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Country Insurance: Reducing Systemic Vulnerabilities in Latin America and the Caribbean

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CURRENCY EQUIVALENTS

National Currency is the US$
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MAIN ABBREVIATIONS AND ACRONYMS

2SLS	Two-Stage Least Squares
ARG	Argentina
ATM	Automatic Teller Machine
BEEPS	Business Environment and Enterprise Performance Surveys
BOL	Bolivia
BRA	Brazil
CCRIF	
CHL	Chile
CHN	People's Republic of China
COL	Colombia
COMTRADE	United Nations Statistics Division's Commodity Trade database
CRI	Costa Rica
DBR	Doing Business Report
DDO	
EAP	East Asia and the Pacific
ECA	Europe and Central Asia
ECU	Ecuador
EMU	European Monetary Union
ENI	Encuesta Nacional Industrial, Argentina
ES	Enterprise Survey
FDI	Foreign Direct Investment
FE	Fixed Effects
FDRI	
Fin. Dev.	Financial Development
GCF	Gross Capital Formation
GCMB	
GDP	Gross Domestic Product
GDPPC	Gross Domestic Product Per Capita
GEMLOC	
GEMX	
GEP	Global Economic Prospects
GMM	Generalized Method of Moments
GNI	Gross National Income
Gov.	Government
GTM	Guatemala
HIE	High Income Exporters
HND	Honduras
IC	Investment Climate
ICA	Investment Climate Assessment
ICOR	Incremental Capital Output Ratio
ICRG	International Country Risk Guide
ICS	Investment Climate Survey
IFC	International Finance Corporation
IMF	International Monetary Fund

IND	India
INE	Instituto Nacional de Estadística de Uruguay
ISO	International Organization for Standardization
IV	Instrumental Variables
KOR	Republic of Korea
LAC / LCR	Latin America and the Caribbean
LCRCE	Office of the Chief Economist, Latin America and the Caribbean Region (World Bank)
LLC	Limited Liability Company
M	Imports
MA	Moving-average
MENA	Middle East and North Africa
MEX	Mexico
MYS	Malaysia
NBFI	Non Bank Financial Institution
NIC	Nicaragua
NTB	Non-tariff barriers
NX	Non-exporters
Obs.	Observations
OECD	Organization for Economic Co-operation and Development
OLS	Ordinary Least Squares
PAN	Panama
PER	Peru
PISA	Program for International Student Assessment
PRY	Paraguay
R&D	Research and Development
SA	South Asia
SLV	El Salvador
SME	Small and Medium Enterprises
SSA	Sub-Saharan Africa
TFP	Total Factor Productivity
THA	Thailand
TI	Transparency International
TOT	Terms of Trade
Trini. & Tobago	Trinidad and Tobago
UK	United Kingdom
URY	Uruguay
USA / US / U.S.	United States of America
USD	United States Dollars
USPTO	United States Patent and Trademark Office
Venezuela, RB	República Bolivariana de Venezuela
WDI	World Development Indicators
WDR	World Development Report
WEF	World Economic Forum
X	Exports
ZAF	South Africa

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Executive Summary

Developing countries are more vulnerable to real and financial shocks than more advanced economies. These shocks, in turn, can lead to output and consumption volatility and sharp economic contractions, which result in worsening income distribution and poverty, especially in lower-income countries.

The relative contribution of external shocks to long-run output volatility in Latin American and the Caribbean (LAC) countries is large, historically exceeding 25 percent. This suggests that these countries' are unable to diversify their own particular risks and avoid drops in income, consumption, investment, and savings. Thus, measures aimed at reducing the income effect of external volatility are a key policy concern.

The higher output volatility of the richer countries in the LAC region suggests that economic growth does not necessarily bring stability in the region. LAC countries therefore need to increase their resilience to external shocks. They have several options for doing so. These include purchasing insurance, accumulating precautionary reserves ("self insurance," by far the developing countries' strategy of choice), and investing in ways to minimize the impact of external shocks ("self-protection").

Buying market insurance is the most effective way to cope with rare but large losses, as those associated with natural disasters. Self-insurance (where feasible) is too expensive in terms of the foregone consumption and self-protection may not be enough, especially for smaller, low-income countries. In deciding to buy insurance to mitigate the effects of real external shocks, countries must assess the trade-off between the cost of insurance and the cost of an uninsured negative shock. This trade-off is at the heart of the policy debate on country insurance. The debate hinges on the choice of effective but reasonably-priced insurance and how sovereigns, private markets, and international financial institutions (IFIs) can help deliver it.

Catastrophe risk is the perfect starting point for approaching the issue for two reasons. First, it is truly exogenous, and therefore, truly insurable. Moral hazard considerations that have plagued the country insurance debate should play no role here. Second, it is concentrated and big, and difficult to diversify. As a result, it is served by specialized and often inefficient markets, where financial innovation can play a decisive role. A good illustration of a more active IFI role is the World Bank's recent establishment of the Caribbean Catastrophe Risk Insurance Facility, the world's first ever multi-country catastrophe insurance pool that provides client governments with immediate liquidity following a natural disaster.

The same considerations apply, although to a lesser extent, to other real and financial shocks. On the positive side, these shocks are smaller, more frequent, and more easily diversified. On the negative side, derivative markets and contingent financial contracts,

when available, are offered at a moderate but still large premium because of insufficient liquidity or credit-risk considerations. The relevant question is, again, not whether countries should insure against cyclical shocks or financial contagion but rather whether they should do so at current costs –and what can be done to reduce these costs.

The solutions adopted by emerging economies reflect these trade-offs, with the result that there are very few insurance experiences. Indeed, the high propensity of developing countries to self- insure against liquidity runs by accumulating reserves speaks of the high cost (and low reliability) of contingent finance, the natural insurance option. Similarly, the popularity of stabilization funds rather than hedging through derivatives partly reflects the lack of capacity and integrated asset-liability management strategies in the countries and the limitations, in terms of coverage and cost, of derivative markets.

