Figure 4: **Reserve Evolution in PRGF-eligible and PRGF-ineligible Economies**



A critical feature of comparative evolution occurs in the later periods. The positive effects of IMF participation are quickly dissipated for the PRGF-eligible countries, leaving them by quarter 36 back with their steady-state value of reserves and susceptible to another negative shock. By contrast, the

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the number of available observations increases. All estimation reported in this table included both country-specific and

adjustment back to the steady-state level of reserve adequacy is slower for the PRGF-ineligible countries – they retain "excess" reserve adequacy until quarter 60 that serves as a buffer against negative shocks. This more-rapid dissipation of benefits from IMF participation provides a good explanation for the increased recidivism of PRGF-eligible countries in the data.

V. Conclusions.

Examination of the evidence of quarterly data on participation in IMF spells and the evolution of reserve adequacy for the period 1974:1 to 2003:1 provides a nuanced picture of the revolving door in IMF participation effects. The duration of IMF spells is reduced significantly by prior participation in IMF programs. However, recidivism is increased significantly by such participation. The adjustment of reserves-adequacy indicators to negative shocks is more rapid while participating in an IMF program than when not participating, but the effects are more quickly dissipated for PRGF-eligible countries. Countries participating in IMF programs have a revolving door relationship with the IMF, and this revolving door accelerates with increased prior participation.

When these results are decomposed, it becomes evident that the aggregate picture of a revolving door masks very different behavior by two groups of countries. Those that are PRGF-eligible follow a different dynamic of participation from those that are PRGF-ineligible. While the PRGF designation is a recent innovation in IMF work, the results of this estimation confirm that this differential treatment has been a feature of IMF programs throughout the period since 1974. The evidence on reduced duration is a feature of the PRGF-ineligible countries, while the evidence of increased recidivism is a feature of the PRGF-eligible countries throughout the sample. It is also the

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year-specific effects. Those coefficients are not reported, but are available from the author on demand.

case that this acceleration of the revolving door is more properly a description of the post-1990 period: prior to that, the reduced duration of IMF spells was not matched with an increased speed to re-enter IMF programs.

Extensive testing for the robustness of the results has been done: some is reported here, and the rest is reported in Conway (2005b). The results are robust to the indicator of reserves adequacy chosen. They are also qualitatively robust to the inclusion or exclusion of country-specific and year-specific effects, although quantitative estimates differ. The message from theory is that controlling for otherwise unobserved heterogeneity in country and year outcomes is appropriate and necessary. It will be useful in future research to investigate carefully the potential sources of this heterogeneity in more detailed datasets.

The use of quarterly data is an important innovation. There is a rich dynamic in this frequency of data that is smoothed out in annual empirical studies. While the annual-data studies can drawn upon more varied cross-country economic data, they abstract from the short-term dynamics that are at the heart of the research questions posed here.

The analysis of this paper sheds little light on the question of whether the IMF should support lengthy spells of IMF programs. As the Meltzer Commission states, "Whatever the wisdom of these programs, their longevity is a clear sign that the IMF has departed from the principle of providing member states exclusively short-term balance-of-payments assistance as envisaged by its founders." (IFIAC 2000, p. 20) The research reported here addresses narrower questions. First, does prior participation have a positive effect in shortening future IMF programs? The historical record says yes. Second, does prior participation have the effect of lengthening the period between IMF programs? The record says no.

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Table 1: **Transition in IMF Programs**

		Period t+1	
		Participation (percent, count)	Non-participation (percent, count)
Period t	Participation	91.5 3471	8.5 321
	Non-participation	5.2 332	94.8 6073

Total observations: 10197
Drawn from the sample of 105 countries.

