

**IMF Working Paper**

© 1999 International Monetary Fund

This is a *Working Paper* and the author(s) would welcome any comments on the present text. Citations should refer to a *Working Paper of the International Monetary Fund*. The views expressed are those of the author(s) and do not necessarily represent those of the Fund.

WP/99/66

INTERNATIONAL MONETARY FUND

Monetary and Exchange Affairs Department

**Financial Fragility and Economic Performance in Developing Economies: Do Capital Controls, Prudential Regulation and Supervision Matter?**

Prepared by Marco Rossi<sup>1</sup>

Authorized for distribution by R. Barry Johnston

May 1999

**Abstract**

Little empirical investigation exists of the links among capital account liberalization, prudential regulation and supervision, financial crises, and economic development, mainly because of the lack of comparable measures to describe regulatory practices for different countries. This paper examines empirically, albeit in a preliminary manner, these links using new measures of capital controls, prudential regulation, supervision, and depositors' safety for a sample of 15 developing economies over the period 1990–97. Results confirm the importance of the degree of capital account convertibility and the regulatory and supervisory framework in affecting financial fragility and economic performance.

JEL Classification Numbers: E44, E53, F21, F32, G21, O16

Keywords: Financial Crises, Capital Account Convertibility, Prudential Regulation, Supervision, Deposit Insurance, Economic Performance

Author's E-Mail Address: MRossi@IMF.ORG

---

<sup>1</sup>The author would like to thank R. Barry Johnston, Karl Habermeier, and Jorge Ivan Canales-Kriljenko for helpful comments and suggestions. Thanks are also extended to Enrica Detragiache and Ranil Salgado for sharing their respective data on the quality of institutions and currency crises, to Pablo Zoido-Lobaton at the World Bank and Ted Haner at the Business Environmental Risk Intelligence for providing additional data on the quality of institutions, and to Gustavo Arriagada (Superintendency of Banks and Financial Institutions, Chile), Neil MacKinnon (Reserve Bank of South Africa), David Ruthenberg (Bank of Israel), and Lorena Masias de Zamalloa (Superintendency of Banks and Insurers, Peru) for information on the regulatory and supervisory framework in their countries. Lorenzo Giorgianni's liaising with the authorities in Thailand is also gratefully acknowledged. Natalie Baumer and Francine Koch provided editing support. The usual disclaimer applies.

Contents	Page
I. Introduction .....	3
II. The Panel Data .....	5
III. Some Stylized Facts about Capital Controls .....	9
IV. Financial Fragility .....	11
A. Banking Crises .....	12
B. Currency Crises .....	15
V. Financial Development and Economic Performance .....	18
VI. Concluding Remarks .....	20
Text Tables	
1. Data Base .....	7
2. Correlations (in descending order, absolute values) .....	10
3. Banking Crises .....	14
4. Currency Crises .....	17
5. Determinants of Economic Performance .....	19
Appendix I. Indices of Prudential Regulation, Supervision, Depositors' Safety, and Capital Controls .....	22
References .....	28

## I. INTRODUCTION

Over the last two decades several developing economies have liberalized their domestic financial markets and eliminated current and capital controls and restrictions, though to various extent and at different speed. Starting with the work of McKinnon (1973) and Shaw (1973), and proceeding with that, among others, of King and Levine (1993), it is broadly accepted that financial liberalization, by fostering financial development, can increase economic performance.<sup>2</sup> However, the banking crises of the 1980s and 1990s have pointed out the link between financial liberalization and financial fragility and the existence of a possible trade-off between the benefits of liberalization and the costs of increasing financial fragility, especially in developing markets.<sup>3</sup> On these grounds, some have pointed out that, although there are clear benefits from moving away from a repressed financial system, it might not be optimal to pursue quick and extensive financial deregulation, especially at an early stage in the liberalization process when market institutions have not yet fully adjusted.<sup>4</sup>

The Asian crisis has, moreover, underscored the importance of the soundness of the domestic financial system in achieving the benefits and avoiding the risks of liberalization, and raised questions about the welfare-related implications of capital account liberalization and whether in some cases capital controls, in particular over short-term capital flows, could be appropriate.<sup>5</sup> In this context, since capital controls may also be easily misused, some have taken the view that it may be necessary to draw up a list of all controls and restrictions that could be compatible with free participation in financial relations and orderly market conditions.

Responding to these developments, some international institutions, such as the Bank for International Settlements and the International Accounting Standards Committee, have been developing a set of guidelines to strengthen regulatory, supervisory, and accounting practices, while others, namely the International Monetary Fund and the World Bank, have stepped up surveillance of the financial sector in individual countries and urged developing economies, in particular, to adopt these guidelines. Given the banks' central role in the payment system and in the mobilization and distribution of financial resources, effective prudential regulation and supervision of the banking sector are deemed crucial to achieving domestic financial stability and economic development, and, hence, to minimizing the odds of an abrupt turnaround in capital flows.

---

<sup>2</sup>See Levine (1993) for a survey.

<sup>3</sup>See Sundararajan and Baliño (1991), and Lindgren, Garcia, and Saal (1996).

<sup>4</sup>Among others, see Stiglitz (1994), Hellmann, Murdoch and Stiglitz (1998), Caprio and Hanson (1999), and Corricelli (1999).

<sup>5</sup>See, for example, Bhagwhati (1998), and Rodrick (1998).

Earlier literature has examined the relationship between financial sector reforms, banking problems, and economic performance. Johnston and Pazarbasioglu (1995) examine the impact of financial sector variables on economic growth and efficiency using panel data for 40 countries distinguishing between those that did or did not face a banking crisis. They find evidence that countries that reform their financial systems and avoid financial crises enjoy higher average rates of economic growth; however, countries that liberalized and faced a banking crisis experienced a deterioration in economic performance following the crisis. Demirgüç-Kunt and Detragiache (1998b) study the connection between financial liberalization and financial fragility empirically on a sample of 53 countries during the period 1980–95. Their main finding is that financial liberalization increases the probability of a banking crisis, though less so if legal institutions and governance are strong. Barth, Caprio and Levine (1999) analyze the relationship between financial regulation, financial fragility, and economic performance, and find that countries with more restrictive regulatory systems have higher probability of suffering a banking crisis. Other recent studies have looked at the relationship between financial liberalization and fragility and underscored the importance of improving, in the context of capital account liberalization, the soundness of the financial system, including through stronger prudential regulation and supervision.<sup>6</sup> Johnston (1998) points out that the adoption of prudential regulations based on generally accepted best practices will not normally entail restrictions on capital flows and will support the move toward capital account convertibility.

Despite the general agreement, which does not necessarily encompass policy responses, on the inherently intertwined nature of financial and capital account liberalization, prudential regulation and supervision, financial fragility and economic performance, very little empirical cross-country investigation exists that could provide evidence on these complex interrelationships and, thus, be a first step toward the formulation of a blueprint of financial and capital account liberalization. The main reason for the lack of such empirical studies seems to be the unavailability of adequate measures to describe the regulatory structure of both the capital account and the domestic financial system.

This paper is a first, albeit preliminary, effort to fill these gaps. On the one hand, it develops and uses new measures of the pervasiveness of capital account controls, prudential regulation and supervision, and the degree of depositors' safety for each of the sample countries. On the other hand, it provides a cross-country empirical analysis of the basic correlations among capital account controls, the banking regulatory and supervisory framework, financial fragility, and economic performance.

The paper is organized as follows. Section 2 describes the data set, whereas Section 3 presents some stylized facts emerging from the panel with a focus, in particular, on capital account controls, prudential regulation, supervision, and depositors' safety. Sections 4 and 5 report the empirical analysis; Section 6 concludes. The Appendix details the methodology

---

<sup>6</sup>Johnston, Darbar, and Echeverria (1997), Johnston and Tamirisa (1998), World Economic Outlook (1998), and Eichengreen, Mussa and others (1998).

used to compute the new measures of capital controls, prudential regulation, supervision, and depositors' safety.

