How Does the Global Economic Environment Influence the Demand for IMF Resources?

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The main objective of this paper is to quantify the relationship between the global economic environment and Stand-By Arrangements (SBAs) with the IMF. The results suggest that oil prices, world interest rates, and the global business cycle are the most influential indicators that affect the number of SBAs being requested. In addition, the empirical model seems to have reasonable accuracy when predicting SBAs. Furthermore, when oil prices, interest rates, and the global business cycle are adversely shocked by one standard deviation, the conditional probability of an SBA nearly doubles, implying an increase from about 6 to 12 SBAs. More critically, the model suggests that even a steady deterioration of the global economic climate would imply increasingly harsher conditions for developing and emerging market countries, which may in turn increase the demand for IMF resources significantly. [JEL F01, F33, F34, F42]

Considering the favorable global economic environment over the past few years, it is probably not much of a surprise that the number of IMF arrangements approved recently is well below historical averages. But what—if any—is the link between global economic and financing conditions and a country's potential request for IMF financial assistance? The main

objective of this paper is to rigorously quantify the relationship between the global economic environment and the number of Stand-By Arrangements (SBAs).

Formal econometric analysis is required to quantify the relationship between global economic conditions and the potential demand for SBAs. Using panel data techniques, this paper reports results based on 412 SBAs among 169 members over a period spanning 1970–2004. We focus on SBAs because they are the main nonconcessional IMF facility designed to provide short-term balance of payments (BOP) assistance to members.[1]

Global activity and liquidity indicators as well as country-specific factors were used to identify determinants influencing the number of SBAs. The three main global factors affecting the probability of requesting IMF financial assistance were found to be oil prices, world interest rates, and the global business cycle. The most important country-specific factors identified include the member's real GDP growth, the depreciation of its currency vis-à-vis the U.S. dollar, its international reserve cover, and whether or not it is an energy exporter. The estimates are robust to changes in model specification, as well as choice of global and country-specific explanatory variables.

Changes in global economic conditions significantly affect the probability of a country's demand for IMF resources. A scenario in which the three global factors are adversely shocked from their respective averages by one standard deviation nearly doubles the conditional probability of an SBA. Furthermore, when oil prices and interest rates are evaluated at their respective historical peaks, and the global business cycle is set at its deepest trough in the sample, the conditional probability almost quadruples to about 14 percent, implying an increase from approximately 6 to 23 SBAs.

The results are intuitive and consistent with economic theory. Among other things, a rise in world interest rates may increase a member's debt service costs and limit access to capital markets, higher oil prices would raise the import bill (for net oil importers), and a global recession could decrease international demand for a member's exports. More critically, even if global economic conditions worsen gradually, the probability of an approved SBA increases disproportionately owing to the underlying nonlinear nature of the econometric model. Such adverse developments would cause a deterioration in a member's current account balance and could lead to acute BOP problems. If a country does not have sufficient access to international capital markets, that member may request an IMF arrangement to mitigate the consequences of potentially severe macroeconomic adjustment.

The estimated regressions may also be used to predict the numbers of SBAs. There are indications that the framework has reasonable predictive accuracy. Whereas the actual number of SBAs approved in 2004 was 6, the model predicts between 5 and 5.7 SBAs in 2004. Furthermore, out-of-sample

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[1]See the earlier working paper version of this paper, Elekdağ (2006).

predictions for 2005 ranged between 5.7 and 6.1, whereas the actual number of approved SBAs was also 6.

Despite the importance of this topic, research on the empirical link between global economic conditions and IMF financing is scarce. In line with the survey of Joyce (2004), only Bird and Rowlands (2002) and Conway (1994) included global economic factors—which was in both cases only a measure of world interest rates. In this context, this paper builds on the literature by emphasizing the importance of global economic conditions and is also the only study that finds a critical role of oil prices in the demand for IMF financial assistance. Even though (in contrast to Bird, Hussain, and Joyce, 2004; and Marchesi, 2003) Barro and Lee (2005); Joyce (1992); and Knight and Santaella (1997) include time dummies to control for common effects of external factors, these frameworks may not be well suited for prediction.[2]

Further review of the literature also indicates that most of the studies rely on short sample periods and therefore miss important events, including the financial crises of the late 1990s. In fact, only Barro and Lee (2005); Bird and Rowlands (2001); Sturm, Berger, and de Haan (2005); and Trudel (2005) include a sample period through at least 2000. Furthermore, as discussed in detail below, the country coverage in this paper exceeds that in other studies, which could be critical to avoid econometric issues such as selection bias. Last, other than this paper, only Barro and Lee (2005) and Oatley and Yackee (2000) distinguish among the various types of IMF facilities.

The results of this paper have relevance for the IMF, for policymakers throughout the IMF membership, and for capital market analysts. The framework developed in this paper underscores cyclical factors that are relevant for future IMF lending capacity. This is especially important because unusually harsh economic conditions would likely imply a bunching of SBA requests—some of which may be exceptional access cases. In this context, this paper is also pertinent for assessing the prospects for the IMF's future income position, which depends on the amount of IMF credit outstanding.

I. IMF Arrangements from 1970 to 2004

The IMF is best known as a financial institution that provides resources to member countries experiencing temporary BOP problems. The IMF makes financial resources available to members in the general resources account under a range of policies and facilities, including credit tranches. More than a decade after its creation, the IMF developed policies on the use of its resources in what came to be known as credit tranches. SBAs were developed as the main instrument through which members would access the credit

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[2]For example, Barro and Lee (2005) partition their sample into five 5-year periods, whereas Knight and Santaella (1997) use an indicator variable that takes the value of unity from 1979 to 1991 when using a sample spanning only 1973–91.

Figure 1. Facilities and IMF Members
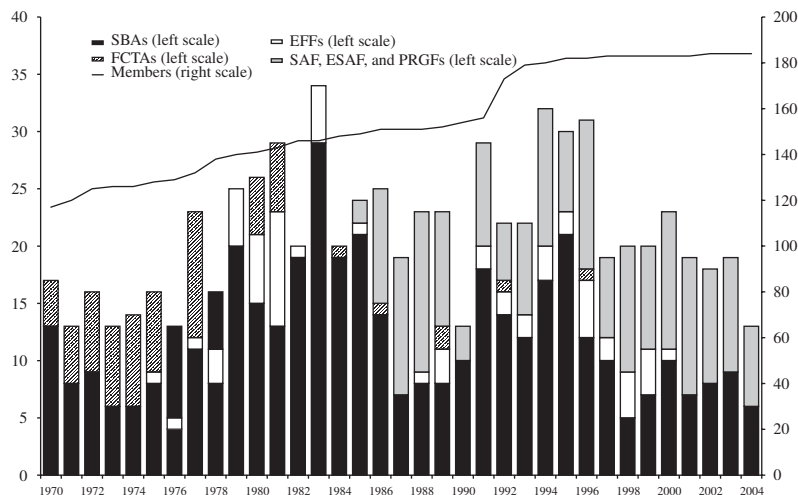
Source: IMF, Policy Development and Review Department database.
Note: SBA = Stand-By Arrangement; EFF = Extended Fund Facility; FCTA = First Credit Tranche Arrangement; SAF = Structural Adjustment Facility; ESAF = Enhanced Structural Adjustment Facility; PRGF = Poverty Reduction and Growth Facility.

tranches, and are available for any BOP need. Access under SBAs is limited to 100 percent of quota annually and 300 percent of quota cumulatively, although in exceptional circumstances access beyond these limits has been granted.

Although the IMF has used a variety of instruments to support members' BOP needs, the most utilized facility is the SBA. Figure 1 depicts the number of SBAs, Extended Fund Facilities (EFFs), first credit tranche arrangements (FCTAs), and concessional facilities (the Structural Adjustment Facility, Enhanced Structural Adjustment Facility, and Poverty Reduction and Growth Facility) against the backdrop of the IMF membership.[3] Table 1 provides the distribution of facilities across selected time periods. Even though SBAs historically outnumber other facilities, concessional IMF financing is increasing in importance. Although not shown, during the past decade exceptional access (especially in response to financial crises) and precautionary arrangements have gained prominence, whereas blended arrangements have been approved much less frequently.[4] Against this

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[3]Appendix I in the working paper version of this paper provides further details on IMF policies and facilities, including the various arrangements used to access IMF credit. See Elekdağ (2006).

[4] The 412 SBAs identified during 1970–2004 do not include blended arrangements.