Table 2**: Programs and Spells in Kenya, 1974-2003**

Program	Arrangement Date	Expiration (or Cancellation) Date	Percent disbursed	Spell
EFF	7/7/75	7/6/78	11	1
Stand-by	11/13/78	8/19/79 *	100	1
Stand-by	8/20/79	10/14/80 *	0	1
Stand-by	10/15/80	1/7/82 *	37	1
Stand-by	1/8/82	1/7/83	60	1
Stand-by	3/21/83	9/20/84	100	1
Stand-by	2/8/85	2/7/86	100	1
Stand-by	2/1/88	5/15/89 *	74	2
SAF	2/1/88	5/15/89 *	28	2
ESAF	5/15/89	3/31/93 **	83	2
ESAF	12/22/93	12/21/94 **	100	3
ESAF	4/26/96	4/25/99	17	4
PRGF	8/04/00	8/03/03	18	5
PRGF	11/21/03	11/20/06	…	5

Source: International Monetary Fund, Annual Report, various issues.

* - Program cancelled before expiration date.
** - Program extended beyond contractual expiration date.

Table 3**: Proportional-hazard Estimation Results for θ_{xct}**

	Full specification		Excluding real exchange rate		Cumulative participation alone	
	Estimate	χ^2	Estimate	χ^2	Estimate	χ^2
δ_x (CD_{xco})	0.20 **	11.67	0.25 **	25.95	0.15 **	16.55
β_T (CT_{ct})	0.07 **	5.37	0.04 **	9.91		
β_r (R^m_{co})	0.93 **	7.24	0.46 **	8.66		
β_S (E_t)	-0.03	0.04	0.11	1.37		
β_S (S_{co})	-0.37	1.73				
Spells	139		187		224	
C: Number of countries with spells	65		77		84	
LR χ^2 test	106.85 **		97.79 **		88.52 **	
-2 Ln L	314.10		568.52		787.26	
-2 ln L (no covariates)	420.96		666.31		875.79	

Also included in each proportional-hazards model: C country-specific fixed-effect terms and 25 year-specific dummy variables. Coefficients of these are not reported, but are available on request.

* - indicates significance at 90 percent level of confidence. ** - indicates significance at 95 percent level of confidence.

Table 4**: Proportional-hazard Estimation Results for θ_{nct}**

	Full Specification		Real Exchange Rate Excluded		Cumulative participation alone	
	Estimate	χ^2	Estimate	χ^2	Estimate	χ^2
δ_x (CD_{nco})	1.73	4.07	2.51 **	21.75	2.94 **	49.16
β_T (CT_{ct})	-0.05 **	6.10	-0.04 **	17.35		
β_r (R^m_{co})	0.32	1.21	-0.52 **	7.15		
β_S (E_t)	0.15	1.30	0.11	2.13		
β_S (S_{co})	-0.38 *	3.00				
Spells	139		199		247	
C: Number of countries with spells	62		75		85	
LR χ^2 test	88.73 **		94.59 **		90.77 **	
-2 Ln L	365.71		706.08		988.26	
-2 ln L (no covariates)	454.44		800.68		1079.04	

also included in each proportional-hazards model: C country-specific fixed-effect terms and 25 year-specific dummy variables. The coefficients of these are not reported, but can be obtained from the author on request.

* - indicates significance at 90 percent level of confidence. ** - indicates significance at 95 percent level of confidence.

