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A Cure Worse Than the Disease? Currency Crises and the Output Costs of IMF-Supported Stabilization Programs

Michael M. Hutchison

10.1 Introduction

There is considerable debate over the output and employments effects of IMF-supported stabilization programs. This controversy seems especially heated for countries facing acute balance-of-payments problems and currency crises, as witnessed in 1997 in Korea, Indonesia, Thailand, and elsewhere. Stiglitz (2000), for example, supports critics of the International Monetary Fund (IMF) who argue that "the IMF's economic 'remedies' often make things worse—turning slowdowns into recessions and recessions into depressions." Some academic work also reaches this conclusion. Bordo and Schwartz (2000), for example, conclude, "the recent spate of [IMF] rescues may be the case of the medicine doing more harm than good" (60).[1] Similar statements by other leading economists are commonplace.

Despite these strong statements about the value of recent IMF programs, no consensus has emerged about the impact of these programs on the real

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1. Part of the criticism against the IMF is that it contributes to moral hazard by creating the expectation of bailouts (implicit debt guarantees) whenever countries face balance-of-payments problems. Empirical evidence on this point is mixed. For example, Dreher and Vaubel (2001) find support for moral hazard associated with IMF programs, whereas Lane and Phillips (2000) do not. See Willett (2001) for a recent review and evaluation of the literature on the debate surrounding the role of the IMF.

side of the economy.[2] Most empirical studies using panel data sets and regression techniques find that IMF-supported programs improve the balance of payments and current account (e.g., Khan 1990; Conway 1994; Bordo and Schwartz 2000). This is not surprising, because a key purpose of the IMF is "to give confidence to members by making the Fund's resources temporarily available to them under adequate safeguards, thus providing them with the opportunity to correct maladjustments in their balance of payments without resorting to measures destructive of national or international prosperity" (IMF *Articles of Agreement,* Article I [v]).

Views on the ultimate output and employment effects of IMF programs, however, appear much more divergent than on the balance-of-payments effects. On the surface, it may seem odd that countries would choose to participate in an IMF stabilization program if it were not in their best interests to do so. That is, participation in a program would presumably be unlikely if the output costs were perceived to be particularly large, outweighing the benefits arising from improvement in the balance of payments, continued access to credit markets, and so on. Stiglitz (2000) and others argue, however, that although officially the IMF does not force countries to participate in programs and negotiate conditions, "[i]n practice, it undermines the democratic process by imposing policies."

A number of previous studies have attempted to measure the output costs of IMF-program participation. However, these studies have reached radically different conclusions, with results suggesting sizable declines in output growth arising from participation in IMF programs (e.g., Przeworski and Vreeland 2000) or quite strong positive output effects (e.g., Dicks-Mireaux, Mecagni, and Schadler 2000). These conflicting results arise from several sources, including differences in the types of IMF programs that are investigated; differences in the groups of countries that are investigated (e.g., poor developing vs. emerging-market economies); differences in the methodologies that are employed; and, perhaps most important, how other factors influencing output growth are taken into account.

One area that has not been sufficiently addressed in previous work is the role of severe currency or balance-of-payments crises on output growth and how these events interact with subsequent participation in IMF programs. We argue that Heckman's (1979) inverse Mills ratio (IMR) approach does not adequately control for selection bias in this case, because "participation equations" in this literature (predicting whether a country participates in an

2. There is a large literature reviewing the effects of IMF-supported stabilization programs. See, for example, Beveridge and Kelly (1980), Bird (1996), Bordo and James (2000), Connors (1979), Conway (2000), Edwards (1989), Gylafson (1987), Killick, Malik, and Manuel (1992), McQuillan and Montgomery (1999), Mussa and Savastano (2000), Pastor (1987), and Santaella (1996). Bird, Hussain, and Joyce (2000) investigate the factors that cause countries to enter repeatedly into IMF programs, and Joyce (2001) investigates the factors that determine the duration of IMF programs.

IMF program) generally have low explanatory power. This is partly because two-thirds of IMF programs are not associated with severe balance-of-payments or currency crises (discussed in section 10.4). Our approach, by contrast, is to measure the output cost of participation in an IMF program and investigate whether there are feedback effects that make implementation of programs especially problematic in the immediate aftermath of or concurrent with an ongoing balance-of-payments or currency crisis. Our study focuses on three related questions: First, given that a country is already facing a severe currency crisis, does participation in an IMF-supported stabilization program tend to make real gross domestic product (GDP) growth weaker? Second, can one identify the channels (policy instruments) through which participation in IMF-supported programs affect real GDP? Third, how much of the downturn in East Asia following the 1997 currency crisis may be attributed to participation in IMF programs?

To address the first question, we control for the effect of a currency crisis on real GDP and consider whether there is an additional effect arising from IMF-program participation at this time. We want to be sure that the effect of a currency crisis on GDP is not inadvertently attributed to participation in an IMF program. The second question asks whether we can identify the policy channel or policy mechanism through which IMF-program participation affects real GDP growth. Beyond providing countries with access to substantial lines of credit, IMF programs are generally associated with conditions on the future conduct of fiscal, credit, and other policies. Identifying the way IMF conditionality affects the formulation of policy in practice (ex post)—as opposed to the agreements themselves (ex ante)—is an important step in determining how participation in programs might affect GDP. If the critics of the IMF are right and conditionality leads to overly restrictive macroeconomic policies and poor output performance, then it should show up in the data. Finally, the answer to the third question should shed light on the macroeconomic performance of East Asian countries that faced currency crises in 1997, distinguishing those that entered into IMF programs (Korea, Thailand, the Philippines, and Indonesia) from the country that did not participate (Malaysia).

To investigate these issues we focus on short-run IMF stabilization programs (Stand-By Agreements and Extended Fund Facilities) that are explicitly focused on balance-of-payments adjustment, rather than programs directed primarily toward structural reform and poverty reduction. The broadest spectrum of developing and emerging-market countries possible is considered, where the key limitation on the number of countries is the availability of macroeconomic data. The estimation methodology employed to investigate real growth effects of IMF programs is the General Evaluation Estimator (GEE). In this context, we control for the occurrence of recent currency or balance-of-payments crises and also test for interaction effects between the two events. This allows us to answer the question:

Is the adverse output effect of a currency crisis made worse when the IMF steps in with a stabilization package? We test the basic model using a panel data set with country-specific fixed effects. Simple reaction functions are also estimated to characterize the influence of IMF programs on the formulation of macroeconomic policy. We take into account the effect of recent currency crises on policy as well as the effects of self-selection bias.

Section 10.2 discusses the GEE methodology and how we control for recent occurrences of currency crises. Section 10.3 discusses the data employed in the study and our selection of IMF programs to investigate. Section 10.4 provides a statistical background and summary statistics on the size, frequency over time, and regional distribution of IMF programs. We also consider the probability of a country's adopting an IMF program conditional upon its having had a recent currency crisis. Section 10.5 presents the primary empirical results of the study. This section presents estimation results of the "reduced-form" output equation with explanatory variables that include balance-of-payments or currency crises and IMF program participation. It also applies the model to an explanation of the recessions faced by East Asian countries following the 1997 currency crisis. Section 10.6 presents results from estimating policy reaction functions and the effect of IMF programs on credit policy. Section 10.7 concludes the paper.

10.2 GEE Methodology: Controlling for Currency and Balance-of-Payments Crises

The basic GEE methodology employed in our study was first applied to the evaluation of IMF programs by Goldstein and Montiel (1986). It is based on the idea that one can derive a counterfactual—what would have happened to an IMF-participating country if it had not adopted a program—by investigating the policy responses of nonparticipating countries. The key element in this approach is that it must be possible to characterize macroeconomic policy choices by a simple and stable (over time and across countries) reaction function that holds for both participating and nonparticipating countries. We extend this standard model by introducing currency or balance-of-payments crisis as an additional factor influencing the evolution of output. We also introduce an interactive term that measures any additional adverse effect on output that is associated with IMF programs directly following a currency crisis.

The growth of real GDP for the ith country at time $t(y_{it})$ is explained by policies that would have been observed *in the absence* of an IMF-supported program ($\mathbf{X}_{it}$); exogenous external factors ($\mathbf{W}_{it}$); the recent occurrence of a currency or balance-of-payments crisis ($D^{CC}_{i(t-1)}$); the existence of an IMF-supported program (D^{IMF}_{it}); and unobservable random disturbances (ε_{it}).

$$(1) \qquad y_{it} = \beta_0 + \beta_k X_{it} + \alpha_h W_{it} + \beta^{CC} D^{CC}_{i(t-1)} + \beta^{IMF} D^{IMF}_{it} + \beta^{int}(D^{CC}_{i(t-1)} * D^{IMF}_{it}) + \varepsilon_{it}$$

where X is a k-element vector of policy variables for country i at time t that would be observed in the absence of IMF support, W is an h-element vector of exogenous variables for country i at time t, $D^{CC}_{i(t-1)}$ is a dummy variable equal to unity if the country has recently experienced a currency crisis (and zero otherwise), D^{IMF}_{it} is a dummy variable equal to unity if a short-run IMF program is in effect (and zero otherwise), $D^{IMF}_{it} * D^{CC}_{i(t-1)}$ is an interaction term measuring additional effects on output growth arising from a currency crisis that is immediately followed by an IMF program, and ε_{it} is a zero mean, fixed variance, serially uncorrelated disturbance term.[3] β_0 is a vector of country fixed effects (allowing average growth rates to vary across countries in the sample), β_k is a k-element vector measuring the impact of policy changes on output, α_h is an h-element vector measuring the impact of exogenous factors on output, β^{CC} measures the effect of currency or balance-of-payments crises on output growth, β^{IMF} measures the affect on output from participation in an IMF-supported stabilization program, and β^{int} measures the effect of the interaction term.

After postulating a rule for the k-element vector of policies that would have taken place in the absence of an IMF-supported program (X_{it}), the model is estimated (with fixed effects) using panel data drawn from countries and periods in which IMF support was in place and those in which IMF support was absent. The aim is to get consistent estimates for β^{IMF} and β^{int}—the effects of IMF support on output.