Table 1. IMF Arrangements, 1970–2004						
	Total	1970–79	1980–89	1990–99	2000–04	1995–2004
Approved	739	166	243	238	92	212
GRA	556	166	195	154	41	114
SBAs	412	93	153	126	40	95
FCTAs	79	62	15	2	0	1
EFFs	65	11	27	26	1	18
SAFs, ESAFs, and PRGFs	183	0	48	84	51	98
Blended arrangements	33	0	25	7	1	4

Source: IMF, Policy Development and Review Department Stand-By Operations Division database.

Note: SBA = Stand-By Arrangement; FCTA = first credit tranche arrangement; EFF = Extended Fund Facility; SAF = Structural Adjustment Facility; ESAF = Enhanced Structural Adjustment Facility; PRGF = Poverty Reduction and Growth Facility; GRA = General Resource Account. Approved refers to the total number of arrangements approved in the year under consideration. Blended arrangements are concessional arrangements (SAF, ESAF, PRGF) combined with an EFF or SBA to supplement IMF financial assistance to a member.

background, we explore below how global economic and financial developments affect the potential demand for IMF resources.

## II. Indicators of the Global Economic Environment

Determinants of the global economic environment can broadly be grouped into activity and liquidity indicators. Controlling for country-specific policies and developments, the main conjecture of this paper is that world interest rates, oil prices, and the global business cycle are the most robust indicators of the global economic environment that influence the demand for IMF financial resources.[5]

Interest Rates

Shown in Figure 2 is the U.S. federal funds rate adjusted by U.S. consumer price index (CPI) inflation against the backdrop of SBAs during 1970–2004. Note that with the onset of the Volker disinflation in the early 1980s, both the real federal funds rate and the number of SBAs reach their historic peaks. The parallel movements between SBAs and the interest rate in the early 1990s are also noteworthy.

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[5]Appendix Table 3 in the working paper version of this paper contains a comprehensive description of the data. See Elekdağ (2006).

Figure 2. Interest Rates and Stand-By Arrangements
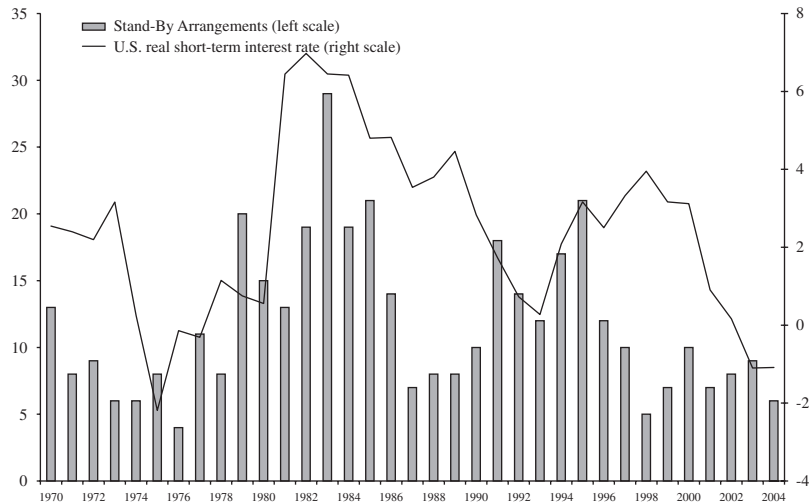
Sources: IMF, World Economic Outlook and Policy Development and Review Department databases; and author's calculations.

Note: Real U.S. short-term interest rate is calculated by subtracting U.S. CPI inflation from the federal funds rate.
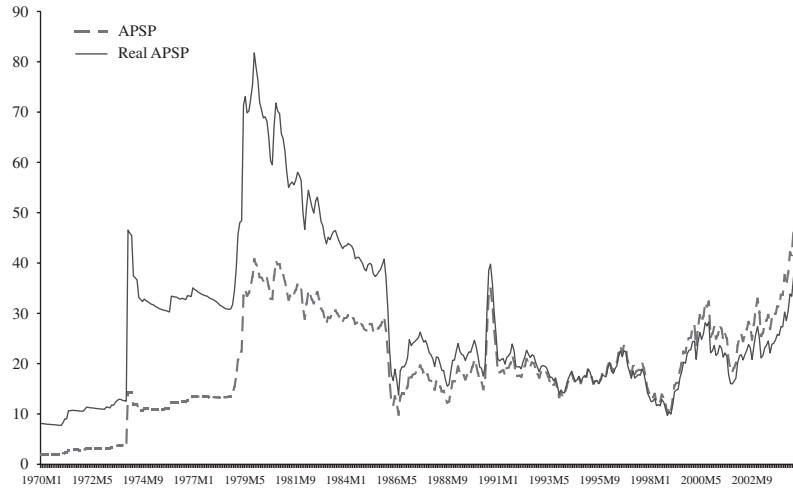
Oil Prices

The monthly nominal and real average petroleum spot prices (APSP) are displayed in Figure 3.[6] Even though nominal oil prices have reached record levels, prices adjusted for inflation are still below the peaks of the late 1970s. Against the background of SBAs, Figure 4 shows the real APSP as a deviation from trend.[7] Note that with the rise in oil prices, there is a trend increase in SBAs from the mid-1970s until the early 1980s. With the spike in oil prices in 1979, the number of approved SBAs more than doubles, increasing from 8 in 1978 to 20 in 1979. It is also worth highlighting how oil prices and SBAs move in tandem during the 1990s. With the gradual decline in the APSP in the mid-1990s, the number of SBAs decreased from 21 in 1995 to 5 in 1998.

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[6]The APSP is calculated using a simple average of U.K. Brent, West Texas Intermediate, and Dubai Fateh spot petroleum prices. The real APSP was scaled using the U.S. CPI, because world inflation is contaminated by episodes of hyperinflation.

[7]To avoid running spurious regressions, the (log) real APSP is detrended using a log-linear trend to ensure stationarity of the real APSP. Deviations from trend were used rather than growth rate, for example, to capture the burden of increased fuel costs more accurately. Consider Figure 3, which shows that after the 1973 OPEC shock, when oil prices roughly tripled, prices did not revert to their original single-digit levels. The first-differenced series would not capture this persistence, whereas the linearly detrended series does.

Figure 3. Monthly Average Petroleum Spot Price
(U.S. dollars per barrel)

Sources: IMF, World Economic Outlook database; and author's calculations.

Note: APSP = Average petroleum spot price. Real APSP is calculated by scaling the APSP by the U.S. CPI.

Figure 4. Oil Prices and Stand-By Arrangements
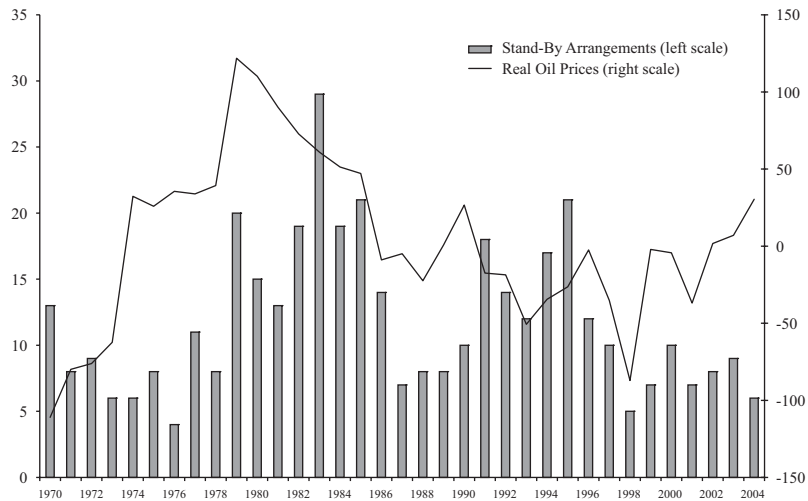
Sources: IMF, World Economic Outlook and Policy Development and Review Department databases; and author's calculations.

Note: Real oil prices represented as the deviation from linear trend, in which average petroleum spot price (APSP) is calculated by scaling the APSP by U.S. CPI.

Global Business Cycle

As the main measure of the global business cycle, the deviation of the logarithm of real-world GDP from trend is used.[8] Figure 5 displays the global business cycle with the number of SBAs as the backdrop. Note that the two global recessions in the early 1980s and 1990s correspond to the two peaks in the number of SBAs approved during 1970–2004. These figures provide casual evidence in favor of a link between the global economic environment and SBAs, but formal econometric analysis is required for a rigorous assessment.

III. Methodology

The objective of this section is to describe the analytical structure underpinning the econometric analysis. After the discussion of a conceptual framework, the section proceeds to discuss the key determinants that influence the approval of SBAs.