## II. THE PANEL DATA

Although dummies to describe the openness of the capital account have been used before in the empirical literature,<sup>7</sup> they usually take a value of zero or one according to whether capital transactions in general are free or restricted, respectively. In fact, the capital account is neither open nor closed altogether, and the usual dummy variable for capital controls is too coarse a measure to reflect accurately the pervasiveness of capital controls and the structure of the capital account (controls on inflows or outflows, on short- or long-term flows, on direct or portfolio flows, and so on).<sup>8</sup> With regard to prudential regulation and supervision, indices that account for the extent to which various regulatory and supervisory practices in different countries accommodate international best standards are not currently available to our knowledge.<sup>9</sup>

The main challenge in compiling the data set was clearly the development of new indices of capital account controls, prudential regulation, supervision, and depositors' safety that would not simply take 0 or 1 values.<sup>10</sup> Inevitably, both the country and time coverage had to be limited; the focus is, therefore, on 15 developing economies over the period 1990–97. Countries included in the sample are Argentina, Brazil, Chile, Colombia, India, Indonesia, Israel, Korea, Malaysia, Mexico, Peru, Philippines, South Africa, Thailand, and Venezuela.<sup>11</sup>

The indices of prudential regulation, supervision, and depositors' safety try to capture how different countries' regulatory and supervisory frameworks fare in terms of

---

<sup>7</sup>Grilli and Milesi-Ferretti (1995), Rodrik (1998), Wyplosz (1999).

<sup>8</sup>Johnston and Tamirisa (1998), and Johnston and others (1999a) develop an index of capital controls on various capital account transactions that varies between 0 and 1 depending on the extent of regulation.

<sup>9</sup>JP Morgan produces a report that establishes, for some Latin American countries, a regulatory rating system relative to that of the United States. Some potential shortcomings of this approach are discussed in the Appendix. Barth, Caprio, and Levine (1999) develop an index based on banks' engagement in four nontraditional activities, namely, securities business, insurance, real estate, and nonfinancial firm ownership.

<sup>10</sup>For details about the calculation of these indices, see the Appendix.

<sup>11</sup>Countries are classified as developing according to the *International Financial Statistics* published by the International Monetary Fund.

internationally accepted guidelines.<sup>12</sup> These guidelines specify that a sound regulatory and supervisory framework should reflect: satisfactory capital adequacy requirements and definition of capital; adequate loan classification and provisions; suitable maximum exposure limits; effective enforcement of regulations; clear responsibilities and objectives for each agency involved in banking supervision; strong powers to review and reject specific activities that do not meet the required standards; proper disclosure and accounting requirements; and an adequate system of market incentives to complement regulatory and supervisory requirements.

The task involved gathering, analyzing and integrating relevant and homogenous information from many sources, and, then, translating it into synthetic indices. Grading scales were developed to include the main features of internationally accepted regulatory and supervisory guidelines, and, then, used to compute the indices for each individual country. The three indices of prudential regulation, supervision, and depositors' safety vary between 1 and 4; the first two increase in tightness, whereas the third in safety.

The indices of capital controls on inflows and outflows are calculated using, as a starting point, those developed in Johnston and others (1999a). They range between 0 and 1 increasing in the number of controls, and are computed as the actual number of restrictions applying to a particular capital flow (inflow or outflow) divided by the total number of possible restrictions on each category of capital flows. After being slightly modified to account for an alternative classification of some of the items in the capital account, the 1997 indices are, then, back casted to 1990 by developing an algorithm that mimics the main episodes in the process of capital account liberalization in our sample countries. The information about the process of capital account liberalization is contained in Johnston and others (1999b). As necessary, the relevant issues of the Annual Report on Exchange Arrangements and Exchange Restrictions are also used.

The entire data base comprises 27 qualitative and quantitative variables. The latter are mainly control factors that have been shown to provide consistent and significant information about financial fragility [Kaminsky and Reinhart (1996), Demirgüç-Kunt and Detragiache (1998a)], currency vulnerability [Kaminsky and Reinhart (1996), Frankel and Rose (1996)], and economic development [King and Levine (1992), and (1993)]. Table 1 lists all the variables by name, definition, and source.

---

<sup>12</sup>Basle Committee on Banking Supervision (1996). See also Folkerts-Landau and Lindgren (1998).

Table 1. Data Base

Name	Definition	Source
<i>Qualitative Variables</i>		
CURR	(0, 1) currency crises dummy: 1 indicates a crisis. For the methodology used to select crises dates, please refer to the source.	Aziz, Caramazza, and Salgado (1998).
BANK	(0, 1) banking crises dummy: 1 indicates a crisis. Banking crises are defined as “cases where there were runs or other substantial portfolio shifts, collapses of financial firms, or massive government intervention. Extensive unsoundness short of crisis is termed significant”. Both definitions are considered in compiling the dummy variable.	Lindgren, Garcia, and Saal (1996).
ARTVIII	(0, 1) current account restrictions dummy: 0 if a country has accepted the obligations of Article VIII of the Fund’s Articles of Agreement, 1 otherwise.	Annual Report on Exchange Arrangements and Exchange Restrictions.
KINF	Index of controls on capital inflows ranging between 0 and 1.	Developed in Johnston and others (1999a), and extended in this paper.
KOUT	Index of controls on capital inflows ranging between 0 and 1.	Developed in Johnston and others (1999a), and extended in this paper.
PRUD	Index of prudential regulation ranging between 1 and 4.	Developed in this paper.
SUP	Index of supervision ranging between 1 and 4.	Developed in this paper.
DEPSAF	Index of depositors’ safety ranging between 1 and 4.	Developed in this paper.
LAW	Index of law and order ranging between 0 and 6, and increasing in the quality of the institution.	International Country Risk Guide, published by Political Risk Service, Syracuse, NY.
CORR	Index of corruption ranging between 0 and 6, and increasing in the quality of the institution.	International Country Risk Guide, published by Political Risk Service, Syracuse, NY.
CONENF	Index of contract enforcement ranging between 0 and 4, and increasing in the quality of the institution.	Business Environmental Risk Intelligence, Washington, DC.
BURQUA	Index of bureaucratic quality ranging between 0 and 4, and increasing in the quality of the institution.	Business Environmental Risk Intelligence, Washington, DC.
<i>Quantitative Variables</i>		
GDPCAP	Real GDP per capita in U.S. dollars. National currency-denominated real GDP (1990 prices) was converted into common international units (US\$) by multiplying it by the 1990 US\$ per local currency exchange rate.	International Financial Statistics (IFS).

Table 1. Data Base (concluded)

Name	Definition	Source
GDPCAPGR	Real GDP per capita growth.	IFS.
REALGR	Real GDP growth as annual change of 1990 GDP.	IFS.
RINT 1/	Real interest rate, calculated as $r = [(1+i)/(1+\pi)] - 1$ . Because of the unavailability for all sample countries of interest rates on short-term government paper, we use nominal interest rates on banks' deposits.	IFS.
INF	Inflation rate as annual change of the GDP deflator (1990 base).	IFS.
TOT	Change in the terms of trade.	World Economic Outlook (WEO).
INVGDP	Investment-to-GDP ratio	WEO.
GOVGDP	Government consumption-to-GDP ratio	WEO.
CAGDP	Current account balance-to-GDP ratio	IFS and WEO.
OPENNESS	Imports plus export-to-GDP ratio	WEO.
CREDITPRI	Private sector real credit growth	IFS.
M2RAT	M2-to-reserves ratio	IFS.
CASHRAT	Banks' liquid reserves-to-assets ratio	IFS.
DOMCR 2/	Domestic private sector credit-to-GDP ratio	IFS and WEO.
DMBCRGDP 2/	Deposit money bank domestic credit-to-GDP ratio	IFS and WEO.

1/ Such a measure of the real interest rate can be interpreted as a proxy for the process of financial liberalization since real rates are usually lower, or negative, in repressed financial systems. Johnston and Pazarbasioglu (1995), and Fry (1997) use the real interest rate as a proxy for financial liberalization. Demirgüç-Kunt and Detragiache (1998b) create a financial liberalization dummy that takes 1 on the first year in which some interest rates are liberalized and on any subsequent year if no policy reversal occurred; 0 otherwise. RINT seems, however, a preferable indicator of the process of financial liberalization. First, we might argue that RINT is a measure of the *de facto* liberalization process, whereas the financial liberalization dummy is rather a *de jure* indication of whether the process has already started, and, thus, measures whether a financial system is "liberalized" rather than the process of liberalization itself. Second, the financial liberalization dummy seems, by construction, to be too rough a measure to pin down effectively the effect of the liberalization process. Regression results using a financial liberalization dummy based mainly on the information contained in Table 1 in Demirgüç-Kunt and Detragiache (1998b) are not reported as this dummy appears to have negligible explanatory power.