Policies adopted in the absence of an IMF-supported program (X_{it}) are directly observable only for nonprogram periods, and a key part of the GEE estimation approach is therefore to construct a counterfactual for policies during programs. This counterfactual is based upon a policy reaction function that links changes in the policy instrument to the deviation of the observed lagged value for output growth from its desired value (y^d_{it}). The policy reaction function is described by

$$(2) \qquad \Delta x_{it} = \gamma[y^d_{it} - y_{i(t-1)}] + \eta_{it}$$

where η_{it} is a zero mean, fixed variance, serially uncorrelated error term assumed to be uncorrelated with ε_{it}, and Δ is the difference operator. The parameter γ indicates the extent to which the policy instrument is adjusted in response to disequilibria in the target variable. Substituting equation (2) into equation (1) and subsuming desired output growth into the vector of fixed-effect constant terms for each country (β_0) gives

3. See Dooley (2000) and Gupta, Mishra, and Sahay (2000) for discussions of the factors that cause output to fall following a currency crisis.

$$(3)\qquad \Delta y_{it} = \beta'_{\mathbf{0}} - (\beta_k \gamma_k + 1) y_{i(t-1)} + \beta_k X_{i(t-1)} + \alpha_h W_{it} + \beta^{CC} D^{CC}_{i(t-1)} + \beta^{IMF} D^{IMF}_{it} + \beta^{int}(D^{CC}_{i(t-1)} * D^{IMF}_{it}) + \varepsilon_{it} + \beta_k \eta_{it})$$

Equation (3) is the basic GEE reduced-form model as applied in earlier studies (Dicks-Mireaux, Mecagni, and Schadler 2000; Goldstein and Montiel 1986; and others). The usefulness of the model, as discussed in detail in Dicks-Mireaux, Mecagni, and Schadler (2000), depends on (a) whether individual country behavior may be aggregated in a stable (across countries and time) uniform model; (b) whether it may be assumed that the policy reaction function of a program country, had it not received IMF support, is identical to that of nonprogram countries that did not seek support; and (c) whether the additive term $\beta^{IMF} D^{IMF}_{it}$ and the interactive term $\beta^{INT}(D^{IMF}_{it} * D^{CC}_{it})$ can fully capture all the channels (static and dynamic) through which participation in IMF programs may affect output growth.

Unlike previous studies, we control for the (lagged) occurrence of currency and balance-of-payments crises as a predetermined variable in the output growth equation. We also take into account the possibility that an interactive effect (operating between currency crises and the adoption of IMF programs) may have an additional impact on output growth. Leaving out these terms could leave the output growth equation misspecified and lead to biased estimates.

10.3 Selection of International Monetary Fund Programs and Data Description

10.3.1 Selection of International Monetary Fund Programs

The main IMF facilities designed to meet short-run balance-of-payments stabilization are Stand-By Arrangements (SBA) and the Extended Fund Facility (EFF).[4] In general, IMF members can access credit tranches from the General Resources Account (GRA) either by means of IMF program arrangements or by means of "outright purchases." Outright purchases are limited, typically, to the first 25 percent of the member's quota and do not involve any phasing or conditionality. Stand-By Arrangements have been the main instrument through which members gain access to further credit tranches.[5] Stand-By Arrangements typically last for twelve to eighteen months (the legal maximum is three years), and first tranche drawings do not require strict conditionality. Any drawings beyond the first tranche require both phasing out and stricter conditionality and are limited

4. This discussion is based on International Monetary Fund (2000).

5. As the Articles of Agreement state, they were defined as "a decision by the Fund by which a member is assured that it will be able to make purchases from the General Resources Account in accordance with the terms of the decision during a specified period and up to a specified amount" (Article XXX [b]).

to 100 percent of quota annually (300 percent cumulatively together with the EFF, as discussed below). Repurchase obligations last about three and one-quarter to five years from the date of purchase.

The EFF, established in 1974, provides somewhat longer-term financing to countries in need of structural economic reforms. Extended Fund Facility arrangements typically last for three years; phasing and conditionality are similar to the SBAs, with an emphasis on longer-term structural reforms. Quota limits are identical to the SBAs, whereas repurchases last much longer (four and one-half to ten years). Both facilities are subject to the same rate of interest for repayments.[6] The supplemental reserve facility (SRF), introduced in 1997 in the Korean stabilization program, aims to supplement resources made available under SBAs and the EFF in order to provide financial assistance for exceptional balance-of-payments difficulties. Penalty interest rates (increasing over time) and short repayment periods (one to one and one-half years) insure that these are taken only in exceptional circumstances.[7]

We use the SBA and EFF programs (and, for Korea in 1997, the new SRF program) as our definition of IMF-supported stabilization programs. These are the only programs clearly linked to short-term balance-of-payments adjustment. (There are no cases of SBA and EFF programs' being approved in the same year in this data sample.) By contrast with these programs, some IMF facilities are designed with other objectives in mind. We do not include these programs, because their primary objective is not short-run balance-of-payments stabilization and adjustment.

For example, separate from the GRA, the IMF established the structural adjustment facility (SAF) in 1986 for "all low-income countries . . . that are in need of such resources and face *protracted* balance of payments problems" (italics mine),[8] and its successor, the Enhanced Structural Adjustment Facility (ESAF), in 1987. In 1999, the ESAF was replaced by the Poverty Reduction and Growth Facility (PRGF). These are managed separately by the IMF and are financed from the sale of IMF-owned gold together with resources provided by members in the form of loans or grants to the IMF, as trustee, for the purpose of helping low-income member countries. These resources are used to finance highly concessional low-interest loans. Eligible countries can withdraw up to 185 percent of their quota conditional on their balance-of-payment needs and the strength of their adjustment program. The interest rate charged is 0.5 percent, and repayments are over a ten-year period.

6. Starting in 1989, the rate of charge was linked directly to the SDR interest rate, and adjusted weekly.

7. In our sample, the only such case is the agreement with Korea in 1997.

8. As determined by the International Development Association (IDA), the World Bank's concessional window (the current cutoff point for IDA eligibility is a 1999 per capita GDP level of $885).

By contrast with our study, Dicks-Mireaux, Mecagni, and Schadler (2000) focus on the structural adjustment programs in their research (SAF and ESAF) and measure the effects of these IMF-supported programs on poor developing economies. Bordo and Schwartz (2000), on the other hand, consider both IMF stabilization and structural adjustment programs and use a mixed sample of twenty emerging-market and developed countries (including Australia and New Zealand). Similarly, Przeworski and Vreeland (2000) do not differentiate between programs, including both stabilization and structural adjustment IMF programs. However, similar to us (and unlike Bordo and Schwartz 2000 or Dicks-Mireaux, Mecagni, and Schadler 2000), they consider a broad set of developing countries. Our basic results, however, are robust to broadening the definition of IMF programs to include the SAF and ESAF.

10.3.2 Defining Currency and Balance-of-Payments Crises

Our indicator of currency and balance-of-payments crises is constructed from "large" changes in an index of currency pressure, defined as a weighted average of monthly real exchange rate changes and monthly (percent) reserve losses.[9] Following convention (e.g., Kaminsky and Reinhart, 1999) the weights are inversely related to the variance of changes of each component over the sample for each country. Our measure, taken from Glick and Hutchison (2000, 2001), presumes that any nominal currency changes associated with exchange rate pressure should affect the purchasing power of the domestic currency, that is, result in a change in the real exchange rate (at least in the short run). This condition excludes some large depreciations that occur during high-inflation episodes, but it avoids screening out sizable depreciation events in more moderate inflation periods for countries that have occasionally experienced periods of hyperinflation and extreme devaluation.[10] An episode of severe exchange rate pressure is defined as a value in the index—a threshold point—that exceeds the mean plus two times the country-specific standard deviation, provided that it also exceeds 5 percent.[11] The first condition insures that any large (real)

9. Our currency pressure measure of crises does not include episodes of defense involving sharp rises in interest rates. Data for market-determined interest rates are not available for much of the sample period in many of the developing countries in our dataset.

10. This approach differs from that of Kaminsky and Reinhart (1999), for example, who deal with episodes of hyperinflation by separating the nominal exchange rate depreciation observations for each country according to whether inflation in the previous six months was greater than 150 percent, and they calculate for each subsample separate standard deviation and mean estimates with which to define exchange rate crisis episodes.

11. Other studies defining the threshold of large changes in terms of country-specific moments include Kaminsky and Reinhart (1999); Kaminsky, Lizondo, and Reinhart (1998); and Esquivel and Larrain (1998). Kaminsky and Reinhart (1999) use a 3–standard deviation cutoff. Although the choice of cutoff point is somewhat arbitrary, Frankel and Rose (1996) suggest that the results are not very sensitive to the precise cutoff chosen in selecting crisis episodes.

depreciation is counted as a currency crisis, and the second condition attempts to screen out changes that are insufficiently large in an economic sense relative to the country-specific monthly change of the exchange rate.

For each country-year in our sample, we construct binary measures of currency crises, as defined above (1 = crisis, 0 = no crisis). A currency crisis is deemed to have occurred for a given year if the currency pressure index for any month of that year satisfies our criteria (i.e., two standard deviations above the mean as well as greater than 5 percent in magnitude). To reduce the chances of capturing the continuation of the same currency crisis episode, we impose windows on our data. In particular, after identifying each "large" indication of currency pressure, we treat any similar threshold point reached in the following twenty-four-month window as a part of the same currency episode and skip the years of that change before continuing the identification of new crises. With this methodology, we identify 160 currency crises over the 1975–97 period.

10.3.3 Other Variables in the Output Growth Equation and Policy Function

Estimation of the reduced-form output growth equation (3) for the output growth equation necessitates that the external exogenous variables influencing output growth (vector $\boldsymbol{\omega}_{it}$) and the (lagged) policy instruments (vector $\mathbf{x}_{i(t-1)}$) be identified. The external exogenous factors included are (trade-weighted) external growth rates of major trading partners and the lagged rate of real exchange rate overvaluation.[12] The (lagged) policy factors considered are the change in the budget surplus to GDP ratio, inflation, and credit growth.

In the policy reaction function estimates of equation (2), we also consider regional dummy variables and a measure of policy "autocracy."[13] In controlling for sample selection bias, a probit equation explaining the likelihood of IMF-program participation is estimated. Other variables employed in this estimation, not noted above, are the (lagged) ratio of foreign exchange reserves to imports, the change in the ratio of current account to GDP, and real per capita GDP growth. These macroeconomic data series are taken from the IMF's *International Financial Statistics* CD-ROM.

The minimum data requirements to be included in our study are that GDP data are available for a minimum of ten consecutive years over the period 1975–97. This requirement results in a sample of sixty-seven developing

12. Real exchange rate overvaluation is defined as deviations from a fitted trend in the real trade-weighted exchange rate. The real trade-weighted exchange rate is the trade-weighted sum of the bilateral real exchange rates (defined in terms of CPI indices) against the U.S. dollar, the German mark, and the Japanese yen. The trade weights are based on the average bilateral trade with the United States, the European Union, and Japan in 1980 and 1990.

13. Autocracy is an index ranging from 1 to 10, with 10 indicating the most "closed" political system. The source of this variable is the "polity" database.