Conceptual Framework

As discussed in Mussa and Savastano (1999), a typical IMF-supported program begins with an explicit request from a member. Then the IMF staff prepares a blueprint of a program to be used as a basis for negotiations between a member's authorities and the IMF staff. When an agreement has been reached, the arrangement has to be cleared by IMF management and approved by the IMF Executive Board. This potentially iterative process demonstrates how IMF-supported programs depend on joint decision making. Using language in line with Knight and Santaella (1997), a member's "demand" for an arrangement, and the IMF's "supply" (willingness to approve one) are both necessary components of the process.[9]

Most of the literature on IMF arrangements has investigated—using binary choice models—the determinants of either participation in IMF programs or of program approval in a certain year. Notable examples of the former include Joyce (1992); Conway (1994); Vreeland (2004); and Cerutti (2007); examples in the latter group of papers include Przeworski and Vreeland (2000); Bird and Rowlands (2001); and Barro and Lee (2005). In contrast to these studies, Knight and Santaella (1997) explicitly jointly model the "demand" and "supply" determinants of IMF program approval using a bivariate probit specification. However, they find that a univariate specification—which they interpret as a reduced-form demand-supply

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[8]The log-linear trend implies an annual real global growth rate of about 3.4 percent.

[9]As emphasized by Cerutti (2007), a similar joint decision process continues throughout the life of an arrangement, with the amounts that are finally drawn while the program is on track determined in such a manner.
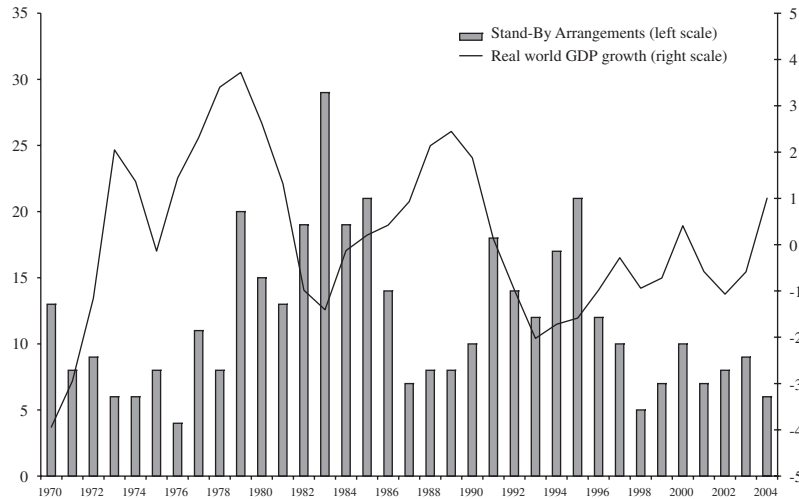
Figure 5. The Global Business Cycle and Stand-By Arrangements

Sources: IMF, World Economic Outlook database and author's calculations.
Note: Real world GDP measured as the deviation of real world GDP from a linear trend.

model—is superior to the bivariate model.[10] In particular, Knight and Santaella find that the univariate model predicts the approval of a financial arrangement more accurately than the bivariate specification.[11] Therefore, based on Knight and Santaella, the joint determinants of an SBA are modeled using a univariate probit model.

However, the estimation strategy used to uncover the empirical relationships between global economic conditions and IMF credit is also based on two other broad strands of research. The first, based on Albuquerque, Loayza, and Servén (2005), uses two sets of explanatory variables: global and country-specific. The global variables are indicators of the world economic and financial climate, whereas the country-specific variables control—among other things—for domestic policies and idiosyncratic shocks.[12] The second strand, building on the vast literature on early warning systems and financial crisis prediction—as summarized by Berg, Borensztein, and Pattillo (2004)—regresses a binary independent

[10]One reason may be that many variables that enter the demand side—for example, BOP need—are likely to enter the supply side (the IMF's willingness to meet that need), thus complicating the separate identification of the demand and supply curves.

[11]Furthermore, Conway (1994) finds that Tobit and probit specifications yield similar results.

[12]The global explanatory variables try to explicitly capture time-specific effects, and their impact is the main focus of this paper. For further details see Baltagi (2005) and the references therein. Other notable references include Wooldridge (2002); Greene (2003); and Hsiao (2003).

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variable on a set of relevant variables thought to be good predictors of economic crises.[13]

Although the analysis in this paper is also related to the second strand of the literature, it is important to note that an approval of an SBA does not necessarily imply that the requesting member is experiencing a financial crisis. Financial crises are infrequent events, but IMF support may be requested for many other reasons, including, for example, to signal sound policies through low-access precautionary SBAs. This paper will also discuss the relationship among SBAs, financial crises, and exceptional access arrangements.

The Econometric Model

Against this background, the objective is to assess the influence of the global economic environment on the probability of a member requesting an SBA by estimating the following equations:

$$y_{it} = Z'_{t-1}\gamma + X'_{i,t-1}\beta + \xi_{it}$$

$$\xi_{it} = \mu_i + v_{it},$$

where t and i are time and country indices, respectively. The dependent variable y_{it} is binary and takes a value of 1 when an SBA is approved.[14] The indicators of the global economic and financial environment are contained in Z_t and are the same for each country. The matrix X_{it} contains the individual country-specific time series, which covers a broad range of economic, financial, and political quantitative as well as qualitative variables. To avoid simultaneity issues, among other things, each explanatory variable is lagged by one year.[15] In the second equation, the error component model for ξ_{it} is composed of an unobservable country-specific effect, μ_i, and a remainder disturbance, v_{it}. The time-invariant term, μ_i, accounts for any country-specific effects that are not included in the regression, whereas v_{it} varies across time and countries and can be thought of as the usual disturbance in the regression.[16] Summary statistics of the three main global factors and a

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[13]Another notable contribution is Frankel and Rose (1996), and in the context of predicting defaults see Manasse, Roubini, and Schimmelpfennig (2003) and Manasse and Roubini (2005). Goldstein, Kaminsky, and Reinhart (2000) is another notable contribution.

[14]This implies that the model is nonlinear. In essence, a curve—typically a logistic or normal cumulative distribution function—is fitted so that the predicted values of the dependent variable (probability of an SBA) are constrained to the [0, 1] interval.

[15]A source of simultaneity could be derived from the following circular argument: IMF credit supports a member's reserve cover, and because reserve cover is a key indicator of whether or not a BOP need has arisen, this support of the member's reserve cover in turn influences the probability that a member will approach the IMF for an SBA.

[16]For further details, see, for example, Baltagi (2005).

Table 2. Descriptive Statistics of Selected Economic Indicators, 1970–2004

	Average	Standard Deviation	Percentile				
			5th	25th	Median	75th	95th
Global economic indicators							
U.S. real short-term interest rate	2.4	2.3	−1.1	0.6	2.5	3.7	6.5
Real average petroleum spot price	3.0	54.3	−82.1	−30.4	−2.1	34.7	96.1
Real-world GDP	0.2	1.8	−2.3	−1.0	−0.1	1.4	2.9
Country-specific controls							
Real GDP growth	3.5	6.2	−5.4	1.5	3.9	6.1	11.0
Reserve cover	3.8	4.8	0.2	1.4	2.7	4.6	10.5
Nominal exchange rate depreciation	−6.4	38.5	−46.7	−10.2	−1.4	0.4	12.3
Inflation	49.6	511.1	0.0	2.6	7.1	15.0	76.9
Broad money growth	59.8	1,257.7	−0.1	7.6	14.5	25.3	76.8
Government balance	−3.9	7.7	−16.1	−6.1	−3.1	−0.5	4.6
Current account balance	−4.0	14.9	−23.2	−7.3	−2.8	0.7	11.9

Sources: IMF, World Economic Outlook database; and author's calculations.

Note: The U.S. real short-term interest rate is calculated by subtracting U.S. CPI inflation from the federal funds rate; the real average petroleum spot price (APSP) is first scaled by U.S. CPI. Then both the real APSP and real-world GDP are represented as percent deviations from a linear trend. The government (or fiscal) balance and the current account balance are in percentage points of GDP. Reserve cover is in months of goods and services imports.

selected set of country controls are depicted in Table 2,[17] and the robustness of the results are discussed later in this paper.