2/ King and Levine (1992) suggest several measures of financial development. In this paper we consider two of them: gross claims on private sector as a share of GDP (DOMCR) and the deposit money bank domestic credit as a share of GDP (DMBCRGDP). These measures are somehow similar in that they try to assess whether the recipients of loans are principally private or public institutions. Data to compute additional measures of financial development were not available for all countries over the sample period.

### III. SOME STYLIZED FACTS ABOUT CAPITAL CONTROLS

Over time, countries have resorted to controls on capital movements for different reasons, which stem from distributional and tax efficiency to balance of payment and macroeconomic management considerations.<sup>13</sup> The 15 countries in the panel are no exception; they also have followed different policies in terms of liberalization of the capital account. Some have liberalized far and fast; others have pursued a gradualist approach; and some others have temporarily reversed the liberalization process when facing external shocks. Most of these countries have simultaneously reinforced their banking regulatory and supervisory framework, though again at an idiosyncratic pace.

A formal empirical analysis of the determinants of capital controls is beyond the scope of this paper.<sup>14</sup> The purpose of this section is to identify some stylized facts about the relationship among capital controls, macroeconomic developments, banking regulation and supervision, depositors' safety, financial fragility, and economic activity. Table 2 presents some basic correlations. In the following sections, the robustness of the relationship among capital account convertibility, prudential regulation and supervision, depositors' safety, banking and currency crises, and economic activity is checked by controlling for economic variables that have been used in previous empirical studies of financial crises and economic performance.

The high positive correlation between KINF and KOUT suggests that controls on both capital inflows and outflows have been eliminated or imposed together. Stronger prudential regulation (PRUD) and more effective supervision (SUP) look relatively highly correlated with fewer controls on capital flows, providing some evidence that some countries have, in the past, used capital controls in pursuit of prudential goals, despite more advanced regulatory and supervisory frameworks being better designed to address the specific risks inherent in both domestic and cross-border financial transactions. In this context, moving toward stronger capital requirements and loan provisioning guidelines, clearer responsibilities and objectives for each agency involved in banking supervision, stronger powers to review and reject specific banking activities that do not meet the required standards, and better disclosure and accounting requirements have each contributed to make controls on capital flows less necessary. By contrast, countries with a larger depositors' safety net, in the form of higher deposit insurance and/or bail-out expectations, appear more likely to control, in particular, the inflow of funds from abroad.

---

<sup>13</sup>For a review of these arguments, see Dooley (1996), and Eichengreen, Mussa, and others (1998). For detailed information about the experience with capital controls of 36 countries over the period 1986–98, see Johnston and others (1999b).

<sup>14</sup>Empirical studies of the determinants of capital controls are Grilli and Milesi-Ferretti (1995), and Johnston and Tamirisa (1998).

Higher financial development (DOMCR), a greater need to raise revenue (GOVGDP), and a less corrupt environment (CORR) seem positively associated with controls on capital outflows. Freer current account transactions, either *de facto* (OPENNESS) or *de jure* (ARTVIII), having accepted the obligations of Article VIII of the Fund's Articles of Agreement, look moderately correlated with fewer controls on both inflows and outflows. Finally, sample countries at a lower level of economic development (GDPCAP), and, arguably, with a less efficient tax system, appear to have maintained higher controls on capital inflows.

Table 2. Correlations (in descending order, absolute values)

	KINF		KOUT
KOUT	.70	KINF	.70
SUP	-.50	DOMCR	.42
PRUD	-.40	PRUD	-.39
ARTVIII	.30	SUP	-.36
DEPSAF	.29	GOVGDP	.34
GDPCAP	-.21	OPENNESS	.33
DOMCR	.18	CORR	.28
BANK	.16	ARTVIII	.20
LAW	-.15	BANK	.17
TOT	-.14	DEPSAF	.17
OPENNESS	.14	GDPCAPGR	-.11
CAGDP	.12	TOT	-.10
CORR	.12	CAGDP	.09
GOVGDP	.11	INF	-.08
CURR	-.07	CURR	.04
RINT	.05	GDPCAP	-.03
GDPCAPGR	.02	RINT	-.03
INF	.00	LAW	.01

#### IV. FINANCIAL FRAGILITY

Over the last two decades, many countries have been liberalizing their capital account and domestic financial system. Simultaneously, many countries, irrespective of whether industrialized, developing, or in transition, have experienced significant banking sector problems (Lindgren, Garcia, and Saal (1996)). In addition many countries, from Europe to Latin America and East Asia, have endured turmoil in the foreign exchange market, taking the form of a sharp devaluation (or depreciation), a large reduction in foreign exchange reserves, a brisk hike in interest rates, or a moratorium on servicing their foreign debt (World Economic Outlook (1998)).

Various theoretical linkages have been identified between capital account liberalization and financial fragility. It is argued that financial and capital account liberalization tend to diminish banks' franchise value by reducing banks' operating margins and lowering barriers to entry in the banking sector.<sup>15</sup> Liberalization also allows banks to diversify further their investment portfolio into riskier assets and to engage in new types of transactions with both residents and nonresidents. Additional liquidity created by larger capital inflows can result in an expansion of bank loan portfolios; in the absence of strong risk assessment and management procedures, banks could easily increase their financial exposure beyond a sustainable level.

The literature on exchange crises also points out that free capital mobility can exacerbate the likelihood of a currency crisis by limiting the scope for national policy makers to pursue an inconsistent policy mix (first generation models of balance of payment crises), or by reducing the authorities' willingness (ability), as perceived by the markets, to fend off a speculative attack because of the limited amount of foreign exchanges at their disposal and/or the unattractiveness of very high short-term interest rates (second generation models).<sup>16</sup> Free capital mobility can also contribute to the spreading of currency crises by enhancing the interdependencies among countries and shortening geographical distances, especially if markets are subject to herd behavior.<sup>17</sup>

Although specific operational advice on the optimal sequencing of capital account liberalization that could be applied generally to a wide range of countries is hard to formulate, if only because different countries are not necessarily at the same stage of economic and financial development, and do not necessarily share the same institutional and legal structures, it is usually argued that, to achieve its benefits, capital account liberalization should be

---

<sup>15</sup>Demirgüç-Kunt and Detragiache (1998b) find some evidence of this link between financial liberalization and banks' franchise value. See also Honohan and Stiglitz (1999) on this issue.

<sup>16</sup>First-generation models are in Krugman (1979), and Flood and Garter (1984); whereas second-generation models are in Obstfeld (1986) and (1994).

<sup>17</sup>Eichengreen, Rose, and Wyplosz (1996), Goldfajn and Valdes (1997), and Masson (1998).

preceded, or at least accompanied, by the strengthening of prudential regulations and supervision and supported by strong and consistent micro and macroeconomic policies.

The question addressed in this section is whether the increasing freedom of action, in particular with regard to capital account transactions, has significantly increased financial fragility based on the evidence provided by the 15 developing economies in our sample. Also the extent to which the prudential and supervisory framework, together with the perceived depositors' safety, have contributed to crises is explicitly considered.

### A. Banking Crises

We estimate a logit model for banking crises with country fixed effects in which the probability of a banking crisis is a function of a set of control variables and the indices of capital controls, prudential regulation, supervision, and depositors' safety.<sup>18</sup> Country fixed-effects are included to allow for the likelihood of a banking crisis to vary across sample countries independently of the explanatory variables as, for instance, the structure of the domestic banking system may well intensify or reduce the consequences of exogenous factors. Table 3 shows the results for various specifications.<sup>19</sup>

Among the macroeconomic variables (REALGR, INF, and TOT) that are likely to affect adversely banking performance via a deteriorating loan portfolio, only real GDP growth is significant across the three different specifications; its positive sign is consistent with the view that banking crises are less likely when economic activity is growing faster.

RINT is the real interest rate on banks' deposits, and, as such, may well be considered a proxy for the process of financial liberalization rather than a measure of adverse macroeconomic shocks to the banking sector.<sup>20</sup> Besides, the average value of RINT over the

---

<sup>18</sup>Standard discussion of binary choice models are in Maddala (1983) and Greene (1997).

<sup>19</sup>The scope for sensitivity analysis, in particular to detect potential reverse causation, is clearly limited in this paper by the size of the data set. Additional regressions using different combinations of the proxies for the quality of institutions and the indices of capital controls, prudential regulation, supervision, and depositors' safety were performed, though are not reported.