More generally, the lack of efficient and politically manageable sources of country insurance against liquidity runs has led most countries to misallocate scarce resources to precautionary reserves or to retain the risk, relying on forms of *ex-post* assistance--such as IFI lending--rather than transferring part of these risks to the market through an insurance arrangement. This choice explains, in turn, the characteristic macroeconomic volatility of most developing countries and their chronic dependence on external flows.

A few LAC countries particularly exposed to commodity prices have bought short-term hedges against large price movements. The Mexican government, for example, has used a short-term hedging strategy to insure against a fall in oil prices using derivatives, covering risk for one fiscal year. Such a short-term hedging strategy provides a "breathing space" to adjust to a changing environment. It is difficult, however, to think of a country insurance scheme that could really insure an economy against the long-term effects of a major shock, but a hedge could be designed to allow the government the time it needs to introduce policies to deal with the effects of the shock.

What strategies then should LAC countries use to reduce their vulnerability to exogenous shocks? At the least, the strategy should help create sufficient fiscal space to pursue countercyclical fiscal policies. This requires increasing access to local and international capital markets to enhance the ability of LAC countries to effectively smooth consumption and investments across time–rather than amplify cyclical swings as in the recent past. Ultimately, debt management is the first-resort country insurance strategy and the front on which financial innovation and outside assistance could most usefully concentrate.

In the case of less diversified economies, risk-transfer strategies could play a larger role in helping them cope with the extremes of output volatility, complementing countercyclical monetary and fiscal policies, to an extent that depends on the availability and cost of the proper insurance instruments. This is where the IFIs should intervene to complement the market by developing underdeveloped hedging markets and even bearing part of the risks themselves.

On this score, the IFIs–with the World Bank taking a more proactive role–have began developing products and financial schemes to help emerging economies gain better access to more cost-efficient country insurance. Several initiatives are currently under way to help catalyze market-based solutions to mitigate natural catastrophe risks in the context of a country's overall catastrophe risk-management strategy. Two such initiatives are:

- The *Global Catastrophe Mutual Bond (GCMB) or "global cat bond.*" This facility would involve creating a special purpose vehicle (SPV) to write insurance contracts with individual countries. The contracts would cover the countries for catastrophe risk and would be written for multi-year periods. The SPV would also issue a catastrophe bond in the capital markets, whose proceeds would be invested in triple-A assets. These assets would form the source of payouts under the insurance contracts if a covered risk event were to occur. The risk-taking capacity in global markets and the diversification offered by the pool should result in attractive pricing for the bond and therefore in low insurance premiums. The World Bank is already working with some of its member countries to assemble a pool of regions and risks to be structured as cat bonds and placed in capital markets.

- The World Bank's recently approved proposal to enhance the *IBRD Deferred Drawdown Option (DDO)* and to introduce a DDO Option for Catastrophic Risk (Cat DDO). This initiative aims to address two separate, yet interconnected, issues: the need of most emerging economies to enjoy ready access to contingent credit lines for either general liquidity purposes or to be able to cope with natural disasters.

These two initiatives, together with the Caribbean Catastrophe Risk Insurance Facility—the world's first ever multi-country catastrophe insurance pool that providing client governments with immediate liquidity following a natural disaster—are only a few examples of the IFIs' ever-expanding range of risk management instruments to help their clients gain better access to insurance for general liquidity needs or to protect against catastrophic events. And such insurance is critical for smoothing volatility in output and consumption—thus mitigating any worsening in income distribution and poverty—and giving governments greater incentives to adopt costly but necessary reforms.

Country Insurance: Reducing Systemic Vulnerabilities in LAC

1. The Case for Country Insurance

This study begins from the premise that output and consumption are more volatile and prone to sharp contractions in developing than in high-income economies. This suggests that developing countries are somehow "underinsured" and may thus need to invest more in "country insurance" policies. To shed some light on this issue, we begin by providing in Chapter 1 evidence of the excessive volatility faced by developing countries in general (and Latin American and Caribbean, LAC, countries in particular) and then discuss some of the welfare costs associated with such volatility. In Chapter 2, we focus on the main trade-offs and on the strategic choices confronted by developing countries if they decide to increase their resilience to external shocks. Finally, in Chapter 3, we look at different policy options, focusing on how the international financial institutions (IFIs) in general and the World Bank in particular can help developing countries' reduce their vulnerability to external shocks. While excessive volatility in developing countries affects both government and the private sectors, this study limits its focus to the government sector. The private sector challenges will be addressed in future research.