Table 10.1 **IMF Programs in Developing Countries: Approvals by Time (1970–99)**

	Short-Term Programs (SBA, ESBA, EFF)	Long-Term Programs (SAF, ESAF, PRGF)	All IMF programs
1970–74	85		85
	(37.12)		
	[0.9]		
1975–79	113		113
	(82.66)		
	[2.0]		
1980–84	169		169
	(298.42)		
	[3.9]		
1985–89	115	58	173
	(265.78)	(87.44)	
	[2.2]	[4.2]	
1990–94	109	46	155
	(275.34)	(110.62)	
	[2.0]	[5.8]	
1995–99	87	63	150
	(1168.48)	(148.30)	
	[2.2]	[7.0]	
Totals	678	167	845

Notes: Figures are number of programs approved. Figures in parentheses are average size of program in million SDRs. Figures in brackets are average size of program relative to GDP (%). The size relative to GDP statistic is limited by data availability.

countries.[14] We use annual observations in our analysis. Although we employ monthly data for our (real) exchange rate pressure index to identify currency crises and date each by the year in which it occurs, using annual data enables inclusion of a relatively large number of countries. The appendix table provides details on the countries included in the sample, the currency crisis dates, and the periods when countries participated in IMF programs.

10.4 Summary Statistics: International Monetary Fund Programs, Currency Crises, and the Economy

10.4.1 International Monetary Fund Programs: Size, Growth, and Regional Distribution

The frequencies of the IMF programs are shown in table 10.1 (for all countries) over the 1970–99 period. (Descriptive statistics on IMF programs reported in tables 10.1 and 10.2 cover the 1970–99 period, whereas the other tables involving statistical analysis cover the 1975–97 period.) The total number of programs, the average size in terms of SDRs (in paren-

14. The developing country sample excludes major oil-exporting countries.

Table 10.2 IMF Programs: Approvals by Region (1970–99)

	SBA	EFF	ESAF	PRGF
Totals	493	69	113	11
Latin America	146	26	13	1
	(29.6)	(37.7)	(11.5)	(9.0)
Middle East	14	6	1	0
	(2.80)	(8.70)	(0.88)	(0.00)
East and South Asia	62	12	12	1
	(12.6)	(17.4)	(10.6)	(9.0)
Africa	177	16	77	9
	(35.9)	(23.2)	(68.1)	(82.0)
Eastern Europe and the former USSR	68	8	9	
	(13.8)	(11.6)	(8.0)	
Other	26	1	1	0
	(5.30)	(1.40)	(0.88)	(0.00)

Notes: Figures are number of programs approved. Figures in parentheses are percent of IMF program by region.

theses), and the size of the average program as a percentage of the recipient country's GDP (in brackets) are given in the table. The table is divided into short-term stabilization (the focus of our study) and longer-term structural adjustment programs, and it is also separated into five-year intervals.

Over the thirty-year period, 845 IMF programs were approved, of which 678 were short-run stabilization programs—SBAs or the EFF. Only 167 were longer-term structural adjustment programs—SAF, ESAF, or the PRGF.

The number of programs reached a peak in the early 1980s (with the Mexican debt crisis and debt problems in other Latin American countries), both in terms of number of programs (169) and size relative to the economies involved (average program size over 4 percent of GDP). The number of IMF programs is not growing, nor is the size relative to the economies involved (about 2 percent of GDP in 1995–99). The size of the average program in terms of SDRs jumped in the late 1990s, however, due to the large economic size of the countries going to the IMF for assistance (e.g., Brazil, Indonesia, Mexico, the Russian Federation, and South Korea).[15]

The regional breakdown of program approvals is given in table 10.2. The short-term stabilization programs (SBA and EFF) are primarily directed to Latin America and Africa, with about 30 and 35 percent respectively of program approvals. Africa dominates the long-term structural programs (SAF or ESAF and PRGF) with 70 percent of the programs over the period.

15. This includes the disbursement to Korea under the SRF.

10.4.2 Currency Crises and International Monetary Fund Program Participation

An important part of our study is to investigate the link between currency crises, real output developments, and IMF stabilization programs. Table 10.3 shows the relative frequencies of currency crises and IMF stabilization program participation for the sixty-seven countries in our sample over the 1975–1997 period. Panel A shows the contemporaneous frequencies (and associated chi-squared independence tests), that is, contemporaneous currency crises and contemporaneous IMF program participation. Statistical independence of these observations is rejected at the 99 percent level of confidence, but only 18 percent of IMF-program participation observations are associated with currency crises. However, a substantially higher percentage (28 percent) of the currency crisis observations coincide with IMF-program observations.

Panel B shows the link between IMF programs and contemporaneous and lagged currency crises. This shows a stronger link than the contemporaneous relationship. Statistical independence is again rejected (at greater than 1 percent significance). Thirty-three percent of contemporaneous IMF-program participation observations are associated with either a contemporaneous or previous (one-year lag) currency crisis. Similarly, 28 percent of contemporaneous or lagged currency crises are associated with a contemporaneous IMF program. Hence, almost one-third of currency crisis observations are linked to an IMF program within the current year or the next year. Of course, this implies that about two-thirds of the

Table 10.3 Relative Frequency of Crises and IMF-Program Participation

	Frequency (%) and Significance Levels
A. Contemporaneous Frequencies	
Short-term IMF programs associated with a contemporaneous currency crisis	18%
Currency crisis associated with a contemporaneous short-term IMF program	28%
Chi independence test for contemporaneous IMF and currency crisis series	0.0004
B. Contemporaneous and Lagged Frequencies	
Short-term IMF programs associated with a contemporaneous or lagged ($t-1$) currency crisis	33%
Contemporaneous or lagged ($t-1$) currency crisis associated with a short-term IMF program	28%
Chi independence test for contemporaneous IMF and currency crisis series	0.0000

currency crisis observations are not linked with IMF-program participation.

10.4.3 Macro Developments: Participation or Nonparticipation and Before and After Statistics

Tables 10.4–10.6 present summary statistics on the timing of IMF-programs (SBA and EFF) participation and key macroeconomic developments. Table 10.4 shows sample mean values for macroeconomic developments during program years and nonprogram years. The first two columns report the statistics for all countries (both for those countries that at some point participated in IMF programs and for those that did not), focusing on nonprogram observations and IMF-program observations. Real GDP growth was about 4 percent (1,082 observations) during the nonprogram years and 2.9 percent during the program years (585 observations). This difference is significantly different at the 99 percent level of confidence (*t*-

Table 10.4 Summary Statistics: Short-Term IMF Programs: Means

	All Countries (67 Countries)		IMF-Participating Countries (60 Countries)		
Variable	Nonprogram Years	Program Years	Nonprogram Years	All Years	Non-IMF Countries[a]: All Years
Real GDP growth	4.18	2.94	3.62	3.36	6.83
		(4.83***)	(–2.62***)	(1.28)	(–9.10***)
	[1,082]	[585]	[895]	[1,480]	[187]
Inflation	18.43	25.01	20.29	22.08	8.26
		(–3.09***)	(2.05*)	(–0.99)	(4.16***)
	[1,061]	[549]	[897]	[1,446]	[164]
Current account–GDP ratio (%)	–5.09	–5.01	–5.81	–5.49	–0.01
		(–0.14)	(1.28)	(–0.60)	(–4.33***)
	[858]	[473]	[719]	[1,192]	[139]
Credit growth	25.11	26.71	26.19	26.39	18.75
		(–0.77)	(0.24)	(–0.11)	(2.28**)
	[1,074]	[567]	[917]	[1,484]	[157]
Budget surplus–GDP ratio (%)	–3.36	–4.44	–4.04	–4.20	0.00
		(3.22***)	(–1.19)	(0.59)	(–8.52***)
	[952]	[507]	[796]	[1,303]	[156]

Notes: Figures in parentheses are statistics for difference in means with the column to the left. Figures in brackets are number of observations.

[a]The countries that have never participated in a short-term IMF program (either SBA or EFF), and that are included in our data set, are Botswana, Hong Kong, Malta, Malaysia, Paraguay, Singapore, and Swaziland.

***Significant at the 1 percent level.

**Significant at the 5 percent level.

*Significant at the 10 percent level.

Table 10.5 **Before and After Summary Statistics: IMF Short-Term Programs (four-year window: Means)**

Variable	Average of 2 Years Before IMF Program	During IMF Program Years	Average of 2 Years After IMF Program
Real GDP growth	3.20	2.94	4.23
		(0.53)	(–2.68***)
			[–1.46]
	{114}	{585}	{132}
Inflation	32.18	25.01	21.00
		(1.42)	(1.01)
			[0.57]
	{116}	{549}	{133}
Current account–GDP ratio	–5.97	–5.01	–5.20
		(–1.15)	(0.24)
			[0.53]
	{90}	{473}	{110}
Credit growth	37.39	26.71	27.11
		(2.46**)	(–0.12)
			[0.64*]
	{121}	{567}	{140}
Budget surplus–GDP ratio	–5.76	–4.44	–4.71
		(–2.09**)	(0.44)
			[1.17]
	{109}	{507}	{132}

Notes: Figures in parentheses are *t*-statistic for difference in means with the column to the left. Figures in brackets are *t*-statistic for difference in means with the first column. Figures in braces are number of observations.

***Significant at the 1 percent level.

**Significant at the 5 percent level.

*Significant at the 10 percent level.

statistic equal to 4.83). Inflation and budget deficits are significantly higher during the program years, but no substantive difference between program and non-program years is detected in the growth rate of credit or the current account balance.

There may be systematic differences in the types of countries that approach the IMF for assistance, however. Focusing only on countries participating in IMF programs (second, third, and fourth columns) avoids this selection bias. For countries involved in IMF programs (at some point during the sample), average GDP growth was 3.6 percent during nonprogram years and 2.9 percent during program years. This difference is statistically significant. Inflation was also significantly lower during the nonprogram years. No difference is discernible in credit growth or the budget and current account balances.

If one simply compares IMF-program countries (both during program and nonprogram years) with those not having a program during the sample

Table 10.6 **Before and After Summary Statistics: IMF Short-Term Programs (two-year window: Mean values)**

Variable	1 Year Before IMF Program	During IMF Program Years	1 Year After IMF Program
Real GDP growth	2.62	2.94	4.34
		(–0.56)	(–2.47**)
			[–1.98**]
	{76}	{585}	{84}
Inflation	32.28	25.01	21.71
		(1.24)	(0.68)
			[1.15]
	{76}	{549}	{85}
Current account–GDP ratio	–5.23	–5.01	–4.18
		(–0.24)	(–0.84)
			[–0.63]
	{59}	{473}	{68}
Credit growth	39.39	26.71	28.98
		(2.48**)	(–0.54)
			[1.22]
	{79}	{567}	{88}
Budget surplus–GDP ratio	–5.98	–4.44	–4.46
		(–2.07**)	(0.02)
			[–1.44]
	{70}	{507}	{75}

Notes: Figures in parentheses are *t*-statistic for difference in means with the column to the left. Figures in brackets are *t*-statistic for difference in means with the first column. Figures in braces are number of observations.