<sup>20</sup>It is conceivable to expect that banking problems are more likely to surface when real interest rates are high as banks may be unable to pass the higher return paid on their liabilities onto borrowers, and, even if they could, the quality of their loan portfolio may deteriorate because high real interest rates not only make it harder for good borrowers to stay current on repayments, but also worsen the average quality of borrowers (adverse selection). Mishkin (1996), for example, finds that increases in short-term interest rates often preceded most banking panics in the United States. Johnston and Pazarbasioglu (1995) provide an empirical  
(continued...)

sample is around one percent, which clearly is not high.<sup>21</sup> RINT is marginally significant only in one regression, and its negative coefficient is an indication that moving from a repressed to a more liberalized, or restrained, banking system decreases the likelihood of a banking crisis.

Of the variables controlling for specific features of the banking system, that is, liquidity in terms of foreign reserves (M2RAT), exposure to the private sector (DOMCR), liquidity in terms of banks' assets (CASHRAT), and lagged real credit growth to the private sector (CREDITPRI), only two (CASHRAT, and CREDITPRI) turn out to be statistically significant. The positive sign on the lagged real credit growth to the private sector is consistent with the view that buoyant credit expansion can well contribute to an unsustainable increase in asset prices and poorer-quality loans, hence, aggravating conditions in the banking sector.<sup>22</sup> The positive sign on the coefficient for liquidity (CASHRAT) could be explained by the observation that cash ratios tend to be higher in more repressed financial systems. A higher liquid reserves-to-assets ratio may also reflect the fact that banks, if experiencing some difficulties over a certain period of time, may have already reduced their loan portfolios willingly, or been prevented from lending as part of a restructuring agreement, when a banking crisis eventually occurs.

Finally, the remaining control variable (GDPCAP) turns out to be statistically significant only in one specification. The sign of its coefficient suggests that banking crises are more likely in more developed countries, as proxied by the (log of the) level of real GDP per capita. We believe there are at least two good reasons to support this result, though it is apparently in stark contrast with that of other studies, for instance Kunt-Detragiache (1998b). First, the evidence provided in Lindgren, Garcia, and Saal (1996) shows that banking crises have occurred at some point or another across a wide spectrum of countries at different stages in economic development, suggesting that economic development is not a robust criterium to identify countries that are relatively more prone to experiencing disruptions in the banking system. Second, and more important, because of the structure of our sample, which comprises only developing economies, the positive sign of GDPCAP simply indicates that developing countries that are at a higher level of development, and whose financial markets are, hence, larger, are relatively more likely to incur banking crises. Interestingly, our findings, especially if read together with those about the indices of prudential regulation and depositors' safety, hint at the existence of a threshold (critical mass) beyond which the size of the banking

---

<sup>20</sup>(...continued)

approach that seeks to distinguish the different effects of the real interest rate in financial liberalizations.

<sup>21</sup>Also the variation around the mean value is low.

<sup>22</sup>Similar results on the relationship between rapid credit expansion and banking crises have been obtained by others. See, for example, Johnston and Pazarbasioglu (1995) and Kunt-Detragiache (1998b).

Table 3. Banking Crises

	(1)	(2)	(3)
<i>Control Variables</i>			
REALGR	-0.95 (.02)	-1.21 (.02)	-1.25 (.02)
RINT	-0.42 (.20)	-0.70 (.08)	-0.66 (.12)
INF	.02 (.37)	.05 (.17)	.05 (.17)
M2RAT	-0.07 (.18)	-0.10 (.19)	-0.11 (.19)
TOT	.04 (.72)	-0.01 (.94)	-0.02 (.92)
DOMCR	.102 (.21)	.12 (.14)	.13 (.15)
CREDITPRI (t-2)	.06 (.11)	.08 (.04)	.08 (.07)
CASHRAT	.35 (.01)	.48 (.01)	.48 (.01)
GDPCAP	35.9 (.03)	33.74 (.11)	34.76 (.11)
CURR (t-1)			.75 (.79)
LAW		1.58 (.31)	1.54 (.31)
CORR		2.79 (.21)	2.73 (.21)
<i>Indices of Capital Controls, Prudential Regulation, Supervision, and Depositors' Safety</i>			
KINF	11.47 (.31)	7.13 (.64)	7.20 (.64)
KOUT	23.81 (.02)	33.84 (.02)	33.14 (.02)
PRUD	-11.72 (.08)	-18.74 (.03)	-19.27 (.03)
SUP	10.89 (.49)	29.35 (.12)	30.16 (.12)
DEPSAF	7.93 (.09)	15.64 (.11)	16.37 (.11)
LR statistic 1/	94.59 (.00)	99.90 (.00)	99.97 (.00)
Hannan-Quinn criterion 2/	1.055	1.063	1.089

Note: p-values in parenthesis. Country dummies are included among the explanatory variables. Column (2) includes indices of institutional quality; column (3) includes the lagged value of the currency crisis dummy.

1/ The LR statistic tests the joint null hypothesis that all slope coefficients, but the constant, are zero. It is asymptotically distributed as a  $\chi^2$  variable.

2/ The smallest information criterion indicates the model that best provides a balance between goodness of fit and a parsimonious specification.

system, directly related to the level of economic development, becomes large enough to enhance financial fragility, should prudential regulation and measures to limit depositors' safety not be buttressed accordingly.

The statistical insignificance of CURR indicates, as in Kaminsky and Reinhart (1996), that balance-of-payment crises do not help predict banking crises. Also the quality of institutions (LAW and CORR) and the degree of liberalization of capital inflows (KINF) turn out to be statistically insignificant.

The indices of capital controls on outflows (KOUT), prudential regulation (PRUD), and depositors' safety (DEPSAF) are all significant irrespective of the specification. The sign of the coefficients suggests that banking crises are more likely in the presence of controls on outflows, of laxer prudential regulation, and higher depositors' safety. With regard to PRUD and DEPSAF, the results conform fully with the conventional wisdom about the importance of setting not only prudent minimum regulatory requirements ensuring that banks could support the risks that arise in their business, but also appropriate market incentives to foster clients' monitoring of their banks' risk-taking behavior. A possible interpretation of the positive sign of KOUT is that banks may try to evade controls by setting up offshore or other types of operations that can eventually expose them to worse risks.<sup>23</sup>

Based on these preliminary results, there seems to be a higher probability of a banking crisis in the context of slower economic growth, and more rapid bank expansion associated with weaker prudential regulation, less market discipline and less developed financial systems. Capital account liberalization does not seem to contribute to these crises.

## **B. Currency Crises**

We estimate a logit model of currency crises with time-specific effects in which the probability of a crisis depends on a series of control variables that were found to be relevant in previous empirical analysis,<sup>24</sup> and the indices of capital controls, prudential regulation, supervision, and depositors' safety. Time-fixed effects are included to account for the fact that currency crises tend to be clustered in time. A remarkable feature of recent currency crises, in particular, has been the extent to which instability in foreign exchange markets has been transmitted across countries; an attack on one currency has spilled over or spread

---

<sup>23</sup>Johnston and Tamirisa (1998) observe that higher controls on capital outflows tend to be associated with less developed and more inefficient financial systems, which may be more prone to banking crises.

<sup>24</sup>See, for example, Eichengreen, Rose and Wyplosz (1995), Kaminsky and Reinhart (1996) and Aziz, Caramazza and Salgado (1998).

contagiously to the currencies of other countries, even, with apparently sound fundamentals. Table 4 reports the results for various specifications.<sup>25</sup>

In conformity with conventional wisdom, higher real growth (REALGR) and improvements in the terms of trade (TOT) tend to reduce the likelihood of a crisis. Also, as in Kaminsky and Reinhart (1996), the emergence of banking problems or the occurrence of a banking crisis (BANK) help predict a balance-of-payment crisis, especially within a two-year period. The quality of institutions (LAW and CORR) and the degree of liberalization of capital outflows (KOUT) are statistically insignificant.<sup>26</sup>

Countries with a larger number of controls on capital inflows (KINF) tend to be less prone to currency crashes, perhaps, by limiting the amount of funds that could leave a particular country should foreign investors' sentiments change.<sup>27</sup> Finally, there is also some evidence that a stronger banking supervisory framework (SUP) and lower degree of depositors' safety (DEPSAF) are positive factors influencing the prospect of sharp movements in the exchange rate.

---

<sup>25</sup>Specifications including the two measures of external openness (OPENNESS and ARTVIII) have also been estimated, though results are not reported. Both turn out to be highly statistically insignificant, and the impact of the other variables remain virtually unchanged.