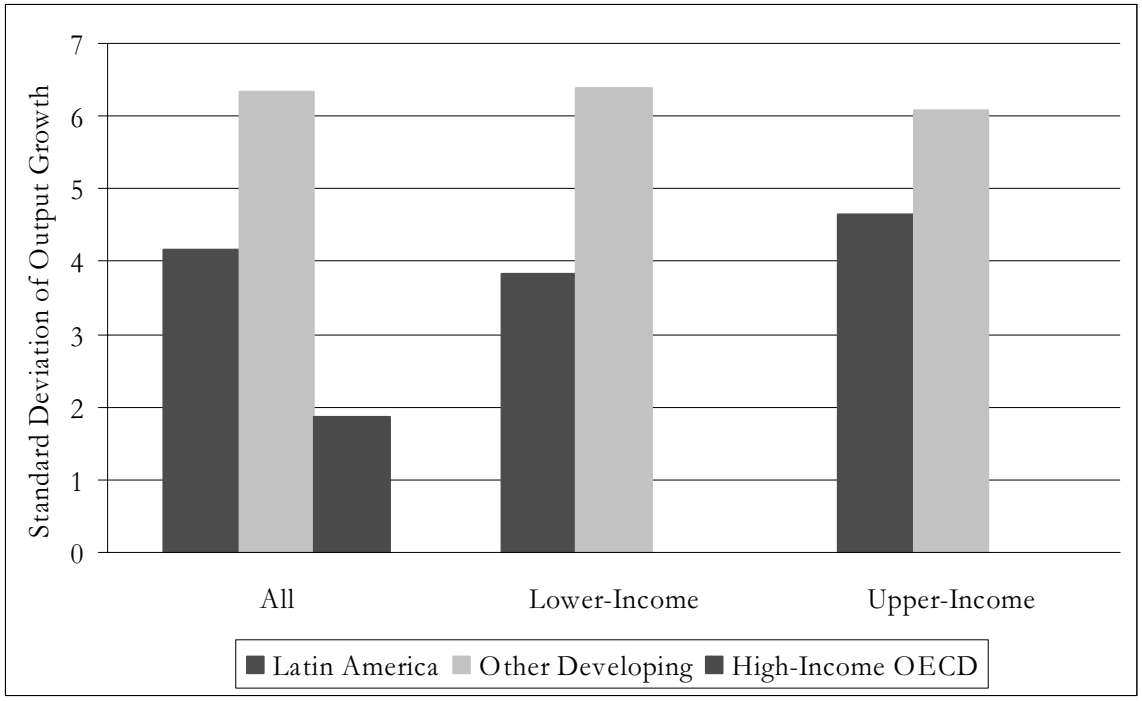
Some preliminary evidence

Figure 1.1 illustrates succinctly the higher volatility of developing countries relative to high-income countries, both with respect to output and consumption Why is this the case? Are developing countries more exposed to shocks (i.e., do they experience more shocks), or are they more vulnerable to shocks (i.e., they suffer more from any single shock)? If vulnerabilities are important, do they depend on a country's specific structural and financial characteristics? How does developing countries' excess volatility translate into individual welfare losses, particularly for less protected low-income households? What are the mitigating and the exacerbating factors? These are some of the questions we address in this introductory chapter. For a more detailed discussion of the topic, we refer the reader to the background papers for this study, Calderon and Levy-Yeyati (2007), Raddatz (2007), and Ventura (2007), which provide most of the material summarized here.

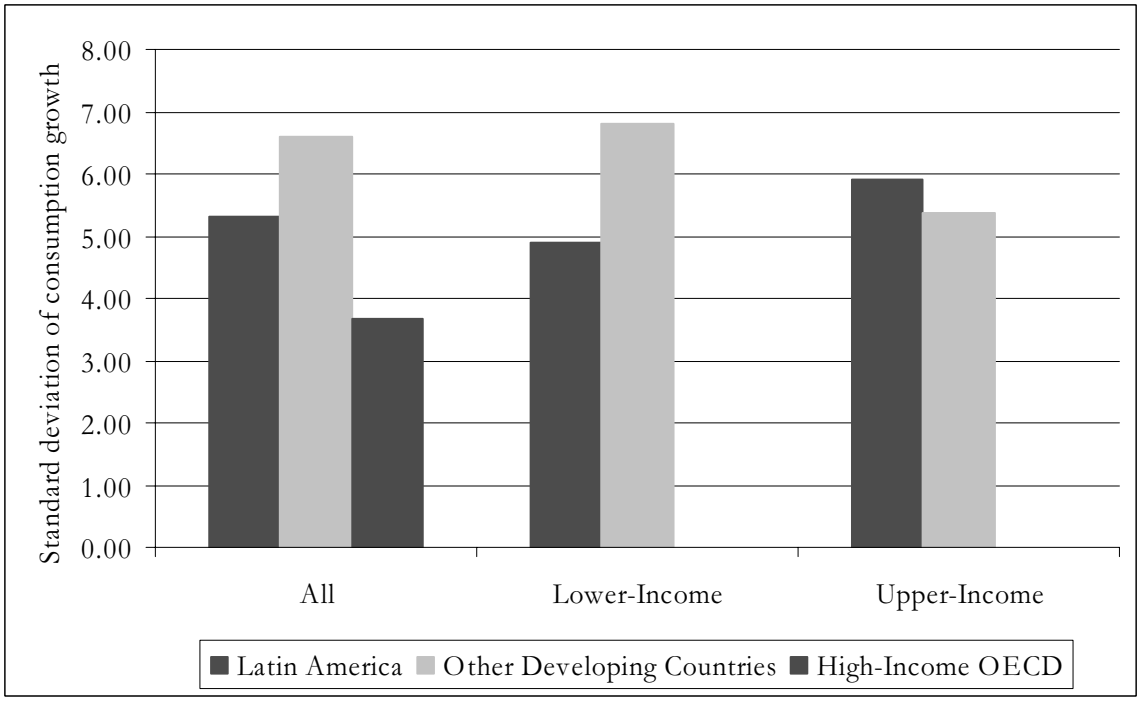
Among developing countries, Figure 1.1 also shows that output and consumption among LAC countries are less volatile than in other developing countries — which is explained by the behavior of lower-income countries. Interestingly, within the LAC region, output in upper-income countries is more volatile than in lower-income countries, whereas differences in consumption volatility across LAC income groups are negligible. Below we will assess whether the volatility differences is explained by differences in the variability or size of the underlying external shocks.

Figure 1.1 Output and consumption volatility, 1975–2005

Output volatility



Consumption volatility



Note: Output and consumption volatility are calculated as the standard deviation of growth in real GDP and real consumption over the period 1975–2005, respectively. For these calculations, we have eliminated small countries and islands (with populations smaller than 1 million in the year 2000) and we have restricted the sample to countries that have data availability for both output and consumption for at least 15 consecutive years.
Source: Authors' calculations based on data from the World Bank's World Development Indicators (WDI).

Exposure to external shocks: Too many, too large?

Experts typically assert that developing economies are excessively exposed to exogenous shocks, that is, to shocks that do not depend on the current or past actions of countries' policymakers. To investigate whether this is indeed the case, we start by classifying such shocks into two categories: real shocks and financial shocks. Under the category of shocks we distinguish between real economic shocks, such as variations in terms of trade or in export demand, and natural disasters, such as hurricanes and earthquakes. As for the financial shocks, we look at changes in international liquidity or risk aversion.