Table 5**: Splitting the Sample: Estimation Results for θ_{xct}**

	PRGF eligible		PRGF ineligible		Total	
	Estimate	χ^2	Estimate	χ^2	Estimate	χ^2
δ_x (CD_{xco})	0.14	2.65	0.31 **	9.46	0.20 **	11.67
β_T (CT_{ct})	0.02	0.40	0.14 **	12.01	0.07 **	5.37
β_r (R^m_{co})	0.73 **	10.54	0.97 **	3.93	0.93 **	7.24
β_S (E_t)	-0.03	0.03	-0.24	1.65	-0.03	0.04
β_S (S_{co})	0.42 *	3.09	-0.65 *	3.45	-0.37	1.73
Spells	67		72		139	
Test of coefficient stability	df 5		Critical χ^2	11.07	χ^2 value	4.42
	Pre-1991		Post-1990		Total	
	Estimate	χ^2	Estimate	χ^2	Estimate	χ^2
δ_x (CD_{xco})	0.26 **	10.80	0.08	0.95	0.20 **	11.67
β_T (CT_{ct})	0.03	0.47	0.06 *	3.56	0.07 **	5.37
β_r (R^m_{co})	2.57 **	10.97	0.53 **	6.21	0.93 **	7.24
β_S (E_t)	-0.06	0.15	-0.27	1.61	-0.03	0.04
β_S (S_{co})	-0.25	0.64	-0.67	1.56	-0.37	1.73
Spells	52		87		139	
Test of coefficient stability	df 5		Critical χ^2	11.07	χ^2 value	1.05

also included in each proportional-hazards model: C country-specific fixed-effect terms and 25 year-specific dummy variables.

The χ^2 statistic in the final row of each panel is a test for coefficient stability.

* - indicates significance at 90 percent level of confidence. ** - indicates significance at 95 percent level of confidence.

Table 6**: Splitting the Sample: Estimation Results for θ_{nct}**

	PRGF-eligible		PRGF-ineligible		Total	
	Estimate	χ^2	Estimate	χ^2	Estimate	χ^2
δ_n (CD_{nco})	4.98 **	10.70	0.21	0.03	1.73 **	4.07
β_T (CT_{ct})	-0.08 **	8.45	-0.04	1.78	-0.05 **	6.10
β_r (R^m_{co})	0.21	0.14	0.32	0.82	0.32	1.21
β_S (E_t)	0.17	0.93	0.17	1.25	0.15	1.30
β_S (S_{co})	0.02	0.00	-0.60 *	3.44	-0.38 *	3.00
Spells	67		72		139	
Test of coefficient stability	df 5		Critical χ^2	11.07	χ^2 value	11.72
	Pre-1991		Post-1990		Total	
δ_n (CD_{nco})	0.07	0.00	2.44 **	6.36	1.73 **	4.07
β_T (CT_{ct})	-0.18 **	21.76	0.01	0.09	-0.05 **	6.10
β_r (R^m_{co})	0.21	0.35	0.06	0.03	0.32	1.21
β_S (E_t)	0.08	0.36	0.44	2.00	0.15	1.30
β_S (S_{co})	-0.42	1.75	-0.59 **	4.09	-0.38 *	3.00
Spells	52		87		139	
Test of coefficient stability	df 5		Critical χ^2	11.07	χ^2 value	22.52

also included in each proportional-hazards model: C country-specific fixed-effect terms and 25 year-specific effects.

* - indicates significance at 90 percent level of confidence. ** - indicates significance at 95 percent level of confidence