***Significant at the 1 percent level.

**Significant at the 5 percent level.

*Significant at the 10 percent level.

period, the differences are substantial—but not surprising. Countries that have never participated in an IMF program during our sample period—presumably not having had a need to participate—exhibit much stronger economic fundamentals: much higher GDP growth rates (6.8 percent versus 3.4 percent), lower inflation, lower credit growth, and balanced positions in the current account and budget.

Table 10.5 focuses on the before and after time series of countries participating in IMF programs. Four-year windows are imposed. The table shows that output growth does *not* decline substantially when a country enters an IMF program, but it does increase significantly during the two-year period following the program. Credit growth, by contrast, falls significantly during the IMF program and stays at the lower rate of growth following the program. No statistically significant shifts are noted in the time pattern of inflation, the current account balance, or the budget surplus.

Table 10.6 undertakes the same decomposition as table 10.5 but instead

imposes only a two-year window, together with a one-year interval before and after IMF program participation. Real GDP growth is not much different one year before and during an IMF program, but it rebounds substantially the year following a program. Inflation drops before, during, and after programs, but the variation in the sample is so great that the differences are not statistically significant. Credit growth drops sharply following an IMF program and stays lower one year following a program. The budget balance improves during an IMF program and stays at a lower level following the program.

Tables 10.5 and 10.6 clearly demonstrate that economies typically experience slow growth prior to entering into an IMF program, and sluggish growth continues until the program is concluded. It does not appear that participation in the IMF program directly contributed to slower growth. Inflation and credit growth both declined during the IMF-program period and stayed lower than in the preprogram period. In short, these summary statistics paint a classic recession-rebound pattern, but it is not clear if IMF program participation played a role.

10.5 Real Output Effects of International Monetary Fund Programs

10.5.1 General Evaluation Estimator Estimates

The reduced-form GEE estimates (equation [3]) are reported in table 10.7. White's consistent standard errors are reported. The first column reports the model without controlling for country fixed effects or currency crises. The lagged control variables are the change in the budget surplus ratio, inflation, credit growth, external (world) output growth, and real exchange rate overvaluation. A lagged dependent variable, as suggested in the theoretical formulation of the model, is also included. The focus is the coefficient on the IMF-program dummy. The coefficient estimate is statistically significant (99 percent level of confidence) and indicates that real GDP growth is lowered by about 1 percent during each year of IMF-program participation.

The estimated coefficients on lagged external growth (positive) and lagged real exchange rate overvaluation (negative) have the predicted signs and are statistically significant. In terms of the policy variables, the estimated coefficient on the lagged change in the budget surplus is positive, and the estimated coefficient on lagged credit growth is negative. Both are statistically significant. Interpreting these coefficients in terms of reaction functions, the rise in the lagged budget surplus (rise in credit growth) could lead to a more expansionary (restrictive) *contemporaneous* fiscal policy (credit policy) and hence a rise (fall) in output growth. Other interpretations are possible. For example, countries with more sustainable fiscal policies and lower credit growth may have systemically higher real output growth

Table 10.7 Output Growth Equation Estimates (Dependent variable: real GDP growth rate)

	Coefficient				
Variable	(1)	(2)	(3)	(4)	(5)
Constant	3.787***	4.169***	4.164***	4.444***	4.147***
	(8.02)	(7.52)	(7.37)	(7.70)	(7.43)
Change in budget surplus–GDP ratio ($t-1$)	13.607***	7.412*	7.213*	7.266*	7.254*
	(3.31)	(1.89)	(1.81)	(1.82)	(1.81)
Inflation ($t-1$)	–0.005	0.003	0.003	0.002	0.003
	(–0.82)	(0.56)	(0.55)	(0.46)	(0.61)
Credit growth ($t-1$)	–0.009	–0.009**	–0.009**	–0.009**	–0.010**
	(–1.55)	(–2.14)	(–2.08)	(–2.03)	(–2.13)
Real GDP growth ($t-1$)	0.094	0.139**	0.146**	0.150**	0.148**
	(1.34)	(2.25)	(2.31)	(2.39)	(2.32)
External growth rates (t) (weighted average)	0.275***	0.253***	0.255***	0.268***	0.259***
	(3.17)	(2.69)	(2.71)	(2.82)	(2.75)
Real exchange rate overvaluation ($t-1$)	–0.030***	–0.033***	–0.030***	–0.030***	–0.030***
	(–4.37)	(–4.19)	(–3.66)	(–3.61)	(–3.49)
IMF participation dummy for short-term programs (t)	–1.010***	–0.740*	–0.781**	–0.659	–0.749*
	(–3.37)	(–1.87)	(–2.02)	(–1.44)	(–1.82)
Currency crises dummy ($t-1$)		–1.496***	–1.161***	–1.107**	–1.089**
		(–3.32)	(–2.80)	(–2.39)	(–2.34)
Currency crises dummy (t)			–0.805**	–0.765*	–0.761*
			(–1.89)	(–1.65)	(–1.64)
Lagged-contemporary interactive term $D^{IMF}_{it} * D^{CC}_{i\,t,\,or\,(t-1)}$				–0.195	–0.202
				(–0.30)	(–0.32)
Dynamics for IMF participation dummy for Short-term programs[a] ($t-1$, $t-2$, $t-3$)					–0.457
					(0.10)
Adjusted R^2	0.12	0.22	0.23	0.22	0.22
N	1,128	966	958	958	958
Durbin-Watson statistic	1.61	2.00	1.99	1.98	1.98

Note: All regressions, except the first, include country dummies. Numbers in parentheses are t-statistics.

[a]Sum of the coefficients of the IMF dummy lagged for $t-1$, $t-2$, and $t-3$ (t-statistic on sum of lags reported). F-statistic (joint significance of three lagged values) is 0.86.

***Significant at the 1 percent level.

**Significant at the 5 percent level.

*Significant at the 10 percent level.

rates. Inclusion of fiscal and credit variables may be picking up important cross-country differences in economic performance.

Column (2) reports results for the model with country fixed effects (dummy variables for each country to capture the significant differences in growth rates over the full sample period) and the currency crisis variable. These variables are highly statistically significant, increasing the overall explanatory power of the model (R-squared) from 12 percent to 21 percent. A currency crisis in year $t-1$ is associated with a decline in output growth in

year *t* of about 1.5 percentage points. The coefficient estimate on the IMF-participation variable decreases substantially when the currency crisis variable is taken into account, indicating that output growth is about 0.74 percentage points less annually for each year of IMF-program participation. This coefficient estimate, however, is only significant at the 90 percent level of confidence.

Column (3) reports the results of the model when both contemporaneous and lagged currency crisis variables are included in the regression. Both of the currency crisis variables are negative and statistically significant. The coefficient estimate on the IMF-program participation is similar (0.78) to the result reported in column (2).

Column (4) reports the results where the model includes an interactive term measuring the occurrence of an IMF program that takes place around the time of a recent occurrence of a currency crisis (i.e., contemporaneous or in the previous year). The model estimates again suggest that a currency crisis leads to an output loss, but the coefficient estimate (–0.66) on the IMF-program dummy variable is not statistically significant. Is the output loss associated with a currency crisis magnified if an IMF program is approved in the same year or immediately following a severe balance-of-payments or currency crisis? The interaction term in column (4) is not statistically significant, indicating that the output loss associated with a crisis does not appear to be affected by a country's participation in an IMF program.

Column (5) reports results from estimating a more dynamic specification of the model. The objective is to investigate whether the adverse effects from participating in an IMF program dissipate, or perhaps intensify, over time. This is accomplished by including three lags of the IMF-participation variable. It appears that the adverse output effects are felt during the years of IMF program participation (generally one to three years), but no significant additional effects are observed in subsequent years. That is, neither the sum of the coefficients on the three lagged values of program participation nor the joint test is statistically different from zero (see footnote a to table 10.7).

In sum, the results are robust and indicate that participating in an IMF program, regardless of whether a currency or balance-of-payments crisis has recently occurred, "costs" about 0.6–0.8 percentage points of real GDP growth annually. Our estimates are about half the size of the negative impact reported by Przeworski and Vreeland (2000)[16] or Bordo and Schwartz

16. Przeworski and Vreeland (2000) estimate a long-run growth model (using capital and labor growth as independent variables), dividing the sample into (IMF) program observations and nonprogram observations. They also include the IMR in the regression. Their conclusions regarding the growth effects of IMF-program participation are based on the difference between the estimated constant terms in the two regressions.

(2000),[17] and similar in magnitude to Conway (1994). Unlike Conway (1994), however, we do not find that the reduction in growth is followed by higher future output growth.[18]

It is noteworthy that we also tested for sample selection bias in the estimation procedure, and the results were unaffected. The estimates on the IMF and currency-crisis variables did not change, and the coefficient on IMF was not statistically significant. (The probit equation estimated to measure self-selection bias is presented in table 10A.3.) Of course, insignificance of the IMR variable may be either because selection bias is not an important issue or because the participation equation is misspecified. These results are not reported for brevity but are available from the author upon request. This finding is similar to Dicks-Mireaux, Mecagni, and Schadler (2000). (We do find IMR significant in the policy reaction functions, however.)

10.5.2 Extensions: IMF Program Dating and Downturns Prior to IMF Program Approvals

Table 10.8 presents several extensions of the basic output growth model. The first two columns use the conventional dating scheme employed in table 10.7, dating the IMF program in the calendar year in which it was approved. The first column adds a one-year leading indicator of IMF program participation ("lead IMF program participation dummy, $t + 1$") and the second column adds a one-year leading indicator of IMF program *approval* (only the year of approval; subsequent program years are coded as zero). The descriptive evidence presented in table 10.6 suggests that a downturn in output tends to lead (by one year) participation in an IMF program. A lagged dependent variable included in the basic output growth equation helps to account for this dynamic. If cycles are irregular, however, inclusion of the IMF leading variable might be able to better capture downward shifts in output growth occurring with some regularity prior to IMF program participation. The leading IMF dummy variable is not significant in either column (1) or (2), however, and the contemporaneous effects are quite similar to those reported in table 10.7.

The second two columns use an alternative-dating scheme for the imple-

17. Bordo and Schwartz (2000) report a contemporaneous effect of IMF programs of –1.61 ($t = 0.97$) and a one-year lagged effect of 2.24 ($t = 2.67$). The contemporaneous effect is insignificantly different from zero, and the one-year lagged effect is significant at the 99 percent level of confidence. On balance, their results indicate that IMF-program participation has a net positive effect on growth. Surprisingly, they conclude that "The main detriment [of IMF-program participation] is a temporary reduction in real growth" (57) and "the impression given by the annual data . . . that turning to the IMF may be harmful to a country's real economic performance" (60). Our results are not directly comparable, however, because they have a limited sample of emerging-market and developed countries and include short-run stabilization programs, structural adjustment, and poverty reduction programs in their study.