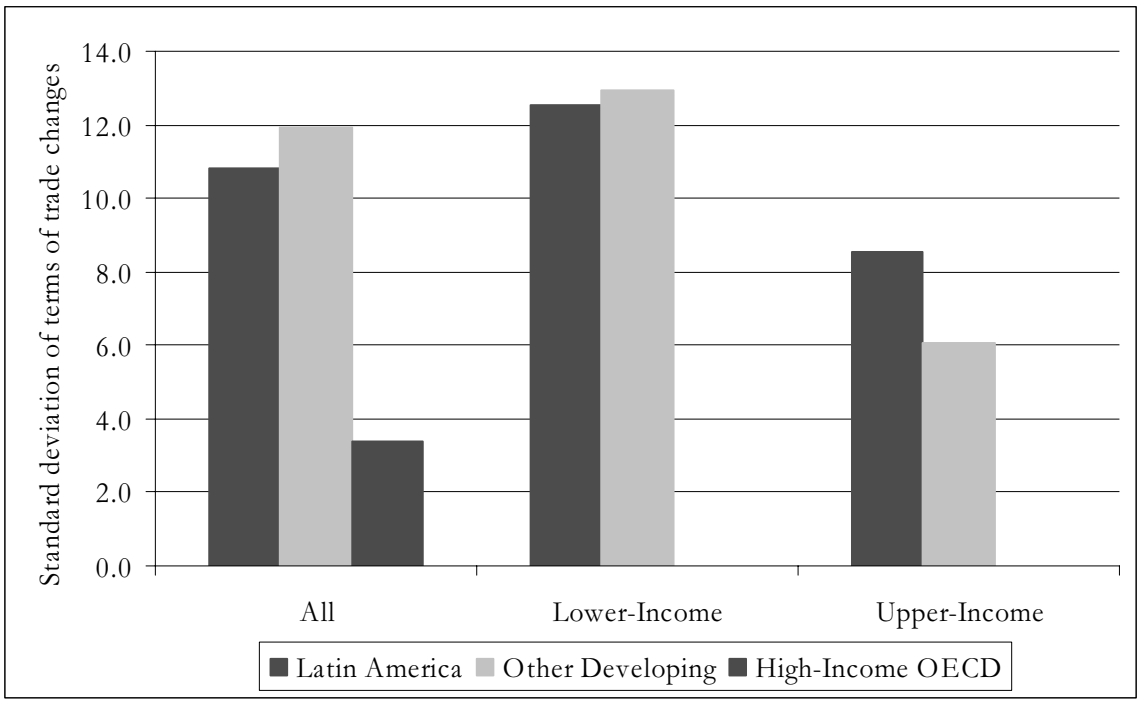
While our focus on exogenous shocks is motivated by our interest in "insurable," and thus non-self-inflicted damage, in the long run, the exogeneity of any measure of exposure, except possibly for certain natural disasters, is questionable. For example, output volatility associated with real shocks may partly explain poor economic performance that, in turn, may lead to underinvestment, low productivity, and the concentrated trade pattern that makes developing economies more exposed to commodity prices in the first place. Similarly, output volatility—coupled with higher borrowing costs—may partly account for the higher credit risk behind the greater volatility of capital flows to developing countries.[1] This being said, from a policy perspective, these aspects (trade patterns, credit records) cannot be changed in the short term; for this reason, we take them as a given (exogenous) at any point in time.

With this caveat in mind, we measure a country's exposure to external shocks, estimating their frequency and magnitude. A cursory look at the evidence shows that income explains an important part of exposure to terms-of-trade shocks. Lower-income countries display higher terms-of-trade volatility and a greater propensity to experience sharp deterioration in terms of trade relative to upper-income and high-income OECD countries. The same holds true for the LAC region and other developing areas: terms of trade are more volatile and more likely to drop dramatically in lower-income LAC countries —and, generally, in lower-income developing countries (Figure 1.2).

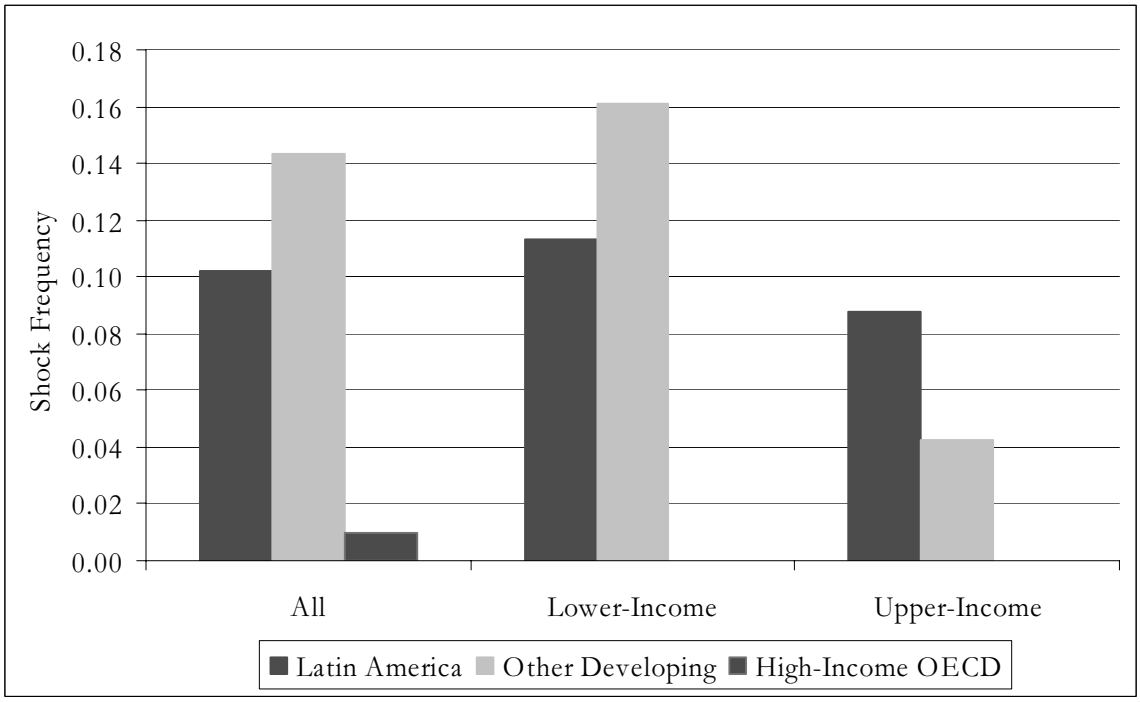
Experts argue that the higher terms-of-trade volatility in developing countries can be explained in part by the less diversified composition of export and import baskets. Specifically, Baxter and Kouparitsas (2007) note that the share of terms-of-trade volatility attributed to the specialization of countries in highly volatile economic activities remains high. They see scope for reducing this volatility through export diversification.