<sup>26</sup>LAW is marginally statistically significant in two regressions. Its positive coefficient, which would suggest that a stronger institutional framework in terms of better law and order increases rather than decreases the likelihood of a banking crisis, may be explained by the fact that, in a country with better legal structure and governance, banking problems are more difficult to be hidden away from the public domain and inherent crises to be concealed in the short term; only in the long period a stronger institutional environment can improve the soundness of the banking sector as well. Also, given the short sample period, it may well be possible that we are merely detecting the contemporaneous rather than any longer-term impact of the quality of institutions on the likelihood of a banking crisis. To verify somehow this hypothesis, we run the same regressions with (5-year) lagged institutional proxies. Results, however, do not substantially change. In fact, these indices of institutional quality do not vary significantly over the period 1985-97.

<sup>27</sup>It should be noted, however, that we have not controlled for the consistency of the monetary and exchange rate policy mix in these regressions. Johnston and others (1999b) observe that this is one of the critical factors explaining large capital inflows and subsequent reversals regardless of the existence of capital controls.

Table 4. Currency Crises

	(1)	(2)	(3)
<i>Control Variables</i>			
REALGR	-0.32 (.00)	-0.33 (.00)	-0.44 (.00)
TOT (t-1)	-0.08 (.09)	-0.11 (.03)	.14 (.01)
CREDITPRI (t-2)	.02 (.38)	.03 (.18)	.07 (.06)
GDPCAP	-0.95 (.18)	-0.80 (.27)	-0.48 (.54)
BANK (t-1)		2.0 (.04)	
BANK (t-2)			3.44 (.00)
LAW	.48 (.19)	.71 (.09)	.92 (.06)
CORR	1.10 (.12)	.87 (.24)	-.57 (.47)
<i>Indices of Capital Controls, Prudential Regulation, Supervision, and Depositors' Safety</i>			
KINF	-6.36 (.02)	-7.44 (.01)	-6.81 (.03)
KOUT	1.15 (.58)	.88 (.66)	1.76 (.43)
PRUD	1.19 (.31)	1.66 (.22)	2.13 (.18)
SUP	-1.51 (.17)	-2.10 (.11)	-2.66 (.096)
DEPSAF	1.12 (.08)	1.17 (.07)	1.37 (.06)
LR statistic	39.01 (.00)	43.40 (.00)	49.56 (.00)
Hannan-Quinn criterion	1.045	1.034	.983

Note: p-values in parenthesis. Time dummies are included among the explanatory variables. Columns indicate different specifications: column (2) includes the one-year lagged banking crisis dummy, and column (3) includes the two-year lagged banking crisis dummy.

## V. FINANCIAL DEVELOPMENT AND ECONOMIC PERFORMANCE

King and Levine (1983) concludes that financial development may well be an important determinant of economic performance. Financial intermediation fosters growth not only by increasing the rate of capital accumulation, but also by enhancing the efficiency with which resources are allocated in the economy. Accordingly, countries that can rely on a well-developed financial system, which effectively allocate credit to the private sector, tend to enjoy more rapid economic growth.

The empirical literature on economic growth is vast.<sup>28</sup> It usually focuses on the analysis of a large number of countries (cross-sections) over many years (panels) using ten- or five-year averages of all the variables. The available data set in this paper is clearly too limited to allow an empirical analysis of long-term growth dynamics. It is, nonetheless, adequate to explore the impact of the regulatory structure of the capital account, and of banking regulation and supervision, on the economic performance of sample countries over the business cycle.

The equation specification is that of a standard neoclassical growth model in which the growth rate of real GDP per capita (GDPCAPGR) is regressed on a time trend, the (log) of lagged real GDP per capita (GDPCAP), and other determinants of the level of output per capita. These latter are the investment-to-GDP ratio (INVGDP), the government consumption-to-GDP ratio (GOVGDP), the inflation rate (INF), the alternative measures of financial development (DOMCR and DMBCRGDP), the measure of financial restraint (RINT), the measure of the current account convertibility (ARTVIII), and the index of corruption (CORR). Besides these variables, our indices of capital controls, prudential regulation, supervision, and depositors' safety are considered.

Table 5 contains the results. The two specifications include both a country-specific (heterogenous) intercept and a country-specific (heterogenous) trend; the difference between them is the consideration of the two different measures of financial development. There seems to be a strong justification for a specification that, *ceteris paribus*, takes into account the possibility not only that countries may be experiencing a different rate of growth in any particular year (heterogenous intercepts), but also that they may be at a different phase in the business cycle (heterogenous trends).

---

<sup>28</sup>See Barro and Sala-i-Martin (1994) for a summary of the theoretical and empirical growth literature.

Table 5. Determinants of Economic Performance

	(1)	(2)
<i>Control Variables</i>		
GDPCAP (t-1)	-78.68 (.00)	-78.12 (.00)
INVGDP	.68 (.00)	.67 (.00)
GOVGDP	.63 (.00)	.62 (.00)
INF	-.01 (.10)	-.01 (.06)
DOMCR	-.02 (.40)	
DMBCRGDP		-.01 (.72)
RINT	.18 (.02)	.20 (.01)
ARTVIII	-2.84 (.00)	-2.81 (.00)
CORR	.18 (.27)	.20 (.24)
<i>Indices of Capital Controls, Prudential Regulation, Supervision, and Depositors' Safety</i>		
KINF	-8.53 (.00)	-8.32 (.00)
KOUT	1.06 (.06)	1.19 (.03)
PRUD	2.29 (.00)	2.27 (.00)
SUP	-2.85 (.12)	-2.68 (.14)
DEPSAF	-3.10 (.00)	-3.16 (.00)
Adjusted R <sup>2</sup>	.932	.932
No. Of Panel Observations	120	120

Note: p-values in parenthesis. Country-specific intercepts and trends are included among the explanatory variables. Columns indicate different specifications whereby two alternative measures of financial development are considered.

The initial level of income per capita (GDPCAP) enters significantly in the regression, supporting the conditional convergence idea. In this case, however, we cannot interpret this (very high) coefficient multiplied by (-1) as the speed of convergence toward the steady state since, as mentioned before, the span of the data set can only allow the analysis of the business cycle. The investment-to-GDP ratio (INVGDP) and the public consumption-to-GDP ratio (GOVGDP) have a positive effect on economic performance, whereas the opposite seems true for inflation (INF).

There is not much evidence of a positive effect of financial development (DOMCR and DMBCRGDP) on economic outcomes over this period. By contrast, moving toward a less repressed financial system (RINT), freer current account transactions (ARTVIII), and higher standards of governance (CORR), enhances economic activity. Finally, countries with banking sector regulations that strengthen prudential guidelines (PRUD) and reduce depositors' safety (DEPSAF) are more likely to achieve better economic results.

With regard to the impact of capital controls, results are partly—those on inflow controls—consistent with the “classic” view that free capital mobility enhances a more efficient allocation of resources raising welfare in the process.<sup>29</sup> Controls on inflows (KINF) seem to hamper economic performance. Fewer controls on inflows would allow capital-scarce developing economies to benefit from the possibility to tap the international capital markets and lower the cost of borrowing, improving investment perspectives and smoothing intertemporal consumption. Controls on outflows (KOUT) appear to contribute, although to a lesser extent, to better economic outcomes even if they might hinder the capability of economic agents, especially financial institutions, to share and spread their risks. It would seem, therefore, that the ability to augment the size of the ‘pot’ of available financial resources within a country, through both increasing the inflows by eliminating controls on them and reducing ‘leakages’ by stepping up controls on outflows, could positively affect the economic performance of a particular country.

## VI. CONCLUDING REMARKS

Over the last two decades, many countries have actively liberalized both their domestic financial systems and their capital account. At the same time, they have also experienced severe disruptions and outright crises in their banking systems, and foreign exchange markets. As a response to these developments, many have argued in favor of strengthening prudential regulation and supervision of financial systems, and, more recently, in favor of controlling those capital flows that are deemed to be of a more unstable nature. These actions are

---

<sup>29</sup>See Greenwald, Stiglitz, and Weiss (1984), Quirk and Evans (1995), and Cooper (1998). This view is debated by those who maintain that asymmetric information can produce inefficiencies in the allocation of resources (Mishkin (1996), Calvo and Mendoza (1997), and Bacchetta and van Wincoop (1998)) and by those who believe in the presence of domestic distortions and apply the theory of the second best (Brecher and Diaz-Alejandro (1977), and McKinnon and Pill (1997)).

believed to improve the soundness of existing financial systems and to shield, to a greater extent than recently experienced, countries from a turnaround in (global) market sentiments, thereby reducing financial fragility and enhancing economic performance.