To avoid selection bias, the random effects estimator was used for the benchmark specification. Initially, there appears to be a trade-off regarding the choice of error specification. The unobservable country-specific effect, μ_i, can be modeled assuming either random- or fixed-effects specifications. However, the latter can be estimated only using the conditional fixed-effects estimator that drops from the sample countries that have never had an SBA.[18] This estimation procedure assesses how the explanatory variables

[17]It is interesting to note that most of the extreme values depicted in Table 2 have important justifications. Most of the extreme decreases in growth correspond to periods of war or post-conflict periods, whereas sharp increases represent the ensuing recovery periods. Extreme variations in nominal variables—including broad money growth, inflation, and the depreciation of the exchange rate—are usually a result of hyperinflationary episodes, which may also coincide with periods of civil strife.

[18]This is because with a binary dependent variable, the fixed-effects estimator is conditional on the realization of an SBA. Baltagi (2005) provides an intuitive exposition.

influence the probability of switching to an SBA. Because countries that have never had an SBA by definition do not switch to one, they do not provide any information about the optimization of the likelihood function, and are thus dropped. Therefore the consequence of the fixed-effects estimator will be selection bias—because the model is estimated using only members that have had at least one SBA. This would potentially bias coefficients upward, because the countries most vulnerable to external shocks are likely to be the ones that have sought IMF financial assistance.

The Global Economic Environment and SBAs

In contrast to the literature, the main focus of this paper is to thoroughly investigate the link between global economic and financial conditions and SBAs. The underlying hypothesis is that indicators of the global economic environment significantly affect a member's access to IMF financial assistance. These indicators are broadly grouped into those that capture global economic activity and those that measure global liquidity conditions.

For the activity measures, the baseline specification considers world GDP growth and real oil price fluctuations. Both of these indicators of the global economic environment directly affect a member's trade balance, and therefore its BOP. World GDP growth affects a member's exports: if a country's trading partners are experiencing a boom (recession), they are more (less) likely to demand that country's exports. Nonetheless, because world GDP growth is a very aggregated concept, other activity measures are also considered in the robustness section.

On the other hand, sharp rises in oil prices have been associated with recessions in countries that are net oil importers. As with world GDP growth, the main channel is also through external balances: because the volume of imports adjusts very sluggishly in the short run, higher oil prices directly raise the import bill of a net oil importer, thereby potentially jeopardizing the viability of its BOP.[19] In addition, higher oil prices generate a wealth transfer from net oil importers to exporters. Because there are many net oil importers, in contrast to just a few net oil exporters, many countries suffer, while a few countries benefit from higher oil prices. This is one potential explanation for the bunching of SBAs in the early 1980s. Although oil price fluctuations are likely to be a dominant explanatory variable, other commodity prices are also studied in the robustness section.

For the global liquidity measure, the baseline specification considers the real U.S. federal funds rate. Higher world interest rates affect countries that rely on external financing through at least three channels. First, directly, by increasing debt service costs, causing a deterioration in a country's external balances. Second, because higher world interest rates imply increased default probabilities, they are associated with higher spreads (risk premiums), further

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[19]For more on the sluggish dynamics of oil import volumes, see Elekdağ and others (2007).

exacerbating external financing costs. Third, higher world interest rates raise foreign investors' aversion to risk, thereby limiting global liquidity outright.[20]

Ideally, to complement the interest rate series used, a spread term could have been included. Including a spread term would not only disentangle the channels discussed above, but the interest rate combined with the spread term would highlight the conditions under which certain countries can obtain external financing from the IMF only through the approval of an IMF arrangement. This is because periods of high world interest rates combined with rising spreads make it prohibitively expensive for countries to obtain external financing.[21] The main difficulty is that data on spreads are available only for a limited number of countries over a short time period.[22] Abiad (2007), however, finds that short-term world interest rates are a good indicator for capital flows to emerging markets because higher real rates usually decrease flows to these countries.[23] The robustness section considers broader interest rate aggregates and longer-term rates.

Country-Specific Determinants of SBAs

Country-specific factors also influence the potential demand for SBAs. In fact, most of the literature focuses almost exclusively on country-specific factors, which typically include various measures of international reserves, current account balances, GDP growth, and public deficits, as well as political and institutional variables. However, because country samples, periods of coverage, and the exact type of IMF arrangement considered vary across papers, it should not be surprising that certain results differ among studies.

The most natural choices of country-specific determinants of SBAs are those affecting the components of the BOP. This is because, according to IMF policy, SBAs are available for any BOP need. At the top of the list would be a measure of international reserves—which, intuitively, turns out to be one of the most robust country-specific determinants of SBA approval used in the literature. The capital (and financial) account reports the sources of external financing and, in line with Agénor (1998), will be influenced by

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[20]Furthermore, because higher interest rates can in turn raise spreads, this causes a deterioration in fundamentals. Weaker fundamentals mean higher default probabilities and trigger a further rise in spreads—an unfavorable chain reaction. This vicious cycle operates through a "financial accelerator," which could greatly amplify the severity of certain shocks. For a detailed model of this mechanism, see Elekdağ and Tchakarov (2007).

[21]The conditions emerging market countries faced around 1994 are a classic example. Along with a U.S. federal funds rate increase from about 3 percent in 1993 to 6 percent in 1995, the JPMorgan Emerging Markets Bond Index (EMBI) jumped from about 400 basis points at end-1993 to more than 1,500 basis points during 1995.

[22]For example, the JPMorgan EMBI spread series starts in the early 1990s, but for only a few countries.

[23]Abiad (2007) uses the real three-month London interbank offered rate, which is more than 99 percent correlated with the measure used in this paper (real U.S. federal funds rate). Arora and Cerisola (2001) find that world interest rates and spreads are reasonably correlated.

either "push" or "pull" factors. Although push factors are typically global liquidity measures that drive capital flows into countries, pull factors are country-specific and attract net capital inflows. Therefore, a suitable candidate for capturing these push factors would be the short-term interest rate discussed above. To quantify the pull factors, measures of structural reforms and sound economic policies would be appropriate choices. To this end, consistent with the literature, country-specific GDP growth, inflation, broad money growth, government deficit, and nominal exchange rate depreciation seem to be natural candidates.

The last component of the BOP is the current account, which is itself a natural candidate for a country-specific determinant regarding the approval of an SBA. However, factors driving the current account may be more accurate predictors of SBAs. The standard textbook model of the current account posits that the current account is a function of country-specific GDP, trading partners' GDP, and the exchange rate. The first of these interrelated factors will be relevant with regard to imports (the expenditure reduction channel), the second (as discussed above) affects exports, and the last, via relative price changes, will affect both major components of the trade balance simultaneously (the expenditure switching mechanism). Therefore, if a model specifies country-specific and global GDP growth together with a measure of exchange rate fluctuations, the inclusion of the current account may be superfluous.[24]

Another novel feature of this paper is the examination of country-specific variables that have received little or no attention in the literature. These variables include measures of exchange rate regimes, debt restructuring, and elections. The first needs little explanation, but the second is important to highlight, because, especially during the period during which the transition economies joined the IMF, SBAs were approved to facilitate the restructuring of those countries' debt obligations. The last variable in this category indicates whether a parliamentary or presidential election took place in a particular year. This is a potentially important variable because election-related spending can seriously undermine prudent macroeconomic policies, leading a country to the IMF's doorstep.

However, Aisen (2007) also identifies another possible channel. As documented by Calvo and Végh (1999), in general, exchange rate–based stabilization programs have been known to generate an initial consumption boom followed by a contraction, whereas money-based stabilization programs bring about a consumption slowdown followed by a recovery. Therefore, policymakers will not only be selective regarding the timing, but they will also be selective regarding the modalities of an arrangement,

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[24]Similarly, if an econometric specification includes explanatory variables that do a good job of proxying the capital and financial accounts and international reserves, then, owing to the definition of the BOP, the inclusion of the current account as an additional regressor may be redundant.

depending on election dates. Scheduled elections can be a critical factor in the potential demand for an SBA.[25]

IV. Empirical Results

This section presents the main results linking global economic indicators and the number of SBAs. Robustness to alternate specifications, country-specific controls, and other possible measures of the global economic environment are explored in the next section.

The main regression results are tabulated in Table 3 and include specifications with and without world GDP (the indicator for the global business cycle) in columns 1 and 2, respectively.[26] Oil prices, interest rates, and world GDP fluctuations have important implications for the probability of an SBA being approved. This conjecture is supported by Table 3, because all coefficients have the expected signs and are statistically significant. Even when world GDP is omitted the results are similar.