[1] The spread over an index, like the U.S. Treasury, is partly exogenous (risk appetite) and partly endogenous related to creditworthiness affected mainly by government policies.

Figure 1.2 Exposure: Terms-of-trade shocks, 1975–2005
Terms-of-trade volatility



Exposure: Sharp deterioration in terms of trade

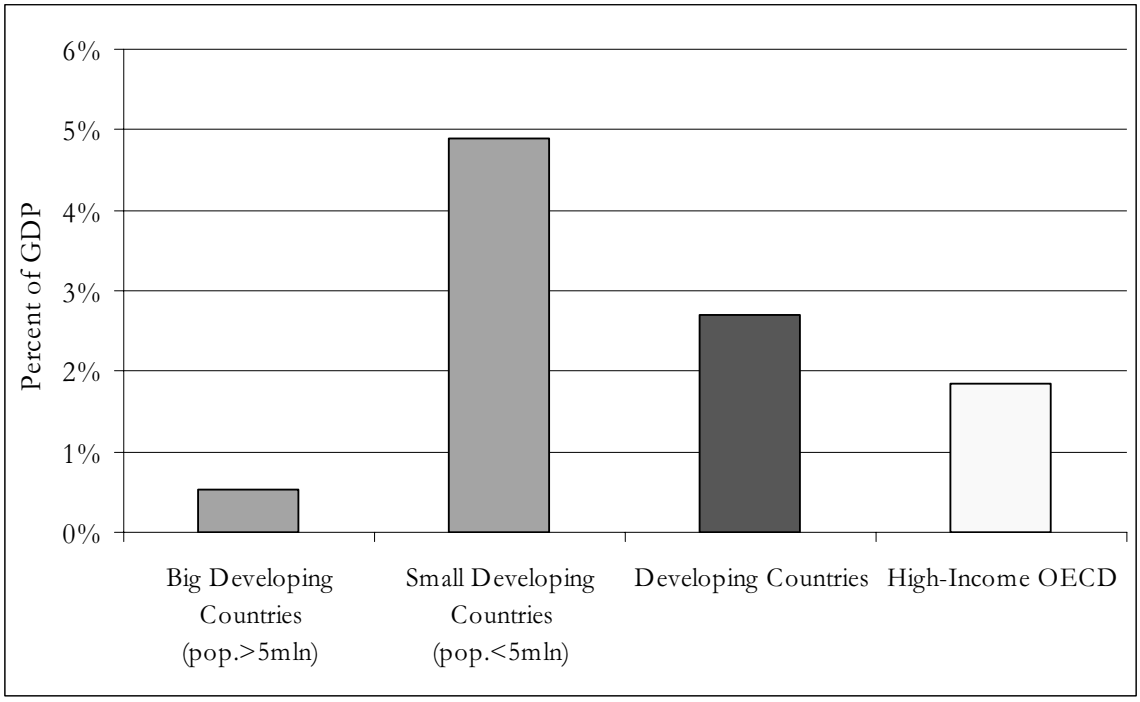


Notes: (a) Volatility per country measured as a standard deviation of the annual growth rate for the terms of trade for the period 1975-2005 (average per group). (b) Shock frequency per country measured as the ratio of number of observations in which the annual growth rate for terms of trade was -10 percent or less than the total number of observations in the sample (average per group).
Source: Authors' calculations on WDI data.

If we look at natural disasters**,** we get a similar picture. The average damage faced by developing countries represents 2.7 percent of GDP for the period 1960–2005, while size

seems to matter in terms of the damage inflicted by natural disasters. Average damage in small states constitutes 4.9 percent while it is 0.5 percent in big developing countries (Figure 1.3). The pattern for countries in LAC is similar to other developing regions, albeit costs are much higher. Indeed, average damages from natural disasters faced by countries in LAC represent 4.4 percent of GDP over the period 1960–2005. The exposure of LAC to natural shocks is reflected in the fact that the region has experienced almost 27 natural disasters (climatic and geological) a year during the period 1960–2005, with an average shock frequency per country of almost 0.8 percent. Across geographical regions, as shown in Table 1.1, LAC and South Asia display the greatest incidence of natural disaster.[2]

Figure 1.3 Natural disaster damage over GDP



Source: Author's elaboration based on data from EM-DAT, the OFDA/CRED International Disaster Database, World Bank

Table 1.1 Average shock frequencies, 1960–2005

	Europe and Central Asia	Latin America and Caribbean	Middle East and North Africa	South-East Asia and Pacific	Sub-Saharan Africa	High-income Countries
Annual average shocks in the region	9.89	26.40	7.31	51.40	17.36	34.24
Annual average shocks per country	0.37	0.80	0.52	1.35	0.36	0.62

Source: Author's elaboration based on data from EM-DAT, the OFDA/CRED International Disaster Database, World Bank

2 In line with this, 15 out of 25 catastrophe "hot-spot countries" identified by the World Bank (2004) are located in the LAC region. The country with the greatest shock frequency is Mexico (with an average annual number of shocks equal to 3, followed by Brazil (2.5), and Peru and Colombia (both averaging 1.7 shocks a year).