Despite the importance of these issues, very little empirical investigation exists of the links among capital account liberalization, prudential regulation and supervision, financial crises, and economic development, mainly because of the lack of comparable measures to describe regulatory practices for a range of countries. The purpose of this paper was to examine empirically, albeit in a preliminary manner, these links by developing and using new measures of capital controls, prudential regulation, supervision, and depositors' safety for a sample of 15 developing economies over the period 1990–97.

There are several correlations that emerge from these initial results. Financial fragility seems exacerbated by lenient prudential practices, higher depositors' safety, and more controls on capital outflows. Banks' risk-taking behavior could be affected by the imposition of controls on capital outflows as such restrictions may drive banks' operations offshore or create the incentives for some sort of 'creative compliance' that could eventually undermine banks' own prospects. By contrast, controls on capital inflows appear to reduce the likelihood of a currency crisis, perhaps, by limiting the amount of funds that could leave a particular country should foreign investors' sentiments change.

Moreover, it seems likely that the size and sophistication of the banking system in developing economies at higher level of economic development may reach a 'critical mass' that requires a stronger regulatory and supervisory framework in order to take care of the increasing risks involved in the business. Interesting in this context is the finding that moving away from financial repression may well strengthen financial stability.

The degree of capital account convertibility and the regulatory and supervisory framework look likely to influence economic performance, as well. Again, stronger prudential practices and incentives to limit depositors' safety, together with a less repressed financial system, seem to allow countries to achieve higher economic activity over the business cycle. With regard to controls on capital account transactions, there is evidence that restrictions on capital movements, especially inflows, might have an impact on economic performance.

Finally, it should be said that all of these findings ought to be interpreted cautiously because of the small size of the panel, the well-known limitations of the estimation procedures, and the endogeneity problems that are likely to exist given the inherently dynamic nature of the issues examined. Further empirical analysis using larger data sets is necessary to check the robustness of the basic correlations reported in this paper.

## INDICES OF PRUDENTIAL REGULATION, SUPERVISION, DEPOSITORS' SAFETY, AND CAPITAL CONTROLS

### A. Indices of Prudential Regulation, Supervision, and Depositors' Safety

The following indices of prudential regulation, supervision, and depositors' safety try to capture how different countries' regulatory and supervisory frameworks fare in terms of some internationally accepted guidelines.<sup>30</sup> These guidelines specify that a sound regulatory and supervisory framework should reflect: satisfactory capital adequacy requirements and definition of capital; adequate loan classification and provisions; suitable maximum exposure limits; effective enforcement of regulations; clear responsibilities and objectives for each agency involved in banking supervision; strong powers to review and reject specific activities that do not meet the required standards; proper disclosure and accounting requirements; and an adequate system of market incentives to complement regulatory and supervisory requirements.

To develop these indices multiple sources are used; these include case studies, staff papers, including various issues of Recent Economic Developments, and technical assistance reports, available databases in the Monetary and Exchange Affairs Department, rating agencies' reports, and private banks' reports.

The main goal in constructing these indices is objectivity, though inevitably this may not always be completely accomplished. Be that as it may, we try to limit, as much as possible, the scope both for grading different countries on the basis of presumptions or perceptions, as it happens sometimes when indices are based on questionnaire circulated to selected individuals, and for grading two countries equally on the basis of the existence of the same regulation (for example, about capital adequacy ratios) whose content is, nevertheless, very different (for example, 8 percent in one country, and 12 percent in the other).<sup>31</sup> It is, therefore, necessary to gather a conspicuous amount of detailed information for each individual country and make sure that this information be homogenous across countries so that the grading scale can be consistently applied across the sample; and countries could be ranked accordingly. Homogeneity also means that attention should be focused exclusively on those items of the regulatory and supervisory framework for which information is available across the sample countries.

---

<sup>30</sup>Basle Committee on Banking Supervision (1996). See also Folkerts-Landau and Lindgren (1998).

<sup>31</sup>For example, the 1997 J P Morgan index of capital adequacy rates Argentina and Peru the same because in both countries requirements are higher than in the U.S., despite Argentina requiring a higher ratio (11.5 percent) than Peru (8.7 percent). The same applies to the definition of overdue loans. Colombia and Brazil, for example, would score the same although the former sets a maximum period of 120 days for mortgage loans to be marked as non-accrual, whereas the latter sets a maximum period of 360 days.

Grading scales for each of the main regulatory and supervisory categories, as well as for the main features describing the depositors' safety net (deposit insurance and likelihood of a government bail-out) are developed. These are reported below.

**Prudential Regulation (PRUD)**

<i>Grading Scale</i>	
Score	Criteria (12)
1	No Basle risk-weighted CAR. Much wider definition of capital and risk-weighted assets than BIS's. Loans are classified as: substandard within 12 months, doubtful within 18 months, and unrecoverable within more than 24 months or are generally assessed against the amount of collateral or the expectation of recovery. No (or very low) general provisions. Specific provisions are required only for doubtful and unrecoverable loans. Specific provisions based on the unsecured part of the loan (less than 12.5 percent, less than 25 percent, and less than 50 percent, respectively). Single borrower limit over 20 percent of net capital. Enforcement of major regulations in more than 24 months.
2	Basle risk-weighted CAR between 8 and 9 percent. Wider definition of capital and risk-weighted assets than BIS's. Loans are classified as: substandard within 6 months, doubtful within 12 months, and unrecoverable within more than 18 months. General provisions of at least 1 percent. Specific provisions are required for substandard, doubtful, and unrecoverable loans. Specific provisions based on the unsecured part of the loan (less than 25 percent, less than 50 percent, less than 100 percent, respectively). Single borrower limit between 15 and 20 percent of net capital. Enforcement of major regulations within 24 months.
3	Basle risk-weighted CAR between 9 and 11 percent. Basle definition of capital and risk-weighted assets. Loans are classified as: substandard within 3 months, doubtful within 6 months, and unrecoverable within 12 months. General provisions of at least 2 percent. Specific provisions are required for special mention, substandard, doubtful, and unrecoverable loans. Specific provisions based on the unsecured part of the loan (at least 25 percent, 50 percent and 100 percent, respectively). Single borrower limit between 10 and 15 percent of net capital. Enforcement of major regulations within 12 months.
4	Basle risk-weighted CAR over 11 percent. Stricter definition of capital and risk-weighted assets than BIS's. Loans are classified as: substandard within 1 month, doubtful within 3 months, and unrecoverable within 6 months. General provisions of at least 3 percent. Specific provisions are required for all types of loans including current loans. Specific provisions of at least 25 percent, 50 percent and 100 percent, respectively, based on the secured part, or of at least 40 percent (substandard), 75 percent (doubtful) of the unsecured part. Single borrower limit between 5 and 10 percent of net capital. Enforcement of major regulations within 6 months.

**Supervision (SUP)**

<i>Grading Scale</i>	
Score	Criteria (7)
1	Two supervisory authorities non-autonomous from the Ministry of Finance (Executive Power). No explicit powers for the main supervisor to address compliance with laws. No periodic off-site inspection required. No periodic reporting is required or report content is unsatisfactory. Substantial discrepancies between national GAAPs and IASs, including all of the following: past due accounting, inflation accounting, trade/non-traded securities accounting and consolidation of accounts. No organization charged with setting accounting/auditing standards. No independent rating report or external audit is required.
2	Two relatively autonomous supervisory authorities (or one non-autonomous authority). Limited powers for the main supervisor to address compliance with laws. Off-site inspection required, and on-site inspections required from time to time. Some satisfactory periodic reporting is required. Some major discrepancies between national GAAPs and IASs, including more than one of the following: past due accounting, inflation accounting, trade/non-traded securities accounting and consolidation of accounts. More than one authority in charge with setting accounting/auditing standards. An independent rating report or external audit is required although not periodically.
3	One relatively autonomous supervisory authority. Explicit powers for the main supervisor to address compliance with laws, including by levying penalties. On-site inspections once a year. Several satisfactory periodic reports are required. Only minor discrepancies between national GAAPs and IASs, including only one of the following: past due accounting, inflation accounting, trade/non-traded securities accounting and consolidation of accounts. A single national authority charged with setting accounting/auditing standards. An independent rating report/external audit is required yearly.
4	One autonomous supervisory authority. Extensive powers for the main supervisor to address compliance with laws, including by levying penalties, withdrawing licenses, transferring controlling interests. Periodic and ad hoc on-site inspections. Several satisfactory periodic reports are required and published in the main newspapers. Virtually no discrepancies between national GAAPs and IASs. The sole national authority charged with setting accounting/auditing standards automatically adopts IASs. An independent rating report or external audit is required semiannually.