The estimation results are intuitive and consistent with economic theory. For a net energy importer, higher oil prices could create a BOP need by raising the import bill. Table 3 indicates that a 1 percent deviation of the real APSP from trend would increase the probability of an SBA by up to 0.031 percent. For debtor countries, higher international interest rates could create BOP problems by increasing debt-servicing costs and limiting access to capital markets. The impact of a 1 percent increase in the real U.S. short-term interest rate would increase the likelihood of a country approaching the IMF for an SBA by up to 0.25 percent. A global recession would most likely decrease the demand for exports, particularly from developing and emerging market countries, also creating a potential BOP need. For the regression that includes world GDP, a 1 percent *decrease* in global output from trend would raise the probability of an SBA by about 0.24 percent.

The results regarding country-specific controls are also statistically significant and have the appropriate signs. As expected, when GDP growth is on the rise, the chances that a country will approach the IMF for an SBA decrease. In fact, a 1 percent increase in real growth decreases that probability by about 0.2 percent, as shown in Table 3. A 1 percent rise in the foreign reserve cover is associated with a 0.5 percent decline in the likelihood that a country will seek IMF financial assistance, whereas a 1 percent depreciation of the domestic currency decreases that probability by about 0.05 percent. International reserve cover, the exchange rate, and a BOP need are closely

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[25]Moreover, for countries that have had a string of previous IMF arrangements, it may be politically unpalatable to approach the IMF, especially during election season.

[26]Because unadjusted probit coefficients are not easily interpretable, Table 4 reports the effects of one-unit changes in the explanatory variables on the probability of an approved SBA (expressed in percentage points) when evaluated at the means of the data (the marginal effects). In addition, diagnostic statistics follow at the bottom of the table testing the joint significance of all explanatory variables as well as the contribution of the panel variability and also include a measure of the goodness of fit.

Table 3. The Global Economic Environment and Stand-By Arrangements
(Panel probit regression results: dependent binary variable takes value 1 for approved SBA)

Independent Variables	1			2		
	$\partial\Phi(x)/\partial(x)$	z	*p-value*	$\partial\Phi(x)/\partial(x)$	z	*p-value*
Real APSP	0.031	4.41	0.000	0.026	4.44	0.000
Real short-term U.S. interest rate	0.207	1.93	0.053	0.249	2.39	0.017
Real-world GDP	−0.238	−1.39	0.165			
Real GDP growth	−0.192	−4.31	0.000	−0.195	−4.36	0.000
Reserve cover	−0.525	−4.44	0.000	−0.521	−4.40	0.000
Exchange rate depreciation	−0.049	−3.66	0.000	−0.050	−3.75	0.000
Hydrocarbon exporter and APSP interaction	−0.030	−2.79	0.005	−0.030	−2.81	0.005
Pseudo-R^2	0.13			0.13		
ρ	0.29			0.29		
p-value of likelihood ratio testing H_0: $\rho = 0$	0.00			0.00		
H_0: Slopes $= 0$; $\chi^2(-)$	144.30			142.10		
p-value of likelihood ratio testing H_0: Slopes $= 0$	0.00			0.00		
Observations	5,199			5,199		
Countries	169			169		
Stand-By Arrangements	412			412		
Log-likelihood	−1211.1			−1212.1		

Summary of the conditional probability of SBAs and the implied number of SBAs when evaluated at:

	Probability	SBAs	Probability	SBAs
Sample means	3.50	5.9	3.51	5.9
Mean plus one standard deviation	6.93	11.7	6.02	10.2
Mean plus two standard deviations	12.51	21.1	9.75	16.5
Historical extremes	13.71	23.2	10.33	17.5

Sources: IMF, Policy Development and Review Department Stand-By Operations Division and World Economic Outlook databases; and author's estimates.

Note: Results are based on panel probit regressions where the binary dependent variable takes the value of unity in a year when a Stand-By Arrangement (SBA) is approved as discussed in the text. The slope derivatives that correspond to the one-unit change in the regressor on the probability of SBA approval (the binary dependent variable) evaluated at their sample means are multiplied by 100 to convert into percentages. The *z*-statistics and *p*-values are to the right of the slope estimates. The conditional probability of an SBA is evaluated at the means for all variables (which includes setting the random-effects error component to zero) unless otherwise specified. Only the global indicators are augmented by their respective standard deviations; the country-specific controls are still evaluated at their individual means. The symbol ρ indicates the proportion of the total variance contributed by the panel-level variance component—if zero, then the panel estimator is not different from the pooled estimator. The degrees of freedom for the chi-squared distribution are 7 and 6 for columns 1 and 2, respectively.

related concepts. Typically, a BOP need arises when a country cannot accumulate enough foreign reserves to meet a certain policy objective, and may prompt recourse to IMF financial assistance. Similarly, countries that do not allow their currencies to depreciate sufficiently may deplete their reserves so much that a BOP need triggers a request for an SBA.[27]

The last variable in the baseline regressions controls for energy exporters. This term interacts the real APSP with a dummy variable that indicates if a country is a net hydrocarbon exporter. Note from Table 3 that this variable is statistically significant and has the appropriate sign. Intuitively, when there is a rise in oil prices, this improves the external position of net energy exporters, decreasing the likelihood that they may need IMF financial assistance.[28]

Although the slope coefficients may at first seem small, it is important to bear in mind the nonlinear nature of the model. The marginal effects presented in Table 3 were evaluated at the respective means of the data. In the case of higher-than-average oil prices, for example, the marginal effects would need to be reevaluated using the new prices if accurate slope estimates are desired, owing to the underlying nonlinear specification of the econometric framework. This implies that even if oil prices rise gradually, the probability of an SBA associated with these higher prices increases at a faster rate. The extreme volatility of oil prices shown in Table 2 adds another source of vulnerability and highlights how a seemingly manageable global economic environment could quickly become very harsh.

The worsening of the global economic environment has important implications for the potential number of requested SBAs. Previously, by focusing on the slope coefficients, we considered the effects of oil prices, interest rates, and world GDP in isolation. But what would the impact of adverse developments on all these indicators be simultaneously? The lower section of Table 3 considers such experiments.

When all the variables are evaluated at their respective means, the conditional probability of an SBA is about 3.5 percent. However, if oil prices, interest rates, and world GDP are adversely shocked by one standard deviation, the conditional probability of an SBA nearly doubles. Focusing on column 1 in Table 3, this implies that the number of SBAs increases from 6 to about 12, when these less favorable global economic conditions are simulated. The fact that we use one-standard-deviation shocks implies that this outcome is not unlikely. Yet harsher conditions (two-standard-deviation shocks) increase the implied number of SBAs further. Moreover, when oil prices and interest rates are evaluated at their respective historical peaks, and the global business cycle is set at its deepest trough in the sample, the

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[27]By letting the exchange rate depreciate, a country may be able to insulate the economy from external shocks. But, in the case of fixed exchange rate regimes, a large enough shock may deplete international reserves so much that it may jeopardize the peg, thus requiring IMF assistance and/or switching to a float.

[28]Further note that for net hydrocarbon exporters, the net impact of oil prices on SBAs is virtually zero.

conditional probability almost quadruples, implying an increase from approximately 6 to 23 SBAs.

Predicting the Number of Approved SBAs

The model may also be used to predict the number of SBAs. As confirmed in Table 4, there are indications that the model has reasonable predictive accuracy. The top panel of Table 4 presents the SBA predictions for 2004 using the data up to and including 2002 and 2003, respectively, then evaluating the regressors using the 2003 actual realizations. Analogously, this procedure is repeated for 2005 as shown in the bottom panel of Table 4. The regressions including the deviation of world GDP from trend seem to predict the six SBAs approved in 2004 relatively well. Although the regressions without the deviation of world GDP from trend are more parsimonious and all regressors are significant at least at the 5 percent level, omitting this indicator seems costly in terms of prediction. Conducting the same procedure, but evaluating the regressions using the 2004 realizations would imply out-of-sample predictions of six SBAs for 2005, which coincides with the actual number of six SBAs approved in 2005. Naturally, recent trends in oil prices and current developments in the U.S. monetary policy cycle could be used to update these predictions.[29]

V. Robustness

This section reports the results of various robustness checks. The overall conclusion of the sensitivity analysis strongly supports the benchmark specifications presented in the previous section. The results are presented in Tables 5, A1 and A2.[30]

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[29]It should be noted that even though prediction of the total number of SBAs is quite accurate, country-by-country prediction is much more difficult. Although certain papers find a percentage of correct predictions as high as 88 percent (Thacker, 1999), it needs to be stressed that given the incidence of IMF arrangements over the period covered by such studies, a straight guess of "no arrangement" would itself be correct approximately 80 percent of the time (Bird and Rowlands, 2002). This highlights the persistence of unexplained variance in the pattern of IMF lending, even in the face of quite sophisticated econometric analysis. Furthermore, the estimations are often far from robust, and some use very short samples that do not cover more turbulent periods such as the latter half of the 1990s.