Exogenous financial shocks faced by individual countries are more difficult to capture than exogenous real shocks mainly because capital flows and borrowing costs are bound to be partly endogenous to national policies. This makes it particularly hard to identify exogenous changes in the supply of international capital. One possibility would be to use indicators such as J.P. Morgan's emerging market global bond index (EMBIG). Indeed, the use of an index dilutes the impact of individual economies and reduces the endogeneity problem (i.e., deteriorating financial conditions worsen the index) in the case of small countries. But this is not the case for the few large countries with important weights in the index. The correlation between the index and the country spreads is particularly strong in crisis periods, and this may lead to overstating the consequences of the shock. To avoid this, in what follows, we adopt a conservative approach and use the spread of high-yield corporate debt, which is highly but imperfectly correlated with financial shocks in developing country markets.[3]

Using high-yield corporate debt as a measure of exposure to financial shocks is equivalent to assuming that all countries are equally exposed to financial shocks. While financial shocks are mostly global, their impact on individual borrowing costs is proportional to the perceived credit risk of the borrower (the country). As a result, spread volatility is lower for better credits (Figure 1.4).[4] Is this exposure or vulnerability? The issue is debatable. But what is important for this analysis is that developing countries face lower and more volatile ratings: in particular, most lower-middle- and upper-middle-income countries are below investment grade while most upper-middle-income countries are above investment grade, as Figure 1.4 shows. Within LAC, Chile and Mexico are currently the only large investment-grade countries.[5] This means that, for the time being, LAC economies could face more volatile financial flows--that is, they are more "exposed" to financial shocks.

To measure the volatility of financial flows, we look at the volatility of the spread, which can be considered a proxy for risk aversion, as a function of the rating. If ratings are taken as given (same as trade patterns), then the shock corresponding to the terms of trade would be the change in the country's spread associated with the change in risk aversion (corporate spread) for the country's rating.

A closer look at the volatility of country ratings by region shows that upper-income countries in LAC and in other developing areas display greater volatility than lower-income countries, and that the volatility difference between upper- and lower-middle-income economies is larger in LAC–possibly an endogenous consequence of the greater propensity of these countries to crisis.

In sum, financial shocks explain why output volatility is higher in upper- than in lower-income countries in the LAC region—despite the higher terms-of-trade volatility in the

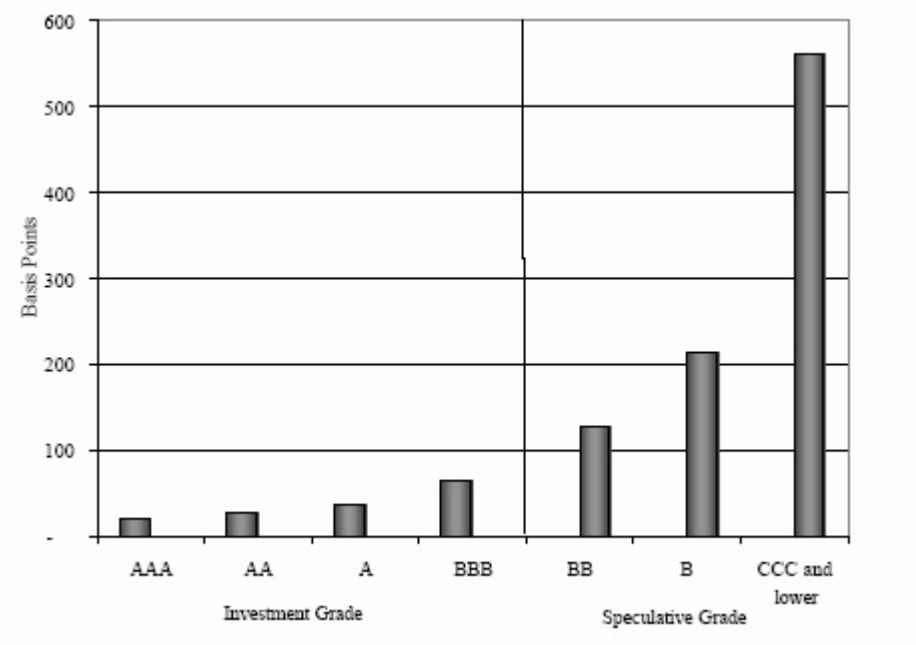
[3] On the link between high-yield and emerging market bond spreads, see González-Rozada and Levy-Yeyati (2006).

[4] There is also a direct association between credit ratings and levels of income per capita, where poorer countries are typically assigned lower ratings.

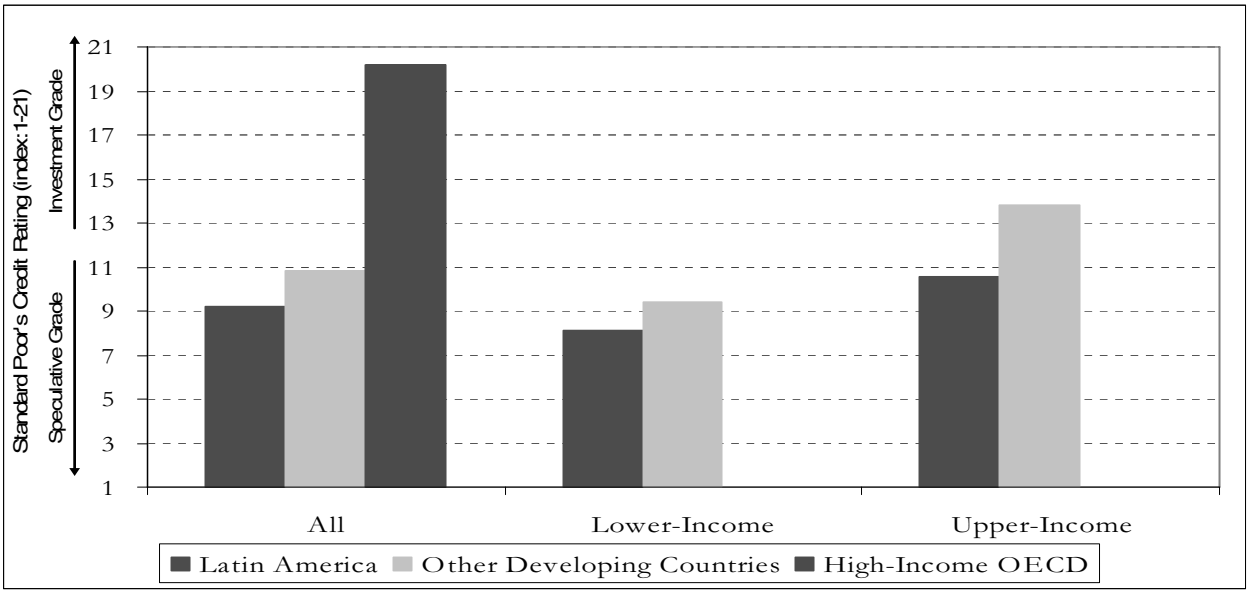
[5] Small Caribbean islands such as the Bahamas, Barbados, Bermuda, and Trinidad and Tobago are also investment-grade nations in LAC.