**Depositors' Safety (DEPSAF)**

<i>Grading Scale</i>	
Score	Criteria (2)
1	No deposit insurance scheme. No role of Lender Of Last Resort (LOLR) and no history of bailing out failing financial institutions, irrespective of size (sizeable losses have been incurred in most previous crises).
2	Limited deposit insurance available (amount or type of deposits). Limited LOLR role and history of bailing out only large failing financial institutions (some losses have been incurred in most previous crises).
3	High deposit insurance coverage available on most categories of deposits. LOLR role and history of bailing out failing financial institutions, irrespective of size, though some losses have been incurred in sporadic cases.
4	Full deposit insurance coverage on all categories of deposits. LOLR role and history of bailing out failing financial institutions, irrespective of size (practically, no losses).

To illustrate how this scoring method works, let us make an example. Consider country X with the following characteristics: the required capital adequacy ratio is 11 percent; the definition of capital and risk-weighted assets is the same as BIS's; loans are classified as substandard, doubtful and unrecoverable within 12, 18 and 24 months, respectively; a general loan provision of 1 percent is required; specific provisions are required for all types of loans and their level is 12.5 percent, 20 percent, and 100 percent according to whether loans are classified as substandard, doubtful, and unrecoverable, respectively; the single borrower limit is 15 percent; and compliance with major regulations is usually enforced within 24 months. Such country would then have a prudential regulation index (PRUD) of 2.17, which is obtained by summing the scores for each individual prudential criterion and dividing the sum by the total number of criteria. The same applies to the other two indices (SUP and DEPSAF).

Implicit in these grading scales is the assumption that scores on individual criterion should be weighted the same when added up. In other words, no attempt is made to formulate a value judgement about the relative importance of, say, the regulation on capital adequacy and on loan provisioning in calculating the index of prudential regulation. Even if it were possible to come up with a satisfactory weighting system for the various criteria in a specific country, the same weighting system could not be used for another country straightforwardly as a different value judgement may apply. Therefore, it seems that using the same weights is the safest, though not necessarily the only choice.

## B. Indices of Capital Controls

The same approach could also be used to compute indices of capital controls. Indeed, grading scales for various elements of the capital account (controls on inward direct investments, on portfolio inflows and outflows, on banks' foreign exchange borrowing, on foreign borrowing by corporations and individuals, and on derivatives and forward market activities) were developed. However, the unavailability of information made it necessary to take an alternative, though less satisfactory route.<sup>32</sup>

Two indices of capital controls (KINF and KOUT) are calculated. The starting point is the 1997 indices of controls on inflows and outflows developed in Johnston and others (1999a).<sup>33</sup> These indices are slightly modified to account for an alternative classification of some of the items in the capital account. Then, the 1997 value of the two indices is back casted to 1990 by developing an algorithm that mimics the main episodes in the process of capital account liberalization in our sample countries. The information about the process of capital account liberalization is contained in Johnston and others (1999b). As necessary, the relevant issues of the Annual Report on Exchange Arrangements and Exchange Restrictions are also used.

The simulation algorithm depicts the type of liberalization process pursued by the individual country and whether this starts before, on, or after the first year in the sample period (1990). There can be different types of policies: the liberalization is extensive and abrupt ("big bang"), the liberalization is gradual over time, and the liberalization process, be it either abrupt or gradual, is temporarily or permanently reversed. The easiest case is that of a "big bang" liberalization starting before or on the first year of our sample period with no reversal. The index does not vary over the remaining period, and, thus, we could use the 1997 value. The case of a gradual policy starting before or on the first year of the sample period is also not very difficult to deal with. In this case, the value of the 1997 index can be back casted to 1990 by calculating the number of years the gradual policy is implemented for, and, assuming an initial value for the index at the time the gradual policy is initiated, by increasing the 1997 value proportionally. Reversals are somehow more difficult to deal with and require calculating how much of the previous liberalization is reversed. One possibility is to assume that gradual reversals move at the same pace as gradual liberalization; in this case, we could take care of reversals by inverting the path of the simulation. For example, if the index is

---

<sup>32</sup>The development of an index of capital controls along the lines just mentioned would be a very powerful tool to explore the relative importance of the different components of the capital account and their impact on the same variables considered in this paper.

<sup>33</sup>These indices range between 0 and 1 increasing in the number of controls. They are calculated as the actual number of restrictions applying to a particular capital flow (inflow or outflow) divided by the total number of possible restrictions on each category of capital flows. For a list of all the categories of flows included in the capital account, see the Country Table Matrix in the Annual Report on Exchange Arrangements and Exchange Restrictions.

supposed to decrease from 0.85 in 1993 to 0.7 in 1994 following a gradual policy, and the tightening occurs in 1995, then the index will move back to its previous value of 0.85 in 1995. The same principle, however, does not apply to cases in which either we have a reversal after a “big bang” liberalization, since we cannot assume that the new temporary controls (reversals) represent a total closure of the capital account, or the reversal proceeds faster than the previous liberalization. In these cases, we looked at the information available to see how the reversal could be quantified.

But, let us quickly see how this approach works. Consider two countries, X and Y. Assume that country X ends 1997 with indices of 0.35 (inflows) and 0.60 (outflows), and maintains its capital controls mainly unchanged after a “big bang” liberalization in 1990. Accordingly, the indices (0.35 and 0.60) stay the same after 1990. By contrast, country Y ends 1997 with indices of 0.50 (inflows) and 0.30 (outflows). It follows a rather “stop-and-go” policy with regard to controls on capital inflows over the sample period; but, outflows are liberalized in the 1980s with no reversals. The index of capital controls on outflows would stay the same as in 1997 at 0.30, whereas the inflow component would vary according to the tightening and easing of controls over the sample period along the lines suggested above.

With regard to the initial value of the index, that is, the value that the index is assumed to have before the process of liberalization started, this is based on the available information in our sources, and chosen as follows: 0.65 if the 1997 value is not greater than 0.5, 0.8 if the 1997 value is between 0.5 and 0.7, and 0.95 if the 1997 value is not smaller than 0.70.<sup>34</sup>

---

<sup>34</sup>For example, in the case of the Chilean index of controls on inflows, since a process of liberalization had already started in 1985, the initial (1990) value is assumed to be 0.5 before the introduction in 1991 of new controls, which mainly took the form of reserve requirements.

## REFERENCES

- Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER)*, (Washington: International Monetary Fund) various issues.
- Aziz, Jahangir, Francesco Caramazza, and Ranil Salgado, 1998, "Currency Crises: In Search of Common Elements, IMF mimeo
- Bacchetta, Philippe, and Eric van Wincoop, 1998, "Capital Flows to Emerging Markets: Liberalization, Overshooting and Volatility," NBER Working Paper No. 6530 (Cambridge, Massachusetts: National Bureau of Economic Research)
- Barth, James R., Gerard Caprio Jr., and Ross Levine, 1999, "Financial Regulation and Performance; Cross-Country Evidence, Policy Brief, (Milken Institute).
- Barro, Robert J., and Xavier Sala-i-Martin, 1994, *Economic Growth*, (New York, McGraw Hill).
- Basle Committee on Banking Supervision, 1996, *Amendment to the Capital Accord to Incorporate Market Risks* (Basle: Bank for International Settlements, January).
- Bhagwati, Jagdish, 1998, "The Capital Myth: The Difference Between Trade in Widgets and Dollars," *Foreign Affairs*, Vol. 77, No. 3 (May/June) pp. 7–12.
- Brecher, Richard, and Carlos Diaz-Alejandro, 1977, "Tariffs, Foreign Capital, and Immiserizing Growth," *Journal of International Economics*, Vol. 7 (November), pp. 317–22.
- Calvo, Guillermo A., and Enrique G. Mendoza, 1997, "Rational Herd Behavior and the Globalization of Securities Markets," Institute for Empirical Macroeconomic Discussion Paper, No. 120–1 (August), Federal Reserve Bank of Minneapolis.
- Caprio, Gerard, and James A. Hanson, 1999, "The Case for Liberalization and Some Drawbacks," paper presented at the Workshop on Finance Liberalization: How Far? How Fast?, World Bank, March 18–19, 1999.
- Cooper, Richard N., 1998, "Should Capital-Account Convertibility Be a World Objective?" in *Should the IMF Pursue Capital-Account Convertibility*, ed. By Peter B. Kenen, *Essays in International Finance*, No. 207 (May), International Finance Section, Department of Economics, Princeton University.