Table 7: **The Impact of IMF Participation On Reserve Holdings**

	R^m_{co}		R^m_{co}		R^m_{co}	
	Estimate	t statistic	Estimate	t statistic	Estimate	t statistic
ΔR^m_{ct-1}	-0.16 **	2.17	-0.18 **	2.49	-0.27 **	3.73
ΔR^m_{ct-2}	-0.11	1.49	-0.12	1.63	-0.19 **	2.60
ΔR^m_{ct-3}	-0.04	0.57	-0.04	0.54	-0.08	1.17
R^m_{ct-1}	-0.21 **	5.60	-0.16 **	4.17	-0.02	0.97
$D_{ct-1}\Delta R^m_{ct-1}$	0.10	1.37	0.10	1.35	0.12 *	1.68
$D_{ct-2}\Delta R^m_{ct-2}$	0.07	0.96	0.06	0.86	0.09	1.22
$D_{ct-3}\Delta R^m_{ct-3}$	0.02	0.21	0.00	0.07	0.03	0.37
D_{ct-1} R^m_{ct-1}	-0.63 **	14.70	-0.65 **	15.22	-0.70 **	20.55
D_{ct-1}	0.85 **	8.47	0.87 **	8.51	0.92 **	9.59
CD_{ct-1}	0.36**	2.90	0.33 **	2.68	0.13	1.19
ΔS_{ct-1}	-0.04	0.44	-0.08	0.97	-0.07	0.84
ΔS_{ct-2}	-0.05	0.54	0.00	0.05	-0.00	0.01
ΔS_{ct-3}	-0.02	0.24	0.02	0.26	0.02	0.22
S_{ct-1}	0.06	0.04	-0.05	1.22	-0.03	0.69
$D_{ct-2}\Delta S_{ct-2}$	0.05	0.28	0.04	0.22	0.05	0.26
$D_{ct-3}\Delta S_{ct-3}$	0.39 **	2.19	0.39 **	2.16	0.40 **	2.18
$D_{ct-1}S_{ct-1}$	-0.18 **	2.72	-0.16 **	2.47	-0.19 **	3.12
Intercept					0.02	0.41
Year-specific	Yes		No		No	
Country-specific	Yes		Yes		No	
R^2	0.44		0.44		0.42	
N	6284		6284		6284	
SSE	30506		30889		31607	
SSR	24390		24006		23288	
DF	138		114		17	
F statistic		3.22		1.47		
Critical value (95^o)		1.52		1.25		

also included in each proportional-hazards model: C country-specific fixed-effect terms and 25 year-specific effects.
* - indicates significance at 90 percent level of confidence. ** - indicates significance at 95 percent level of confidence

Table 8: **The Impact of IMF Participation On Reserve Holdings**

	All		PRGF-eligible		PRGF-ineligible	
	Estimate	t statistic	Estimate	t statistic	Estimate	t statistic
ΔR^m_{ct-1}	-0.16 **	2.17	-0.04	0.29	-0.27 **	13.24
ΔR^m_{ct-2}	-0.11	1.49	-0.02	0.17	-0.18 **	8.64
ΔR^m_{ct-3}	-0.04	0.57	-0.00	0.04	-0.09 **	4.78
R^m_{ct-1}	-0.21 **	5.60	-0.34 **	3.85	-0.07 **	9.10
$D_{ct-1}\Delta R^m_{ct-1}$	0.10	1.37	0.03	0.24	0.07 *	1.85
$D_{ct-2}\Delta R^m_{ct-2}$	0.07	0.96	0.06	0.01	0.07 *	1.77
$D_{ct-3}\Delta R^m_{ct-3}$	0.02	0.21	-0.01	0.10	-0.02	0.49
$D_{ct-1}\ R^m_{ct-1}$	-0.63 **	14.70	-0.57 **	6.03	-0.04 **	3.44
D_{ct-1}	0.85 **	8.47	0.60 **	3.07	0.15 **	5.64
CD_{ct-1}	0.36**	2.90	0.49 **	2.11	-0.02	0.71
ΔS_{ct-1}	-0.04	0.44				
ΔS_{ct-2}	-0.05	0.54				
ΔS_{ct-3}	-0.02	0.24				
S_{ct-1}	0.06	0.04			-0.00	0.22
$D_{ct-2}\Delta S_{ct-2}$	0.05	0.28				
$D_{ct-3}\Delta S_{ct-3}$	0.39 **	2.19				
$D_{ct-1}S_{ct-1}$	-0.18 **	2.72			-0.04 **	2.60
Intercept						
Year-specific	Yes		Yes		Yes	
Country-specific	Yes		Yes		Yes	
R^2	0.44		0.46		0.14	
N	6284		3011		4126	
SSE	30506		29459		31607	
SSR	24390		24976		23288	
DF	138		79		95	

also included in each proportional-hazards model: C country-specific fixed-effect terms and 25 year-specific effects.
* - indicates significance at 90 percent level of confidence. ** - indicates significance at 95 percent level of confidence

Data:

Program data: from IMF Annual Report, various years.

CD_{xct}, CD_{nct}: created from program data.