latter group (Figure 1.4). On the other hand, the lower volatility of the LAC region as a whole, relative to other developing countries, is attributed mainly to the larger exposure to terms-of-trade deterioration in other developing countries even though financial shocks are more volatile in LAC.

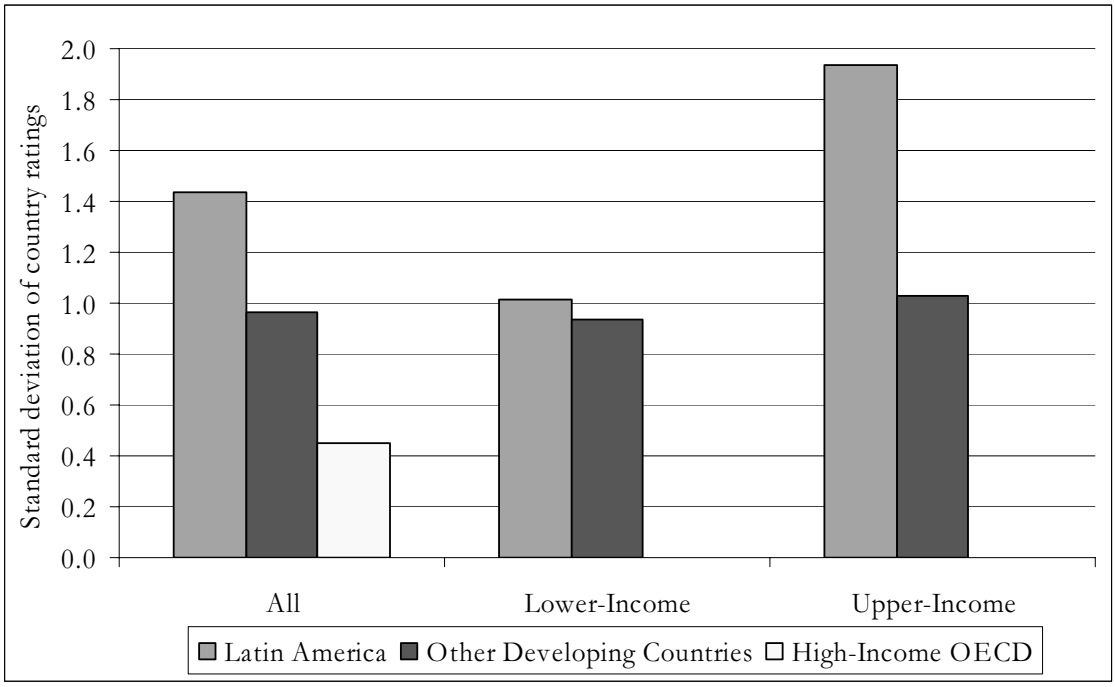
Figure 1.4 Exposure: The credit rating channel, 1975–2006
Sovereign spread volatility



Average rating (December 2006)



Rating volatility



Note: We use the Standard and Poor's credit rating for long-term sovereign debt in foreign currency. The credit rating index depicted here is the numerical equivalent of the categorical S&P rating in which "Default" is equal to 1 and "AAA" is equal to 21. Volatility is calculated as the credit-risk-rating index (with monthly frequency) from 1975 to 2006.
Source: Merryl Lynch, Bloomberg and Standard and Poor's.

Vulnerability: From external shocks to macroeconomic effects

Is the degree of output volatility in developing countries the sole result of the larger and more frequent shocks or does it also reflect a larger response to shocks? Are these countries more vulnerable to external conditions? How does Latin America compare with other regions?