18. Similar to us, Conway (1994) uses only SBA and EFF programs in his study.

Table 10.8 Output Growth Equation: Extensions (Dependent variable: real GDP growth rate)

Variable	Coefficient			
	Standard Dating		Alternative Dating	
Constant	4.171***	4.068***	4.159***	4.032***
	(7.36)	(7.29)	(7.48)	(7.26)
Change in budget surplus–GDP ratio ($t-1$)	7.080*	6.912*	7.042*	6.635*
	(1.77)	(1.71)	(1.78)	(1.64)
Inflation ($t-1$)	0.003	0.003	0.003	0.003
	(0.56)	(0.54)	(0.57)	(0.56)
Credit growth ($t-1$)	–0.009**	–0.009**	–0.009**	–0.009**
	(–2.11)	(–2.12)	(–2.10)	(–2.12)
Real GDP growth ($t-1$)	0.146**	0.150**	0.147**	0.152**
	(2.33)	(2.41)	(2.36)	(2.42)
External growth rates (t) (weighted average)	0.253***	0.264***	0.252***	0.267***
	(2.69)	(2.81)	(2.72)	(2.85)
Real exchange rate overvaluation ($t-1$)	–0.030***	–0.029***	–0.030***	–0.029***
	(–3.62)	(–3.42)	(–3.53)	(–3.44)
IMF program participation dummy (t)	–0.647*		–1.217**	
	(–1.77)		(–2.71)	
Lead IMF program participation dummy ($t+1$)	–0.266		0.303	
	(–0.69)		(0.73)	
IMF program approval dummy (t)		–0.878*		–0.583
		(–1.93)		(–1.51)
Lead IMF program approval dummy ($t+1$)		–0.550		0.305
		(–1.42)		(0.74)
Currency crises dummy ($t-1$)	–1.137***	–1.178***	–1.110***	–1.228***
	(–2.72)	(–2.86)	(–2.67)	(–2.98)
Currency crises dummy (t)	–0.778*	–0.643	–0.772*	–0.783*
	(–1.84)	(–1.52)	(–1.83)	(–1.83)
Adjusted R^2	0.23	0.23	0.23	0.22
N	958	958	958	958
Durbin-Watson statistic	1.99	2.00	1.99	2.00

Note: All regressions include country dummies. Numbers in parentheses are t-statistics.

***Significant at the 1 percent level.

**Significant at the 5 percent level.

*Significant at the 10 percent level.

mentation of IMF programs that has been used by Dicks-Mireaux, Mecagni, and Schadler (2000) and others. This dating scheme dates the IMF program to be in effect in year t if it was approved in the first half of year t or in the second half of year $t-1$. Again the leading IMF-program dummy variable is not statistically significant. However, the estimated contemporaneous effects of IMF programs on output growth using the alternative dating scheme do change somewhat. In particular, the estimated negative effect of an IMF program in column (3) (IMF program participation) rises to –1.22 and is significant at the 95 percent level of confidence. By contrast, the estimated output effect in the year of an IMF program *approval* is

insignificant. These results indicate that changes in the dating scheme of IMF program implementation and program definition (whether defined as all years of participation or only the first year of approval) affect the results to some extent but do not change the basic findings.

We also estimated the basic model over the 1990–97 period, because the evolving nature of IMF programs and conditionality may have changed their effect on output. In particular, the number of conditions attached to IMF programs have increased in the 1990s. The coefficient on the IMF dummy drops to only –0.36 in this regression and is not significant at conventional levels.

10.5.3 The East Asian Financial Crisis and Output Contraction

Figure 10.1 presents the predicted values for output growth for the five East Asian countries that experienced a severe currency and balance-of-payments crisis in 1997. These predictions are for 1998 and based on 1997

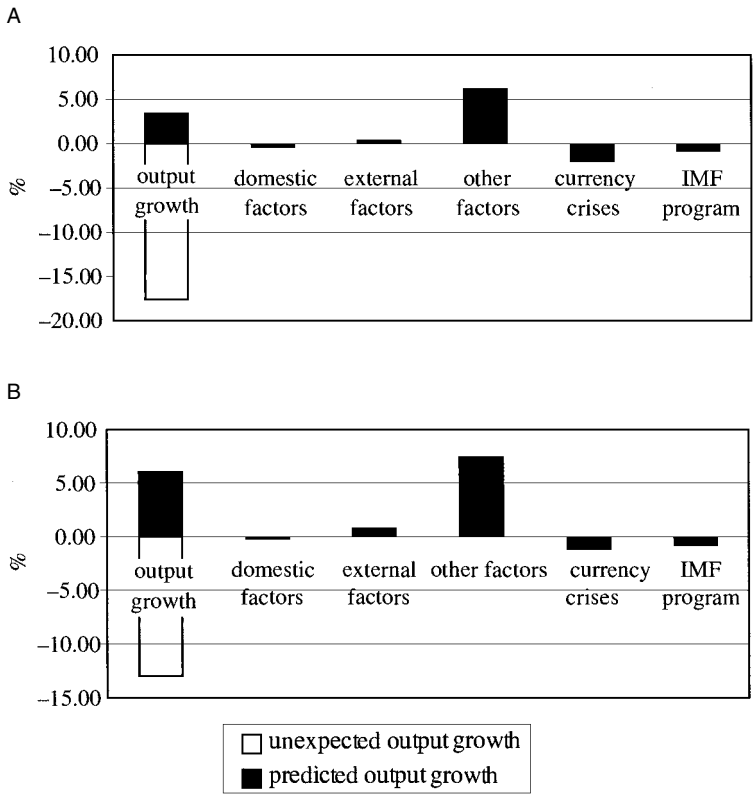

Fig. 10.1 Real GDP growth in East Asia 1998 (predicted values and forecast error): *A,* Indonesia; *B,* Korea; *C,* Malaysia; *D,* The Philippines; *E,* Thailand

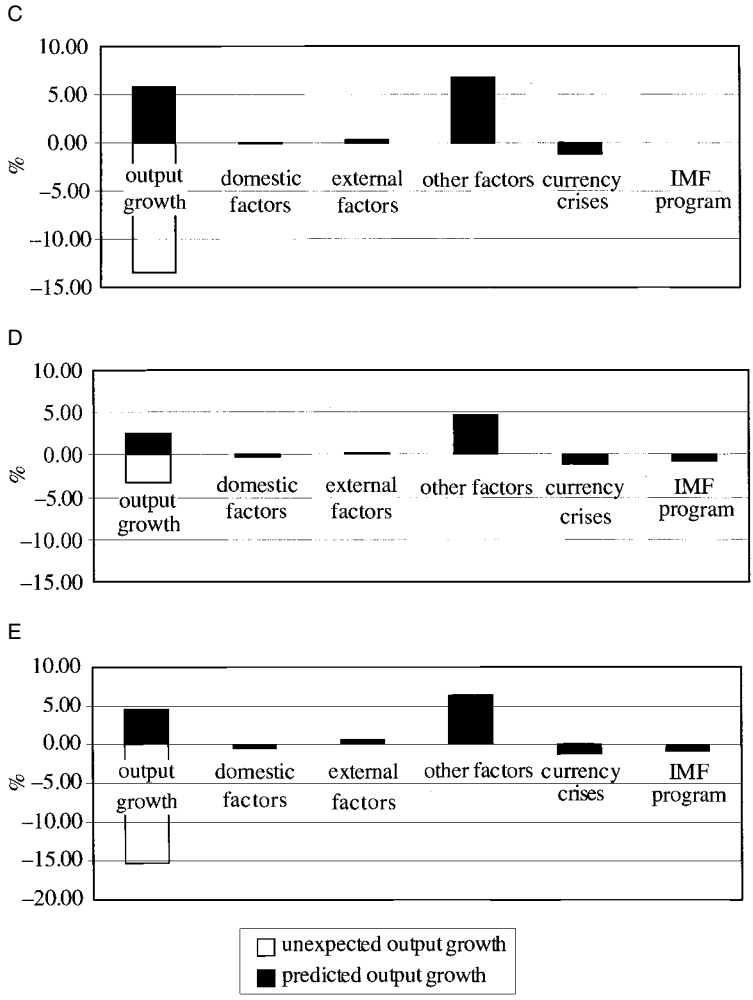

Fig. 10.1 (cont.) Real GDP growth in East Asia 1998 (predicted values and forecast error): *A,* Indonesia; *B,* Korea; *C,* Malaysia; *D,* The Philippines; *E,* Thailand

values of the explanatory variables, and the coefficient estimates—including country-specific fixed effects—are based on the model presented in column (3) of table 10.7 (estimates are based on 1975–97 data). The explanatory factors leading to the 1998 predicted value are decomposed into (a) domestic factors (change in budget surplus, inflation, and credit growth); (b) external factors (external growth and real exchange rate overvaluation); (c) other factors (previous year's output growth and country-specific fixed effect); (d) the currency crisis effect; and (e) the IMF-participation effect.

Predicted output growth for all five countries is positive in 1998, and the

forecast error (unexpected declines in output) is therefore very large. The negative effect exerted by the currency crisis and subsequent participation in an IMF program is entirely dominated by positive "other factors"—mainly a history of very strong growth in the region and the consequently large country-specific fixed effect growth factor—and a modestly supportive external growth environment. The effect of the currency crisis was expected to slow output growth by 1–2 percentage points, and IMF-program participation (for Indonesia, Thailand, Korea, and the Philippines) lowers predicted growth by about 0.8 percentage points.

The largest unexpected fall in real GDP was Indonesia (17.6 percentage points) and the least in the Philippines (3 percentage points). The average of the four negative forecast errors for the four countries participating in IMF programs was 12.3 percentage points, not much different from the 13.5 point unexpected fall in Malaysia's GDP. Not participating in the IMF program did not appear to help Malaysia avoid a huge fall in output, and this decline was similar to others in the region.[19] The 0.8 predicted negative effect of participating in an IMF program pales by comparison with the actual declines in output observed.

There appears to have been a common shock or common vulnerability in these countries—not related to the IMF and unobserved in this model—causing the unexpectedly large collapse in output.[20] All of these countries had serious banking problems that were associated with currency crises, a characteristic likely to cause substantially greater output effects, working through the disruption of credit and other channels (Glick and Hutchison 2001). Taiwan, Hong Kong, and Singapore avoided the worst of the currency and banking problems because they did not have significant external (foreign-currency-denominated) short-term debt positions. Other factors, such as an abrupt loss of confidence after two decades of rapid growth and unrealistically high expectations for the region, may also have played a role.