- Corricelli, Fabrizio, 1999, "Financial Market Development and Financial Liberalization" in *Economies in Transition: Tales of Failure and Success*, paper presented at the Workshop on Finance Liberalization: How Far? How Fast?, World Bank, March 18–19, 1999.
- Demirgüç-Kunt, Asl, and Enrica Detragiache, 1998a, The Determinants of Banking Crises in Developing and Developed Countries, *IMF Staff Papers*, International Monetary Fund, No. 45, pp. 81–109.
- , 1998b, Financial Liberalization and Financial Fragility, IMF Working Paper 98/83, (Washington: International Monetary Fund)
- Dooley, Michael, 1996, "A Survey of Academic Literature on Controls over International Capital Transactions," *Staff Papers*, International Monetary Fund, Vol. 43, No. 4, (December), pp. 639–87.
- Eichengreen, Barry, Andrew K. Rose, and Charles Wyplosz, 1996, Contagious Currency Crises: First Test, *Scandinavian Journal of Economics*, Vol. 98, No. 4, pp. 463–84.
- Eichengreen, Barry, Michael Mussa, and others, 1998, *Capital Account Liberalization*, IMF Occasional Paper 172 (Washington: International Monetary Fund)
- Flood, Robert, and Peter Garter, 1984, "Collapsing Exchange Rate Regimes: Some Linear Examples," *Journal of International Economics*, Vol. 17 (August), pp. 1–13.
- Folkerts-Landau, David and Carl-Johan Lindgren, 1998, Towards a Framework for Financial Stability (Washington: International Monetary Fund).
- Frankel, Jeffrey A. and others, eds., 1996, *The Microstructure of Foreign Exchange Markets* (Cambridge, Massachusetts: National Bureau for Economic Research), Chapter 4.
- Fry, Maxwell, 1997, "In favor of Financial Liberalization," *Economic Journal*, No. 107, pp. 754–70.
- Garber, Peter H., 1998, "Buttressing Capital-Account Liberalization with Prudential Regulation and Foreign Ownership," in *Should the IMF Pursue Capital Account Convertibility*, ed. By Peter B. Kenen, *Essays in International Finance*, No. 207 (May), International Finance Section. Department of Economics, Princeton University.
- Goldfajn, Ilan, and Rodrigo Valdés, 1997, "Capital Flows and the Twin Crises: The Role of Liquidity," IMF Working Paper 97/87 (Washington: International Monetary Fund).
- Greene, William H., 1997, *Econometric Analysis*, 3rd Edition, Prentice Hall.

- Greenwald, Bruce, Joseph Stiglitz, and Andrew Weiss, 1984, "Information Imperfections in the Capital Markets and Macroeconomic Fluctuations," *American Economic Review, Papers and Proceedings*, Vol. 74 (May), pp. 194–99
- Grilli, Vittorio, and Gian Maria Milesi-Ferretti, 1995, "Economic Effects and Structural Determinants of Capital Controls," *Staff Papers*, International Monetary Fund, Vol. 42, No. 3 (September), pp. 517–51.
- Hellmann, T., K. Murdoch, and Joseph E. Stiglitz, 1998, "Liberalization, Moral Hazard in Banking and Prudential Regulation: Are Capital Requirements Enough?" mimeo.
- Honohan, Patrick T., and Joseph E. Stiglitz, 1999, "Robust Financial Restraint," paper presented at the Workshop on Finance Liberalization: How Far? How Fast?, World Bank, March 18–19, 1999.
- Johnston, R. Barry, and C. Ryan, 1994, "The Impact of Controls on Capital Movements on the Private Capital Accounts of Countries' Balance of Payments: Empirical Estimates and Policy Implications," IMF Working Paper 94/78 (Washington: International Monetary Fund, July).
- Johnston, R. Barry, and Ceyla Pazarbasioglu, 1995 "Linkages Between Financial Variables, Financial Sector Reform and Economic Growth and Efficiency," IMF Working Paper 95/103 (Washington: International Monetary Fund).
- Johnston, R. Barry, Salim Darbar, and Claudia Echeverria, 1997, "Sequencing Capital Account Liberalization: Lessons from the Experience in Chile, Indonesia, Korea, and Thailand" IMF Working Paper 97/157 (Washington: International Monetary Fund).
- Johnston, R. Barry, and Natalia Tamirisa, 1998, "Why Do Countries Use Capital Controls?" IMF Working Paper 98/181 (Washington: International Monetary Fund).
- Johnston, R. Barry, and others, 1999a, *Developments and Issues in International Exchange and Payments System*, forthcoming (Washington, DC: International Monetary Fund).
- Johnston, R. Barry, and others, 1999b, "Countries' Experiences With the Use of Controls on Capital Movements and Issues in Their Orderly Liberalization", forthcoming (Washington: International Monetary Fund).
- Kaminsky, Graciela, L., and Carmen Reinhart, 1996, "The Twin Crises: The Causes of Banking and Balance-of-Payments Problems," *International Finance Discussion Paper No. 544* (Washington: Federal Reserve Board).
- King, R.G., and R. Levine, 1992, "Financial Indicators and Growth in a Cross Section of Countries," World Bank Working Paper No. 819 (Washington: World Bank, January).

- \_\_\_\_\_, 1993, "Finance and Growth: Schumpeter Might be Right," *Quarterly Journal of Economics*, Vol. 108, pp. 717–37.
- Krugman, P., 1979, "A Model of Balance-of-Payments Crises," *Journal of Money, Credit and Banking*, 11 (August) 311–25.
- Levine, Ross, 1997, "Financial Development and Growth: Views and Agenda" *Journal of Economic Literature*, No. 35, pp. 688–726.
- Lindgren, Carl, Gillian Garcia, and Matthew Saal, 1996, *Bank Soundness and Macroeconomic Policy* (Washington: International Monetary Fund).
- Maddala, G. S., 1983, *Limited-dependent and Qualitative Variables in Econometrics* (New York: Cambridge University Press).
- Masson, Paul R., 1998, "Contagion: Monsoonal Effects, Spillovers, and Jumps Between Multiple Equilibria" (unpublished: Washington: International Monetary Fund).
- McKinnon, Ronald, 1973, *Money and Capital in Economic Development* (Washington: Brookings Institution).
- McKinnon, R., and H. Pill, 1997, "Credible Economic Liberalization and Over borrowing," *American Economic Review Papers and Proceedings*, 87(2) 189–193.
- Mishkin, F., 1996, "Understanding Financial Crises: A Developing Country Perspective," *NBER Working Paper*, No. 5600 (Cambridge, Massachusetts: National Bureau of Economic Research).
- Obstfeld, M., 1986, "Rational and Self-Fulfilling Balance-of-Payments Crises," *American Economic Review*, 76 (March) 72–81.
- \_\_\_\_\_, 1994, "Risk-Taking, Global Diversification, and Growth," *American Economic Review*, 84(5) 1310–29.
- Quirk, Peter, and Owen Evans, 1995, *Capital Account Convertibility: Review of Experience and implications for IMF Policies*, IMF Occasional Paper No. 131 (Washington: International Monetary Fund).
- Rodrik, Dani, 1998, "Who Needs Capital Account Convertibility?" in *Should the IMF Pursue Capital Account Convertibility*, ed. By Peter B. Kenen, *Essays in International Finance*, No. 207 (May), International Finance Section. Department of Economics, Princeton University.
- Shaw, E., 1973, *Financial Deepening in Economic Development* (New York: Oxford University Press).

Stiglitz, Joseph E., 1994, The Role of the State in Financial Markets, in Bruno and Pleskovic, ed., *Proceedings of the World Bank Annual Conference on Development Economics* (Washington: World Bank).

Sundararajan, V., and Tomás Baliño, eds., 1991, *Banking Crises: Cases and Issues* (Washington: International Monetary Fund).

World Economic Outlook, 1998, Financial Crises and Indicators (May) (Washington: International Monetary Fund).

Wyplosz, Charles, 1999, "Financial Restraints and Liberalization in Post War Europe," paper presented at the Workshop on Finance Liberalization: How Far? How Fast?, World Bank, March 18–19, 1999.