[30]Further robustness checks were conducted, but in the interest of brevity they have been deferred to a technical appendix, which is available from the author on request. The sensitivity checks include panel and pooled regressions using probit and logit—including rare events logit, regressions testing the exclusion of oil prices and interest rates, tabulation of the marginal effects corresponding to harsher global economic conditions (detailed version of the bottom panel of Table 3), marginal effects along with predictions using the fixed-effects estimator (detailed version of Table 5, and more detailed versions of Tables A1 and A2), regressions considering quadratic specifications for oil prices and interest rates, regressions with other arrangement types, and, finally, regressions across decades. The results are quite robust to these additional sensitivity checks; however, it is interesting to note that the regressions across decades indicate that the significance of oil price fluctuations diminishes over time. As elaborated in Elekdağ and others (2007), this is intuitive because oil intensities have been trending downward over time for most countries.

Table 4. One-Year-Ahead Predictions of Stand-By Arrangements
(Panel probit regression results: dependent binary variable takes value 1 for approved SBA)

	1 Probability	2 Implied SBAs
In-sample predictions for 2004		
Sample 1970–2003		
With world GDP	3.30	5.6
Without world GDP	2.95	5.0
Sample 1970–2002		
With world GDP	3.36	5.7
Without world GDP	2.95	5.0
Actual number of SBAs in 2004		6
Out-of-sample predictions for 2005		
Sample 1970–2004		
With world GDP	3.41	5.8
Without world GDP	3.36	5.7
Sample 1970–2003		
With world GDP	3.60	6.1
Without world GDP	3.51	5.9
Actual number of SBAs in 2005		6

Source: Author's estimates.

Note: Using the specification and data described in Table 4, the regression equations (both including and excluding world GDP) are estimated using the sample periods shown in this table. The estimated equations are evaluated using actual realizations in the preceding year. The outcome is the conditional probability (converted to percentages by multiplying by 100) of a Stand-By Arrangement (SBA), and the implied number of SBAs (which is the probability multiplied by the number of countries in the sample, 169).

Fixed vs. Random Effects

Table 5 contains the baseline results without the measure of the global business cycle (for brevity) in columns 1–2 as well as logit specifications assuming either random or fixed effects in columns 3–4 and 5–6, respectively.[31] For the three specifications under consideration, in contrast to the other tables in the paper, Table 5 also intentionally displays the unadjusted coefficients under the odd columns along with the marginal effects under the even columns. First, note that the marginal effects for the random-effects probit and logit models in columns 2 and 4, respectively, are

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[31]Recall that a conditional fixed-effects probit model does not exist because there is no statistic that allows the fixed effects to be conditioned out of the likelihood function.

Table 5. Fixed vs. Random Effects Logit and Probit Models

(Panel probit regression results: dependent binary variable takes value 1 for approved SBA)

Independent Variables	Random Effects				Fixed Effects	
	Probit		Logit		Logit	
	1	2 $\partial\Phi(x)/\partial(x)$	3	4 $\partial\Phi(x)/\partial(x)$	5	6 $\partial\Phi(x)/\partial(x)$
Real APSP	0.0034	0.0261	0.0063	0.0211	0.0066	0.1603
	(5.10)	(4.47)	(4.88)	(4.23)	(5.04)	(4.92)
Real short-term U.S.	0.0322	0.2494	0.0661	0.2218	0.0707	1.7205
interest rate	(2.47)	(2.37)	(2.67)	(2.55)	(2.85)	(2.75)
Real GDP growth	−0.0251	−0.1947	−0.0453	−0.1517	−0.0448	−1.09
	(−4.86)	(−4.36)	(−4.61)	(−4.12)	(−4.38)	(−4.46)
Reserve cover	−0.0672	−0.5206	−0.1629	−0.546	−0.1421	−3.4584
	(−4.68)	(−4.40)	(−4.83)	(−4.61)	(−3.86)	(−4.18)
Exchange rate depreciation	−0.0064	−0.0499	−0.0117	−0.0392	−0.009	−0.2194
	(−4.15)	(−3.76)	(−3.99)	(−3.59)	(−2.98)	(−2.91)
Hydrocarbon exporter	−0.0039	−0.0302	−0.0076	−0.0256	−0.0079	−0.1932
and APSP interaction	(−2.96)	(−2.82)	(−3.00)	(−2.84)	(−3.09)	(−3.06)
Observations	5,199		5,199		3,252	
Countries	169		169		105	
Log-likelihood	−1,212.1		−1,214.3		−879.0	

Source: Author's estimates.

Note: Dependent variable is binary, taking the value 1 if an SBA was approved in a given year. The slope derivatives correspond to the one-unit change in the regressor on the probability of an SBA evaluated at their sample means (multiplied by 100 to convert into percentages); z-statistics are in parantheses. Recall that because 64 members never had an SBA approved in the sample under consideration, the conditional fixed effects logit estimation procedure will omit these observations because members that do not switch between SBAs do not contribute any information toward the optimization of the log-likelihood function. A Hausman (1978) test comparing the fixed-effects logit model (columns 3 and 4) and the random-effects logit model (columns 5 and 6) using the same 105-country sample for each specification was used because the sample of 169 countries for the random-effects model implies that data fail to meet the asymptotic assumptions of the test. The test yields $\chi^2(6) = 6.84$ with a p-value of 0.3362, thus not rejecting the null hypothesis that the difference in coefficients is not systemic, suggesting that the random-effects specification is appropriate.

remarkably similar. Second, note that the unadjusted coefficients for the random- and fixed-effects logit model, in columns 3 and 4, respectively, are also very similar. However, note that the marginal effects for the fixed-effects model, in column 6, are much larger in absolute value than the other two specifications.

It is important to recall that to get the marginal effects, the unadjusted coefficients are weighted by a factor that depends on all the independent variables evaluated at their respective means as well as the underlying

distribution. Therefore, as discussed earlier, because the conditional fixed-effects logit specification drops members that have not had an SBA, the number of countries is reduced to 105. This is critical because these are precisely the members that have previously made use of IMF resources, and are therefore the more vulnerable countries in the sample. For example, the members that have had a previous SBA are the countries with lower average levels of international reserves. In other words, using the fixed-effects model induces selection bias, which biases the marginal effects estimates upward, implying that these countries are much more sensitive to the global economic environment. Similarly, this implies that using the fixed-effects specification will result in overestimating the number of SBAs.

Even though the fixed-effects model may substantially exacerbate the issue of selection bias, it is an attractive specification because it allows for endogeneity of all the regressors. Therefore a Hausman (1978) test comparing the random- and fixed-effects logit model using the same 105-country sample was conducted. Using 169 countries for the random-effects specification implies that the data fail to meet the asymptotic assumptions of the Hausman test. The test yields $\chi^2(6) = 6.84$ with a p-value of 0.3362, thus not rejecting the null hypothesis that the difference in coefficients is not systemic. This suggests that the random-effects specification is appropriate. Finally, because the probit model has slightly better predictive accuracy as compared with the logit model, in the end, the random-effects probit model was favored as the baseline specification.

Alternative Indicators of the Global Economic Environment

The choice of indicators measuring the global economic environment is crucial. The appropriateness of using oil prices, world interest rates, and the global business cycle is verified in this section by using alternative measures of the global economic environment. The results are presented in Table A1 with the benchmark regressions reproduced in the first column.

Commodity prices

Columns 2–5 use the commodities, metals, agricultural raw materials, and food price indices, respectively, instead of the average petroleum spot price. Only the commodities price index is reasonably statistically significant (column 2). This is most likely because the energy component of the commodities index has a weight of about 40 percent.[32]

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[32]The primary commodities index is split between nonfuel and energy, with weights of 52.2 and 47.8 percent, respectively, of which the weight of petroleum (APSP) is 39.9 percent. The nonfuel index is further split between edibles (food and beverages, with weights of 21.7 and 3.1, respectively) and industrial inputs (agricultural raw materials and metals, with weights of 11.3 and 16.1, respectively). All indices were scaled by the U.S. CPI, then logged and linearly detrended exactly as the APSP was. See Appendix Table 3 in the working paper

Interest rates

Columns 6–8 use the real U.S. deposit rate and the real U.S. and G7 long-term interest rates as alternates. The results are consistent with the benchmark specification, which can be explained partly by the high correlation among the various interest rate series used, theoretically consistent with the term structure hypothesis and interest rate parity conditions.[33]

Global business cycle

For alternative measures of the global business cycle, other GDP aggregations and global import volume fluctuations were used. Columns 9–12 use narrower measures of global GDP, which are less significant statistically, as expected. Because industrialized country import volumes have significant implications for many developing and emerging market countries' exports, this variable is used in columns 13–15. As expected, the coefficients are smaller (and statistically insignificant), reflecting the importance of real GDP relative to import volumes.