10.6 Is Policy Changed by International Monetary Fund–Program Participation?

An important assumption underlying the GEE strategy is that it is possible to characterize policy actions in the form of stable and systematic re-

19. Kaplan and Rodrik (2001) argue that, following the crisis, the imposition of capital controls in Malaysia, as opposed to adoption of an IMF program, led to a faster recovery and lower unemployment compared to Thailand and South Korea. They compare the aftermath of the imposition of controls in 1998 with the adoption of IMF programs in 1997 by Korea and Thailand (using the time-shifted difference-in-difference specification). However, this approach does not take into account a counterfactual that the Malaysian currency crisis probably would not have extended to September 1998 if it had adopted an IMF program in 1997.

20. It is possible that the "common shock" was indeed especially severe austerity programs associated with the IMF programs and perhaps mimicked by Malaysia to gain international acceptance of its policies. However, the evidence reported by Kaplan and Rodrik (2001) and others, and the imposition of capital controls by Malaysia, does not support this view.

action functions (equation [2]). This may prove extremely difficult because we are attempting to identify common responses from a broad spectrum of developing and emerging-market countries over a thirty-year period. The work of Dicks-Mireaux, Mecagni, and Schadler (2000) highlights the problems in identifying a consistent policy reaction function even among low-income developing economies. For example, they do not find any significant determinants of the fiscal balance or net domestic credit. They conclude that "these estimates provide a weak basis for deriving estimates of the unobservable counterfactuals" (508).

Table 10.9 presents our estimates of policy reaction functions for domestic credit growth—a primary policy instrument for many developing economies. Domestic credit growth is also a key indicator of monetary policy used by the IMF in conditionality and surveillance. Equations for narrow money growth, broad money growth, and government budget policy-reaction functions were also estimated, but the results are much weaker and not reported for brevity.

Column (1) reports the results of the basic policy-reaction-function model for all observations in the sample (program and nonprogram years), and columns (2) and (3) report the estimates over the program and nonprogram observations, respectively. Consistent with the theoretical formulation of the model, the macroeconomic determinants consist of lagged values of the current account surplus (relative to GDP), inflation, real GDP growth, and whether the country experienced a currency crisis. Also included are regional dummy variables and a dummy variable for the form of government ("autocracy"). Further, in the equations for nonprogram years and program years we have included the IMR to control for sample selection bias. (The probit model estimated with IMF-program approvals as the dependent variable is reported in table 10A.3. The IMR is calculated from the predicted values of this model.)

The only significant macroeconomic predictors of credit growth, shown in columns (1)–(3), are lagged inflation and the occurrence of a currency crisis in the previous year. The coefficient estimates of lagged inflation range between 0.6 and 0.7, indicating that a 1 percentage point rise in inflation is associated with a rise (fall) in nominal credit growth (real credit growth) of about 0.7 (0.3) percentage points. Interpreting this equation as a reaction function suggests that, in response to a rise in inflation, the authorities respond by reducing real credit growth. The coefficient on the (lagged) currency crisis variable is positive and significant in columns (1) and (3), indicating that countries generally respond to currency crises by expanding credit growth.

The constant term is much lower during IMF programs (6.9) relative to the nonprogram observations (28.8), suggesting more restrictive policy on average during the IMF-program years. The IMR is significant in the IMF-program-years regression (column [3]), indicating that sample selection

Table 10.9 Policy Reaction Function Estimates (Dependent variable: credit growth)

	Coefficient				
	All Years	Program Years	Nonprogram Years	All Years	
Explanatory Variable	(1)	(2)	(3)	(4)	(5)
Constant	10.252***	6.892	28.769***	40.045***	39.857***
	(4.23)	(1.39)	(4.46)	(4.55)	(4.67)
Change in current account–GDP ratio ($t-1$)	–11.720	48.131	–67.246**	–19.938	–18.511
	(–0.49)	(0.87)	(–2.05)	(–0.89)	(–0.83)
Inflation ($t-1$)	0.615***	0.641***	0.661***	0.390***	0.394***
	(4.97)	(3.06)	(4.24)	(2.86)	(2.95)
Real GDP growth ($t-1$)	0.063	0.024	–0.385	–0.267	–0.277
	(0.22)	(0.09)	(–0.78)	(–1.08)	(–1.13)
Autocracy	–0.337	–0.022	–0.511	0.409	0.509*
	(–1.17)	(–0.06)	(–1.11)	(1.32)	(1.64)
Africa dummy	–0.520	–0.544	–6.897	–33.074***	–35.168***
	(–0.19)	(–0.15)	(–1.47)	(–4.03)	(–4.33)
Asia dummy	3.328**	4.411	0.163	–23.709***	–24.277***
	(2.00)	(1.51)	(0.08)	(–2.82)	(–2.97)
Latin America dummy	4.558**	6.738*	5.228*	–25.626***	–25.463***
	(2.24)	(1.73)	(1.77)	(–3.30)	(–3.36)
Inverse Mills ratio (sample selection correction)		1.373	49.661***		
		(0.75)	(3.40)		
IMF participation dummy (t)				–3.942*	–1.285
				(–1.84)	(–0.67)
Currency crises dummy ($t-1$)	3.737	–3.315	19.210***	3.798	11.326**
	(1.06)	(0.64)	(3.01)	(1.16)	(2.19)
Interactive term ($D_{it}^{IMF} * D_{i(t-1)}^{CC}$)					–15.645**
					(–2.44)
Adjusted R^2	0.38	0.47	0.41	0.44	0.44
N	987	322	505	987	987
Durbin-Watson statistic	1.73	1.27	1.92	1.81	1.83

Note: Column (4) and (5) regressions also include country dummies. Numbers in parentheses are t-statistics.

***Significant at the 1 percent level.

**Significant at the 5 percent level.

*Significant at the 10 percent level.

bias is an issue: countries do not randomly enter into IMF programs, and their decision to participate is systematically linked to domestic credit growth.

The regressions reported in columns (4) and (5) cover all years and control for IMF-program participation by including a dummy variable in the regression. Country-specific dummy variables are included in these regressions—a fixed-effects model formulation—in order to control for the wide variation in average credit growth across countries. These results indicate the importance of controlling for country fixed effects in attempting to ex-

plain credit growth over such a wide diversity of countries. The impact of inflation is substantially reduced (to 0.4), indicating that inflation reduces real credit growth. The dummy variable on autocracy is also significant in one formulation of the model, as are the regional dummy variables.

We find that, in column (4), IMF programs reduce domestic credit growth by about 4 percentage points during the period they are in effect. Inclusion of the interactive term, in column (5), indicates that currency crises tend to induce greater credit expansion (by 11 percentage points), and the joint coincidence of a recent currency crisis and current IMF program is associated with a contraction of credit by about 15 percent annually. The joint effect of a currency crisis (lagged) followed by an IMF program is estimated to reduce credit growth by about 5.6 percentage points (11.2–1.3–15.6).

These results suggest that IMF-program participation is associated with restrictive credit growth. Investigations of budget policy and money growth, however, did not indicate any link between IMF-program participation and policy. Even the credit reaction function is fairly weak, however, likely reflecting shifts in policy over time and the fact that the types of countries going to the IMF for assistance have very different characteristics from countries not going to the IMF.

10.6.1 The East Asian Financial Crisis and Credit Growth

The empirical credit growth equation (column [4] of table 10.9) is employed to predict credit growth for the five East Asian countries that experienced currency crises in 1997. Predicted credit growth was divided into component parts and the "unexpected" (forecast error) calculated. In every case, credit growth in 1998 is predicted to be quite strong, ranging from 15.5 (the Philippines) to 24.4 (Indonesia). Participation in IMF programs lowered predicted credit growth by about 4 percentage points, and the predicted response to the currency crises increased predicted credit growth by about 4 percentage points.[21]

A sharp and unanticipated contraction (negative forecast error) was experienced in every country except for Indonesia following the East Asian currency crisis. The countries that participated in IMF programs experienced smaller unexpected declines (Korea, –8.4 percent; the Philippines, –17.5 percent; Thailand, –18.2 percent) than did Malaysia (–23.2), and Indonesia experienced a sharp, unpredicted jump in credit. The observed decline, as opposed to the negative forecast error, in credit growth was also largest in Malaysia at –2.7 percent. Indonesia, by contrast, experienced an 18.6 percent unpredicted rise in credit and an observed rise of 43 percent. Similar to the output growth prediction results, Malaysia was hurt at least as much by the Asian currency crisis as the IMF-program countries.

21. These results are not reported for brevity but are available from the author upon request.

10.7 Conclusion

The estimated cost of an IMF stabilization program, in terms of forgone output growth, is about 0.6–0.8 percentage points during each year of program participation. Currency crises also reduce output growth over a two-year period by about 2 percentage points. Participation in an IMF-supported program following a balance-of-payments or currency crisis, however, does not appear to mitigate or exacerbate the output loss. This is despite the fact that countries participating in IMF programs seem to follow much tighter credit policy when facing a severe balance-of-payments crisis. Moreover, there is some evidence that the decline in GDP growth generally precedes the approval of an IMF program and may not be attributable to program participation per se. These results are robust to estimation technique, model specification, types of IMF programs included, and corrections for sample selection bias.

The huge declines in output and credit growth in the wake of the 1997 Asian currency crisis were much larger than predicted by historical patterns linking GDP developments to currency crises, IMF program participation, external conditions, and policy developments. Indeed, the models predicted fairly robust output growth and credit growth in 1998 despite the currency crises and, in most cases, participation in IMF-supported programs. The unexpected falls in output and credit were also very large in Malaysia, even though it chose not to participate in an IMF stabilization program at the time. Whether a country decided to participate in an IMF-supported program at the time of the Asian currency crisis seems to have had little affect on the ultimate output cost.

The effect of IMF-supported stabilization programs on output growth—judging by the experiences of sixty-seven countries with over 450 programs—does not appear large in comparison with the average growth rates of developing and emerging-market economies over the 1975–97 period. Nonetheless, whether the cost of participating in an IMF-supported stabilization program exceeds the benefit measured in terms of balance-of-payments adjustment and continued access to credit markets is an open question to be answered by policy makers in the countries involved.

Appendix

Participation in IMF-Supported Stabilization Programs

Table 10A.3 presents a probit equation attempting to explain participation in short-term IMF programs by a variety of economic determinants. Our selection of economic determinants is guided by previous literature in this

area, especially Knight and Santaella (1997), who test a number of supply-side (e.g., willingness of the IMF to approve programs) and demand-side (e.g., demand of a particular country for IMF credits) determinants. This literature demonstrates that entering into an IMF agreement is not random, but guided by "a clear set of observable economic factors that are strongly correlated with the event of approval of a financial arrangement" (431). They find that a low level of international reserves, low per capita GDP, high ratio of external debt service (to export earnings), movements in the real exchange rate, weak GDP growth, and a low rate of domestic investment induce countries to seek an IMF-supported program. Policy measures to enhance fiscal revenues, reduce government expenditures, tighten domestic credit, and adjust the exchange rate are significant factors likely to win IMF approval of programs.