CT_{ct}: cumulative terms of trade index. The terms of trade index from the World Economic Outlook is used to construct this variable. It is available only in annual form, but quarterly values were interpolated for each country from the annual data. Interpolation uses a cubic spline such that both the curve and its first and second derivatives are continuous.

S_{ct}: real effective exchange rate, from IMF sources.

R^m_{ct}: foreign-exchange reserves/merchandise imports ratio, from International Financial Statistics.

R^g_{ct}: (foreign exchange reserves plus gold)/merchandise imports ratio, from International Financial Statistics.

R^l_{ct}: (foreign exchange reserves plus gold)/(merchandise imports plus service imports plus factor services) ratio

E_{ct}: Three-month interest rate on Eurodollar credits minus the actual 3-month inflation rate for the same period. From Datastream and the Economic Report of the President.

CT_{ct} and **S_{ct}** are converted for cross-country comparability through creation of "normalized" versions of the two variables. The mean and standard deviation by country is calculated. The mean is subtracted from the index, and the difference is divided by the standard deviation. For **CT_{ct}**, these normalized variables are summed for the periods while the country is in (or is not in) an IMF program to create the cumulative index.

Countries included in Estimation

181 Malta
186 Turkey
199 South Africa
213 Argentina
218 Bolivia (PRGF)
223 Brazil
228 Chile
233 Colombia
238 Costa Rica
243 Dominican Republic
248 Ecuador
253 El Salvador
258 Guatemala
263 Haiti (PRGF)
268 Honduras (PRGF)
273 Mexico
278 Nicaragua (PRGF)
283 Panama
288 Paraguay
293 Peru
298 Uruguay
299 Venezuela
313 Bahamas
316 Barbados
336 Guyana (PRGF)
343 Jamaica
369 Trinidad & Tobago
419 Bahrain
423 Cyprus
436 Israel
439 Jordan
443 Kuwait
449 Oman
469 Egypt
512 Afghanistan (PRGF)
513 Bangladesh (PRGF)
518 Myanmar (PRGF)
522 Cambodia (PRGF)
524 Sri Lanka (PRGF)
534 India (PRGF)
536 Indonesia
542 Korea
548 Malaysia
558 Nepal (PRGF)
564 Pakistan (PRGF)
566 Philippines
576 Singapore
578 Thailand
612 Algeria
616 Botswana
618 Burundi (PRGF)
622 Cameroon (PRGF)
636 Congo, Dem. Rep. (PRGF)
644 Ethiopia (PRGF)
646 Gabon
648 Gambia (PRGF)
652 Ghana (PRGF)
662 Cote d'Ivoire (PRGF)
664 Kenya (PRGF)
666 Lesotho (PRGF)
668 Liberia (PRGF)
674 Madagascar (PRGF)
676 Malawi (PRGF)
682 Mauritania (PRGF)
684 Mauritius
686 Morocco
688 Mozambique (PRGF)
694 Nigeria (PRGF)
714 Rwanda (PRGF)
718 Seychelles
724 Sierra Leone (PRGF)
732 Sudan (PRGF)
734 Swaziland
738 Tanzania (PRGF)
742 Togo (PRGF)
744 Tunisia
746 Uganda (PRGF)
748 Burkina Faso (PRGF)
754 Zambia (PRGF)
819 Fiji
846 Vanuatu (PRGF)
853 Papua New Guinea (PRGF)
862 Samoa (PRGF)
866 Tonga (PRGF)
911 Armenia (PRGF)
914 Albania (PRGF)
915 Georgia (PRGF)
916 Kazakhstan
917 Kyrgyz Republic
918 Bulgaria
921 Moldova (PRGF)
922 Russia
924 China
926 Ukraine
935 Czech Republic
936 Slovak Republic
939 Estonia
941 Latvia
944 Hungary
946 Lithuania
960 Croatia
961 Slovenia
962 Macedonia
964 Poland
968 Romania