Robustness to Alternative Quantitative Country Controls

Although not the primary focus of the paper, other readily accepted country-specific controls would likely include inflation, money growth, fiscal balance, and the terms of trade. However, as depicted in columns 2–5 in Table A2, none of these variables are statistically significant when included in the benchmark regression. Country-specific real growth, international reserve cover, exchange rate depreciation, and the hydrocarbon interaction term seem to capture the relevant information contained in the alternative country-specific controls. It seems that the impact of terms-of-trade shocks (after controlling for net energy exporters) can be largely inferred from exchange rate, international reserve, and real growth developments.[34] Also consistent with economic theory, seigniorage-financed government deficits would likely increase the rate of broad money growth and thus the rate of inflation, which would be summarized by a large depreciation of the exchange rate or a rapid depletion of international reserves.

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version of this paper for a comprehensive description of the data (Elekdağ, 2006) and www.imf.org/external/np/res/commod/index.asp for further details.

[33]The correlation coefficients between the real U.S. short-term interest rate and the other interest rate series range between 70 and 75 percent.

[34]Although higher nonfuel commodity prices (as captured by the terms of trade variable) could cushion the impact of higher oil prices for nonfuel net commodity exporters, this channel seems to affect only a few countries, which is another reason terms of trade is not statistically significant.

The current account balance

One of the most important criteria governing the approval of an SBA is an actual BOP need. To this end, as discussed earlier, a measure of the current account balance would seem a natural country-specific control. However, as can be seen from Table A2 in columns 6–9, the current account balance as a percent of GDP is only statistically significant at the 5 percent level when the reserve cover variable is omitted.

Although somewhat surprising, it is important to recall the standard textbook relationship associating the current account with a country's output, trading partners' output, and the exchange rate as discussed earlier. In the regression specifications, country-specific and world GDP growth and exchange rate depreciation have been included. Therefore, it seems that the inclusion of these variables would capture the behavior of the current account well and warrant its inclusion unnecessary in a statistical sense.[35] In sum, the regressions suggest that variables in the main specification largely capture whether a BOP need has arisen without the explicit consideration of the current account.

Robustness to Qualitative Country Controls

There may be other factors that influence the request for an SBA that are qualitative in nature. These include election years, whether a country had implemented a fixed exchange rate regime, and whether debt restructuring took place. The baseline regression is augmented with these variables, and the results are tabulated in Table A2.

Elections

The regression, with a dummy variable denoting parliamentary and presidential elections, in column 10 of Table A2 is statistically significant, and seems to be an important predictor of a request for an SBA. However, a bit of caution is warranted, because the sample size is much smaller, with election data for only 75 countries. Nonetheless, this highlights the potential importance of political factors that influence the request for SBAs.[36]

Debt restructuring

The IMF provided financial assistance to support countries that were engaged in debt restructuring. A dummy variable was used to account for

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[35]Furthermore, if the U.S. federal funds rate captures the key (push) factor affecting the capital and financial accounts, and because of the inclusion of a measure of international reserves, owing to the BOP identity, the explicit incorporation of the current account in the regressions seems to be (statistically) redundant.

[36]Similarly, recall that as discussed above, Aisen (2007) argues that a member's political cycle influences the modalities of the requested SBA, particularly the choice of anchor in the context of inflation stabilization.

SBAs that were approved under these conditions. It is interesting to note that the real short-term interest rate loses its significance in these specifications, as shown in column 11 of Table A2. This is intuitive: when a country's external debt burden is reduced, its debt service obligations are much smaller and are less vulnerable to international interest rate fluctuations. However, these results should be interpreted with some caution because the sample size is drastically reduced.

Fixed exchange rate regime

The fact that a country was implementing a fixed exchange rate regime does not seem to be important, even when we exclude the depreciation of the exchange rate, as shown in columns 12 and 13 of Table A2.[37] International reserve cover and currency depreciations in the baseline regression seem to capture distress related to speculative attacks, large capital outflows, or other disruptive shocks.

VI. Predicting Access Levels

Once the main factors determining the approval of an SBA are identified, the logical next step is trying to predict the access levels needed to support a country's BOP need. Based on the work presented in this paper, Ghosh and others (2007) estimate access levels in a second-stage regression after controlling for selection bias. In summary, their main result is that the estimated access levels fall far short of the actual amount granted during periods of financial crises. Intuitively, this reflects the findings in the early warning systems literature that attempts to forecast financial crises, which conclude that predicting crises (which usually involves exceptional access arrangements) is notoriously difficult. In other words, although predicting the number of SBAs is promising, the associated access levels are, in contrast, very challenging to predict owing to the possibility of infrequent but large BOP needs arising from financial crises.

VII. Concluding Remarks

This paper sets out to rigorously quantify the relationship between the global economic environment and requests for SBAs. Formal econometric analysis based on a panel of 412 SBAs among 169 members over a period spanning 1970–2004 indicates that the main global economic factors affecting the

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[37]Because of breaks in the data and limited country coverage, the definition of a country's exchange rate regime is based on both the de jure definitions of Ghosh, Gulde-Wolf, and Wolf (2002) and the de facto definitions of Bubula and Ötker-Robe (2002), who retroactively updated the IMF's *Annual Report on Exchange Arrangements and Exchange Restrictions*. For further details see Appendix Table 3 in the working paper version of this paper (Elekdağ, 2006) and the IMF's Monetary and Financial Surveillance Department's Exchange Rate Regime Classification database.

probability of requesting IMF credit were oil prices, world interest rates, and a measure of the global business cycle.

Most critically, even if the global economic environment gradually worsens, the probability of requesting an SBA increases disproportionately as a result of the underlying nonlinear nature of the model. The empirical framework implies that a steady deterioration of the global economic climate will mean increasingly harsher conditions for developing and emerging market countries, which may in turn significantly increase the demand for IMF resources. In this context, when oil prices and interest rates are evaluated at their respective historical peaks, and the global business cycle is set at its deepest trough in the sample, the conditional probability almost quadruples, implying an increase from approximately 6 to 23 SBAs.

The estimated regressions can be used to predict the numbers of SBAs with reasonable accuracy. Whereas the actual number of SBAs approved in 2004 was 6, the model predicts between 5 and 5.7 SBAs in 2004. Furthermore, using only 2004 data, out-of-sample predictions suggest between 5.7 and 6.1 SBAs compared with an actual 6 approved SBAs in 2005.

Despite the importance of the topic, research on the empirical link between global economic conditions and IMF financing is scarce. This paper attempts to address this issue and has relevance for the IMF, for policymakers throughout the IMF membership, and for capital market analysts. The framework developed in this paper highlights cyclical factors that are pertinent for future IMF lending capacity. This is especially important because unusually harsh economic conditions would likely lead to a bunching of SBA requests—some of which might be exceptional access cases, in which certain members could exceed their quotas by large margins. In this context, this paper is also relevant for assessing the prospects for the IMF's future income position, which depends on the amount of IMF credit outstanding.

APPENDIX I

See Tables A1 and A2.