We report similar results in table 10A.3. We find that an improvement in the budget surplus helps win IMF approval of programs, whereas lower foreign exchange reserves (relative to imports) and a currency crisis induce countries to seek an IMF program. Countries in Africa and Asia are less likely to have short-term IMF programs approved. There is no discernible shift in the probability of having an IMF program approved in the 1980s and 1990s compared to earlier periods and, surprisingly, we find no connection between program approval and inflation, real exchange rates, real per capita GDP growth, or the level of real GDP per capita. Other lagged values were investigated but did not add explanatory power to the model.

There are 862 observations in sample, and the model (at the 25 percent predicted probability cutoff point) predicts 71 percent of the observations correctly. However, although 80 percent of the "no program participation" observations are correctly predicted, only 34 percent of the "program approval" observations are correctly predicted. At the 10 percent probability cutoff point, however, 96 percent of the "program participation" observations are correctly predicted, but only 32 percent of the "no participation" observations.

Table 10A.1 Countries Included in Data Set

Emerging Markets (25 Countries)	Other Developing Countries (42 Countries)	
Argentina	Bangladesh	Mali
Brazil	Belize	Morocco
Chile	Bolivia	Mozambique
Colombia	Botswana	Myanmar
Costa Rica	Burundi	Nepal
Cyprus	Cameroon	Nicaragua
Dominican Republic	Ecuador	Nigeria
Hong Kong	Egypt	Pakistan
Indonesia	El Salvador	Paraguay
Jordan	Equatorial Guinea	Peru
Korea	Ethiopia	Sierra Leone
Malaysia	Fiji	Sri Lanka
Malta	Ghana	Swaziland
Mauritius	Grenada	Syria
Mexico	Guatemala	Uganda
Panama	Guinea-Bissau	Zambia
The Philippines	Guyana	Zimbabwe
Singapore	Haiti	
South Africa	Honduras	
Thailand	India	
Trinidad and Tobago	Jamaica	
Tunisia	Kenya	
Turkey	Laos	
Uruguay	Madagascar	
Venezuela	Malawi	

Table 10A.2 Occurrences of Currency Crises and IMF Program Participation

	Currency Crises	IMF Programs
Argentina	1975, 1982, 1989	1972[f], 1973[f], 1975[f], 1976[a], 1976[f], 1977[a], 1983[a], 1984[a], 1987[a], 1989[a], 1991[a], 1992[b], 1996[a]
Bolivia	1981, 1983, 1988, 1991	1973[a], 1980[a], 1986[a], 1986[c], 1988[c], 1994[c]
Brazil	1982, 1987, 1990, 1995	1970[a], 1971[a], 1972[a], 1983[b], 1988[a], 1992[a]
Chile	1985	1970[a], 1972[f], 1973[f], 1974[a], 1975[a], 1985[b], 1989[a]
Colombia	1985	1970[a], 1971[a], 1972[a], 1973[a]
Costa Rica	1981	1976[a], 1980[a], 1981[b], 1982[a], 1985[a], 1987[a], 1989[a], 1991[a], 1993[a], 1995[a]
Dominican Republic	1985, 1987, 1990	1983[b], 1985[a], 1991[a], 1993[a]
Ecuador	1982, 1985, 1988	1970[a], 1972[a], 1983[a], 1985[a], 1986[a], 1988[a], 1989[a], 1991[a], 1994[a]
El Salvador	1986, 1990	1970[a], 1972[a], 1980[a], 1982[a], 1990[a], 1992[a], 1993[a], 1995[a], 1997[a]
Guatemala	1986, 1989	1970[a], 1972[a], 1981[a], 1983[a], 1988[a], 1992[a]
Haiti	1977, 1991	1970[a], 1971[a], 1972[a], 1973[a], 1974[a], 1975[a], 1976[a], 1977[a], 1978[b], 1982[a], 1983[a], 1986[c], 1989[a], 1995[a], 1996[d]

(*continued*)

Table 10A.2 (continued)

	Currency Crises	IMF Programs
Honduras	1990	1971[a], 1972[a], 1979[b], 1982[a], 1990[a], 1992[c]
Mexico	1976, 1982, 1985, 1994	1977[b], 1983[b], 1986[a], 1989[b], 1995[a]
Nicaragua	1993	1970[a], 1972[a], 1979[a], 1991[a], 1994[c]
Panama		1970[a], 1971[a], 1972[a], 1973[a], 1974[a], 1975[a], 1977[a], 1978[a], 1979[a], 1980[a], 1982[a], 1983[a], 1985[a], 1992[a], 1995[a], 1997[b]
Paraguay	1984, 1986, 1988, 1992	
Peru	1976, 1979, 1987	1970[a], 1977[a], 1978[a], 1979[a], 1982[b], 1984[a], 1993[b], 1996[b]
Uruguay	1982	1970[a], 1972[a], 1972[f], 1975[a], 1976[a], 1976[f], 1977[a], 1979[a], 1980[a], 1981[a], 1983[a], 1985[a], 1990[a], 1992[a], 1996[a], 1997[a]
Venezuela	1984, 1986, 1989, 1994	1989[b], 1996[a]
Grenada	1978	1975[a], 1979[a], 1981[a], 1983[b]
Guyana	1987, 1989	1970[a], 1971[a], 1972[a], 1973[a], 1974[a], 1974[f], 1975[a], 1976[a], 1978[a], 1979[b], 1980[b], 1990[a], 1990[c], 1994[c]
Belize		1984[a]
Jamaica	1978, 1983, 1990	1973[a], 1974[f], 1977[a], 1978[b], 1979[b], 1981[b], 1984[a], 1987[a], 1988[a], 1990[a], 1991[a], 1992[b]
Trinidad & Tobago	1985, 1988, 1993	1989[a], 1990[a]
Cyprus		1980[a]
Jordan	1983, 1987, 1989, 1992	1972[f], 1973[f], 1989[a], 1992[a], 1994[b], 1996[b]
Syria	1977, 1982, 1988	1972[f]
Egypt	1979, 1989	1973[f], 1977[a], 1978[b], 1987[a], 1991[a], 1993[b], 1996[a]
Bangladesh	1975	1972[f], 1974[a], 1975[a], 1979[a], 1980[b], 1983[a], 1987[c], 1990[c]
Myanmar	1975, 1977	1973[a], 1974[af], 1977[a], 1978[a], 1981[a]
Sri Lanka	1977	1971[a], 1972[f], 1973[f], 1974[af], 1977[a], 1979[b], 1983[a], 1991[c]
Hong Kong		
India	1976, 1991, 1995	1974[f], 1981[b], 1991[a]
Indonesia	1978, 1983, 1986, 1997	1970[a], 1971[a], 1972[a], 1973[a], 1997[a]
Korea	1980, 1997	1970[a], 1971[a], 1972[a], 1973[a], 1974[a], 1975[a], 1977, 1980[a], 1981[a], 1983[a], 1985[a], 1997[a], 1997[e]
Laos	1995	1975[f], 1980[a], 1989[c], 1993[c]
Malaysia	1986, 1997	
Nepal	1975, 1981, 1984, 1991, 1995	1975[a], 1985[a], 1987[c], 1992[c]
Pakistan		1972[a], 1973[a], 1974[a], 1980[b], 1981[b], 1988[ac], 1993[a], 1994[bc], 1995[a], 1997[bd]
The Philippines	1983, 1986, 1997	1970[a], 1971[a], 1972[a], 1973[af], 1974[a], 1975[a], 1976[f], 1979[a], 1980[a], 1983[a], 1984[a], 1986[a], 1989[b], 1991[a], 1994[b]
Singapore	1975	
Thailand	1981, 1984, 1997	1978[a], 1981[a], 1982[a], 1995[a]
Botswana	1984, 1996	
Burundi	1976, 1983, 1986, 1989, 1997	1970[a], 1972[f], 1976[a], 1986[c], 1991[c]

Table 10A.2 (continued)

	Currency Crises	IMF Programs
Cameroon	1982, 1984, 1994	1980[a], 1988[a], 1991[a], 1994[a], 1995[a], 1997[d]
Equatorial Guinea	1991, 1994	1980[a], 1985[a], 1988[c], 1993[c]
Ethiopia	1992	1981[a], 1992[c], 1996[d]
Ghana	1978, 1983, 1986	1979[a], 1983[a], 1984[a], 1986[a], 1987[bc], 1988[c], 1995[d]
Guinea-Bissau	1991, 1996	1974[f], 1982[a], 1986[a], 1987[a], 1987[c], 1991[c], 1995[c], 1997[d]
Kenya	1975, 1981, 1985, 1993, 1995, 1997	1975[b], 1978[a], 1979[a], 1980[a], 1982[a], 1985[a], 1988[ac], 1989[c], 1993[c], 1996[c]
Madagascar	1984, 1986, 1991, 1994	1977[a], 1980[a], 1981[a], 1982[a], 1984[a], 1985[a], 1986[a], 1987[c], 1988[a], 1989[c], 1996[d]
Malawi	1982, 1985, 1992, 1994	1979[a], 1980[a], 1982[a], 1983[b], 1988[ac], 1994[a], 1995[cd]
Mali	1993	1971[a], 1982[a], 1985[a], 1988[ac], 1992[c], 1996[d]
Mauritius	1979	1978[a], 1979[a], 1980[a], 1981[a], 1983[a]
Morocco	1983, 1990	1971[a], 1976[f], 1980[b], 1981[b], 1982[a], 1983[a], 1985[a], 1988[a], 1990[a], 1992[a]
Mozambique	1993, 1995	1987[c], 1990[c], 1996[d]
Nigeria	1986, 1989, 1992	1987[a], 1989[a], 1991[a]
Zimbabwe	1982, 1991, 1994, 1997	1981[a], 1983[a], 1992[bc]
Sierra Leone	1988, 1990, 1997	1976[f], 1977[a], 1979[a], 1981[b], 1984[a], 1986[c], 1994[c]
Swaziland	1975, 1979, 1982, 1984	
Tunisia	1993	1970[a], 1986[a], 1988[b]
Uganda	1981, 1987, 1989	1970[a], 1976[f], 1980[a], 1981[a], 1982[a], 1983[a], 1987[c], 1989[c], 1994[c], 1997[d]
Zambia	1985, 1994	1972[f], 1973[a], 1975[f], 1976[a], 1978[a], 1981[b], 1983[a], 1984[a], 1986[a], 1995[c]
Fiji	1986	1974[a]

Notes: Currency crises defined by criteria described in text, with twenty-four-month exclusion windows imposed. IMF programs specified below.

[a] Stand By and Extended Stand By Agreements (SBA).

[b] Extended Fund Facility (EFF).

[c] Structural Adjustment Facility (SAF) and Enhanced Structural Adjustment Facility (ESAF).

[d] Poverty Reduction and Growth Facility (PRGF).

[e] Supplemental Reserve Facility (SRF).

[f] Contingency and Compensatory Fund Facility (CCFF).

Table 10A.3 **Participation Equation in Short-Term IMF Programs: Probit Estimation Results**

Variable	Partial Derivative
Constant	–0.165**
	(–2.21)
Post-1979 dummy	0.031
	(0.54)
Change in current account–GDP ratio	–0.258
	(–0.94)
Change in budget surplus–real GDP ratio ($t-2$)	–0.678*
	(–1.86)
Change in budget surplus–real GDP ratio ($t-1$)	0.747**
	(2.22)
Inflation ($t-1$)	0.000
	(0.96)
Real per capita GDP growth ($t-1$)	0.001
	(0.79)
Foreign exchange reserves to imports ratio ($t-1$)	–0.215***
	(–3.97)
Real per capita GDP – level ($t-1$)	0.000
	(–0.35)
Real exchange rate overvaluation ($t-1$)	0.000
	(0.72)
Currency crises dummy ($t-1$)	0.083**
	(2.49)
Africa dummy	–0.154***
	(–2.99)
Asia dummy	–0.120**
	(–2.34)
Latin America dummy	0.005
	(0.10)
Autocracy	0.001
	(0.25)
Goodness-of-fit (10% cutoff)	
% of observations correctly called	32
% of IMF programs correctly called	96
% of no program correctly called	17
Goodness-of-fit (25% cutoff)	
% of observations correctly called	71
% of IMF programs correctly called	34
% of no program correctly called	80
N	862
Log likelihood function	–388.90
Significance level	0.000

Note: Dependent variable: approval of short-term IMF programs.

***Significant at the 1 percent level.

**Significant at the 5 percent level.

*Significant at the 10 percent level.

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Comment Gian Maria Milesi-Ferretti

Identifying the effects of International Monetary Fund (IMF) programs on economic growth and on other macroeconomic variables is a difficult task. In this paper, the author follows the methodology first laid out by Goldstein and Montiel (1986) to examine whether IMF programs for stabilization

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purposes have measurable effects on economic performance. The novelty in this study consists in the use of data on currency crises: the author asks whether currency crises provide additional explanatory power to the basic growth regressions used to identify the effects of IMF programs, and whether the presence of an IMF program during a currency crisis has a significant effect on growth. The study focuses on emerging economies and excludes those less-developed countries that borrowed at concessional rates under the structural adjustment facilities.

The paper is well written, and the basic inputs to the empirical analysis are clearly presented to the reader. An appendix lists both the IMF programs the paper considers and the dates of the currency crises, and the formal panel regression analysis is preceded by a careful examination of the data. For example, the author documents the path of economic growth and other variables such as inflation and the current account before and after IMF programs. The crucial difficulty in identifying the effects of IMF programs on economic variables is the standard selection bias problem: Countries that borrow from the IMF typically do so because they face balance-of-payments difficulties, and it is therefore likely that their overall macroeconomic situation will be worse than the one faced by countries that do not borrow from the IMF. Indeed, considering the list of countries in the author's sample that never borrowed from the IMF, we find several of the fastest-growing developing and emerging economies of the past three decades: Botswana, Hong Kong, Malaysia, and Singapore.

My comments will mostly focus on the specification of the model used by the author and the policy implications that are drawn in section 10.6 and in the conclusions.

What Effects of Fund Programs Can the Model Identify?

As mentioned above, the model used by the author is standard in the literature. The Generalized Evaluation Estimator (GEE) addresses the selection bias problem by attempting to construct a counterfactual—that is, determine how economic policy would have been conducted in the absence of an IMF program—and to use this counterfactual to identify the actual impact of IMF programs on economic growth. The basic equation is

$$y_{it} = \beta_i + \beta_k \mathbf{X}_{it} + \alpha_h \mathbf{W}_{it} + \beta^{\mathrm{IMF}} D_{it}^{\mathrm{IMF}} + \varepsilon_{it} \tag{1}$$

where $\mathbf{X}_{it}$ is a vector of economic policy variables in the absence of IMF programs. The counterfactual is constructed assuming that policies in the absence of an IMF program are set according to the policy reaction function

$$\Delta \mathbf{X}_{it} = \gamma(y_i^d - y_{i,t-1}) + \eta_{it}. \tag{2}$$

Estimation is conducted substituting equation (2) into equation (1) without actually proceeding to the estimation of the policy reaction function in equation (2).

We also know from the literature that this approach has serious weak-

nesses, the primary one being the extremely poor explanatory power exhibited by the postulated policy reaction functions when these are separately estimated. In addition to this, the reader should also keep in mind what type of effects of IMF programs the above specification can identify. As highlighted by Dicks-Mireaux, Mecagni, and Schadler (2000), this specification can capture "direct" effects of IMF programs on performance, related to the availability of external funds to weather the balance-of-payments difficulties, or the effects of programs on confidence (say, through their impact on the risk premium). However, this specification is not appropriate for capturing the effects of IMF programs on economic policy conduct (for example, on monetary and fiscal policy) and through this channel on growth. This can easily be seen by considering the following, more general specification of equation (1):

$$y_{it} = \beta_i + \beta_k \tilde{\mathbf{X}}_{it} + \alpha_h \mathbf{W}_{it} + \beta^{\mathrm{IMF}} D_{it}^{\mathrm{IMF}} + \varepsilon_{it} \tag{3}$$

where the vector $\tilde{\mathbf{X}}_{it} = \mathbf{X}_{it} + \mathrm{X}_{it}^{\mathrm{IMF}} \mathrm{D}_{it}^{\mathrm{IMF}}$ so that economic growth depends on actual economic policy conduct $\tilde{\mathbf{X}}_{it}$ and allowance is made for a systematic difference in the conduct of economic policy in the presence of IMF programs. The estimation of the effects of IMF programs in this case also requires the use of the policy reaction function in equation (2) (which determines the value of policies in the absence of IMF programs when these are not directly observable). However, in general the two formulations will not be equivalent, unless it is assumed that the effects of IMF programs on policy are constant across policy variables. This must be kept in mind when one examines whether economic policy is systematically different during IMF programs, as the author does in section 10.5.

Policy Reaction Functions

In section 10.5, the author proceeds to the actual estimation of policy reaction functions for the policy variables included in the regression in equation (1). Only the results of the credit growth regressions are reported, because the explanatory power of the other policy reaction function is very limited.

In these regressions, the author shows that policy under IMF programs appears to be systematically different from policy in the absence of programs, with credit growth being lower. This finding seems reasonable, considering the typical design of IMF programs. However, inferring from this finding that the negative effects of IMF programs on growth identified using the GEE could work through a negative impact on growth of tight credit policy is problematic for two reasons. First, as mentioned above, the formulation used by the author in the GEE regressions is not appropriate for capturing the effects on growth of different policies under IMF programs. Second, and most important, the regressions show a systematic *negative*

effect of credit growth on output growth, and therefore they do not seem to identify any negative effect of "tight credit" on economic performance.

Interestingly, in the estimation of the credit policy reaction function for nonprogram years there appears to be a significant effect of selection bias: the inverse Mills ratio (IMR) is statistically very significant. This suggests that selection bias may indeed be a problem also in the estimation of the growth regressions, but the author does not find there any significant impact of the IMR.

The Choice of Variables

In general the author uses a fairly standard specification for growth regressions. I am only unclear about the use of the *change* in the budget balance in the growth regressions and the use of the lagged *change* in the current account as an explanatory variable for credit growth. In both cases the level of the underlying variable would seem to be a much more logical choice.

Other Issues

I am also concerned that some of the author's results concerning the impact of inflation on growth as well as differences in inflation between program and nonprogram years may be contaminated by the presence of a few countries that suffered bouts of hyperinflation: Argentina, Bolivia, Brazil, Nicaragua, and Peru. Also, while in the regressions it is perfectly reasonable to use a log-difference specification for inflation, this is less appropriate for the comparison of program and nonprogram years, given that for relatively high rates of inflation the log difference is a poor approximation of the actual inflation rate.

Although I concur with the construction of the currency crises index, which takes into account variations in the real rather than the nominal exchange rate (thus correcting for the presence of high inflation, high depreciation episodes) I am surprised that the methodology does not detect a currency crisis in Chile in 1982, a year of high real depreciation and substantial reserve losses.

In summary, the author has made a valuable effort in his attempt to identify the degree to which IMF programs and currency crises affect economic performance. The shortcomings of the paper are those of the overall methodology being used.

References

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Discussion Summary

Martin Feldstein questioned the treatment of the endogeneity problem for IMF programs. He remarked that it is not clear whether the insignificance of the IMR coefficient means there is no selection bias (participation is random) or the process does not account for it and estimation is still biased. Also, he questioned whether the fact that the IMF provides a "good housekeeping" seal of approval is accounted for in the empirical work.

Morris Goldstein mentioned an interdependence problem. Even if Malaysia does not want an IMF program, it might still adopt IMF policy recommendations in order to get acceptance by international markets. Thus, the IMF had an effect on Malaysia even though it did not implement a program there.

Kenneth D. West noted that the insignificance of the IMR term is also pervasive in labor studies.

William Easterly remarked that there is a very high rate of repetition in IMF programs. Some countries go to the IMF repeatedly for many years, which suggests the IMF is not successful in whatever it is trying to do.

Nouriel Roubini suggested using a variable that proxies for the currency mismatch in the balance sheet (net foreign debt times the amount of devaluation).

Michael P. Dooley remarked that domestic credit is a variable that is very closely watched by the IMF staff and that the IMF always negotiates for contractionary credit policy. This could be the only thing that differentiates program countries. This, he noted, corresponds to the paper's findings.

Martin Eichenbaum asked what the IMF is trying to do. If it is trying to build reserves, then it is successful. As for structural change, he doubted that the IMF actually manages to achieve much, considering the institutional and cultural character of these reforms.

Michael Hutchison responded that dealing with self-selection bias appeared to be very difficult. It hinges on developing a stable policy reaction function over time and space. Handling currency crises up front was an attempt to control better for policy responses. In response to Feldstein's comment, he commented that an attempt to split the sample to examine whether the 1975–90 period was different from what followed was made but that no significant structural break was detected. In response to Goldstein's comment, Hutchison stated that if Malaysia took the same policy measures then the question remains whether the contribution of the IMF loan facil-

ity for the other East Asian countries helped with a faster recovery. Also, he noted that his participation equation, as is shown in the appendix, is not very good. Therefore, it is difficult to know whether the insignificance of the IMR is because a stable participation equation was not identified or that it does not exist and participation is random.