Table A1. Robustness to Alternative Indicators of the Global Economic Environment
(Panel probit regression results: dependent binary variable takes value 1 for approved SBA)

Independent Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		Commodity prices				Interest rates			GDP				Import volume		
	Baseline	All	Metals	Agriculture	Food	Deposit rate	U.S. long-term	G7 long-term	Industrial	EU-25	G7	U.S.	World	G7	U.S.
Commodity price index	0.0305 (4.43)	0.0586 (3.87)	−0.0113 (−0.57)	0.0193 (1.04)	0.0298 (1.51)	0.0333 (4.83)	0.0314 (4.50)	0.0386 (5.16)	0.0268 (4.52)	0.0306 (4.42)	0.0268 (4.53)	0.0256 (4.38)	0.0268 (4.46)	0.0244 (4.13)	0.0248 (4.02)
Real interest rate	0.2070 (1.93)	0.2630 (2.43)	0.3433 (3.03)	0.4157 (3.19)	0.4032 (3.39)	0.1558 (1.66)	0.1601 (1.41)	0.2564 (2.16)	0.2217 (2.10)	0.1954 (1.78)	0.2394 (2.29)	0.2245 (2.13)	0.2205 (1.93)	0.1884 (1.67)	0.2362 (2.21)
Real GDP or import volume	−0.2386 (−1.39)	−0.2412 (−1.33)	0.2921 (1.47)	0.1182 (0.68)	0.0645 (0.37)	−0.2546 (−1.48)	−0.2139 (−1.15)	−0.0574 (−0.29)	−0.4005 (−1.30)	−0.4605 (−1.38)	−0.3405 (−1.21)	−0.3411 (−1.38)	−0.0699 (−0.61)	−0.1286 (−1.29)	−0.0364 (−0.59)
Real GDP growth	−0.1919 (−4.31)	−0.1943 (−4.34)	−0.2045 (−4.50)	−0.2045 (−4.50)	−0.2048 (−4.51)	−0.1909 (−4.30)	−0.1889 (−4.26)	−0.2047 (−4.43)	−0.1948 (−4.35)	−0.1952 (−4.37)	−0.1953 (−4.37)	−0.1905 (−4.28)	−0.1923 (−4.30)	−0.1891 (−4.23)	−0.1916 (−4.27)
Reserve cover	−0.5254 (−4.44)	−0.5508 (−4.61)	−0.6077 (−4.95)	−0.6086 (−4.96)	−0.5978 (−4.90)	−0.5407 (−4.57)	−0.5388 (−4.55)	−0.4729 (−3.93)	−0.5209 (−4.40)	−0.5189 (−4.40)	−0.5226 (−4.42)	−0.5121 (−4.34)	−0.5132 (−4.32)	−0.5057 (−4.28)	−0.5135 (−4.33)
Exchange rate depreciation	−0.0485 (−3.67)	−0.0476 (−3.60)	−0.0498 (−3.70)	−0.0483 (−3.61)	−0.0497 (−3.70)	−0.0482 (−3.65)	−0.0476 (−3.59)	−0.0492 (−3.61)	−0.0506 (−3.79)	−0.0497 (−3.75)	−0.0508 (−3.80)	−0.0482 (−3.63)	−0.0488 (−3.65)	−0.0475 (−3.58)	−0.0486 (−3.62)
Hydrocarbon exporter and APSP interaction	−0.0299 (−2.79)	−0.0247 (−2.38)	−0.0087 (−0.91)	−0.0080 (−0.84)	−0.0104 (−1.09)	−0.0302 (−2.80)	−0.0301 (−2.80)	−0.0414 (−3.33)	−0.0300 (−2.80)	−0.0299 (−2.80)	−0.0300 (−2.80)	−0.0303 (−2.82)	−0.0304 (−2.82)	−0.0304 (−2.82)	−0.0304 (−2.82)
Observations	5,199	5,199	5,199	5,199	5,199	5,199	5,199	5,199	5,199	5,199	5,199	5,199	5,199	5,199	5,199
Countries	169	169	169	169	169	169	169	169	169	169	169	169	169	169	169
Log-likelihood	−1,215.4	−1,215.0	−1,224.0	−1,223.6	−1,223.0	−1,211.6	−1,212.0	−1,156.2	−1,211.2	−1,211.1	−1,211.3	−1,211.1	−1,211.9	−1,211.2	−1,211.9

Source: Author's estimates.

Note: Additional variables from the IMF World Economic Outlook database. As in the previous regressions, the dependent variable is binary, taking the value of 1 if a Stand-By arrangement (SBA) was approved in a given year. The slope derivatives that correspond to the one-unit change in the regressor on the probability of an SBA evaluated at their sample means were multiplied by 100 to convert into percentages. The z-statistics are in parentheses. In columns 2–5, the APSP is replaced by an alternative commodity price index (also a deviation from linear trend), in columns 6–8 an alternative real interest rate is used, and in columns 9–15 an alternative measure of the global business cycle is used (also a deviation from linear trend). For columns 9–12 different aggregations of GDP are used, whereas in columns 13–15 import volumes are used. For further details refer to the text.

Table A2. Robustness to Alternative Country Controls
(Panel probit regression results: dependent binary variable takes value 1 for approved SBA)

Independent Variables	1 Baseline	2	3	4	5	6	7	8	9	10	11	12	13
		Quantitative controls				Current account balance				Qualitative controls			
Real APSP	0.0261 (4.47)	0.0261 (4.46)	0.0267 (4.48)	0.0269 (4.48)	0.0268 (4.52)	0.0260 (4.44)	0.0250 (4.29)	0.0254 (4.80)	0.0249 (4.67)	0.0303 (2.14)	0.0095 (1.84)	0.0334 (4.99)	0.0327 (4.87)
Real short-term U.S. interest rate	0.2494 (2.38)	0.2490 (2.37)	0.2444 (2.29)	0.2317 (2.19)	0.2467 (2.31)	0.2528 (2.40)	0.2981 (2.79)	0.2510 (2.57)	0.3212 (3.17)	0.6385 (2.19)	−0.0094 (−0.12)	0.2996 (2.57)	0.3444 (2.91)
Real GDP growth	−0.1947 (−4.36)	−0.1947 (−4.36)	−0.1974 (−4.36)	−0.1919 (−4.18)	−0.1929 (−4.22)	−0.194 (−4.36)	−0.2498 (−5.39)	−0.1898 (−4.77)	−0.2651 (−6.18)	−0.5058 (−4.15)	−0.0321 (−0.90)	−0.214 (−4.39)	−0.2666 (−5.33)
Reserve cover	−0.5206 (−4.40)	−0.5207 (−4.40)	−0.535 (−4.43)	−0.5244 (−4.34)	−0.4850 (−4.13)	−0.5060 (−4.26)	−0.5642 (−4.61)			−2.1111 (−6.12)	−0.4242 (−2.78)	−0.5736 (−4.29)	−0.6431 (−4.67)
Exchange rate depreciation	−0.0499 (−3.76)	−0.0503 (−3.60)	−0.0543 (−3.77)	−0.0496 (−3.70)	−0.0553 (−3.97)	−0.0498 (−3.75)		−0.0671 (−5.14)		−0.0642 (−1.91)	−0.0288 (−2.10)	−0.0501 (−3.40)	
Hydrocarbon exporter and APSP interaction	−0.0302 (−2.82)	−0.0303 (−2.82)	−0.0310 (−2.83)	−0.0308 (−2.81)	−0.0361 (−3.17)	−0.0296 (−2.74)	−0.0295 (−2.73)	−0.0289 (−2.88)	−0.0292 (−2.87)	−0.0486 (−1.82)	−0.0116 (−1.16)	−0.0356 (−2.98)	−0.0357 (−2.97)
Inflation		0.0000 (0.08)											
Broad money growth			−0.0004 (−0.72)										
Government balance				−0.0243 (−0.65)									
Terms of trade					0.0002 (0.03)								
Current account balance						−0.0171 (−0.92)	−0.0181 (−0.97)	−0.0347 (−2.13)	−0.0372 (−2.21)				
Elections										5.1847 (2.68)			
Debt restructuring											−1.1736 (−2.42)		
Fixed exchange rate regime												1.0188 (1.68)	0.5780 (0.94)
Observations	5,199	5,199	5,199	5,199	5,086	5,199	5,199	5,199	5,742	2,269	2,222	4,850	4,850
Countries	169	169	169	169	165	169	169	169	169	75	168	169	169
Log-likelihood	−1,212.1	−1,212.1	−1,210.1	−1,207.7	−1,182.3	−1,211.6	−1,220.4	−1,275.7	−1,294.4	−816.6	−354.1	−1,177.9	−1,184.8

Source: Author's estimates.

Additional variables from the IMF World Economic Outlook database, Annual Report on Exchange Arrangements and Exchange Restrictions database, and those based on the Policy Development and Review Department's data. As in the previous regressions, the dependent variable is binary, taking the value 1 if a Stand-By Arrangement (SBA) was approved in a given year. The slope derivatives that correspond to the one-unit change in the regressor on the probability of an SBA evaluated at their sample means were multiplied by 100 to convert into percentages. The z-statistics are in parentheses. In columns 2–5 alternative country-specific quantitative controls are added to the baseline regression, in columns 6–9 the current account balance is further added to the baseline and alternative specifications are tabulated, whereas in columns 10–13 alternative qualitative country-specific controls are added to the baseline. For further details refer to the text.

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