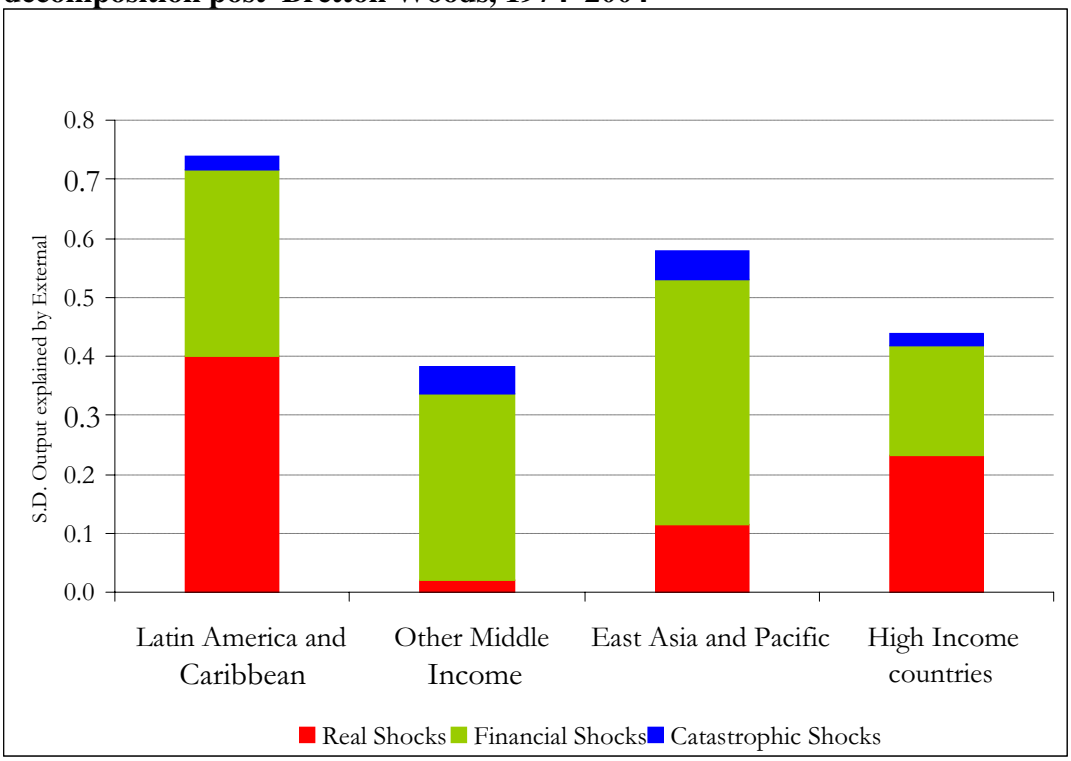
The relative contribution of external shocks to long-run output volatility is particularly important in LAC and East Asia and the Pacific (EAP)—where it has historically exceeded 25 percent. In LAC, real and financial shocks are equally important, while financial shocks tend to dominate the contribution of external shocks in East Asian and the Pacific—not surprisingly given the frequency of crises during the period (Raddatz 2007).

In Figure 1.5, we see the contribution of external shocks to volatility (measured by the standard deviation of output) in each region and find that external shocks are important business cycle drivers in LAC. Indeed, the magnitude of the output volatility explained by external factors is larger in LAC than in other regions for the period 1986-2005, with real shocks (i.e., terms of trade and external demand) being the main drivers of output volatility. Financial shocks, instead, constitute an important source of output volatility in the East Asian countries that were hit hard by financial crises in the 1990s.

At this point we can confidently claim that developing countries (particularly in LAC) display greater volatility in output and consumption than more advanced economies. But is this greater aggregate volatility a concern? To what extent does it translate into lower welfare, for example, in the form of more volatile consumption and lower and more unequal individual incomes? How resilient is the economy to this unstable external environment?

To evaluate the combined response to shocks and their welfare cost, we assess the ability of countries to insure against income shocks. Countries enjoy full risk-sharing opportunities if there is high (if not perfect) consumption co-movement across countries. This implies that domestic consumption growth must not be explained by country-specific components. If there is no perfect correlation, there is scope for risk diversification that will reduce the variance of aggregate consumption and raise expected utility. In this case, welfare gains could be measured as the increase in expected consumption corresponding to a rise in welfare resulting from a reduction in the variance of consumption.

Figure 1.5 Contribution of external shocks to output volatility: Variance decomposition post–Bretton Woods, 1974–2004

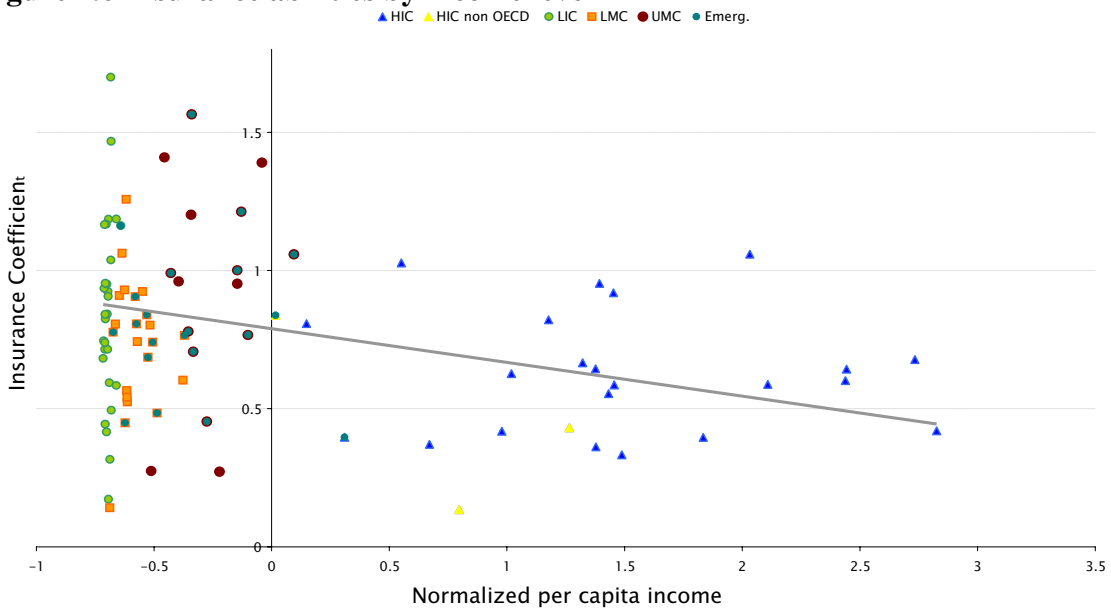


Source: Raddatz 2007.

In Figure 1.6, scatter diagrams show where the *x*-axis contains the normalized per capita income (with mean and standard deviation computed over the whole sample of countries)

and the *y*-axis is represented by the estimated value of the insurance coefficient.[6] The figure classifies countries by their level of income per capita (high income, upper-middle-income, lower-middle-income, low-income, and emerging economies).[7] The figure suggests a positive relationship between income and insurance against idiosyncratic shocks. But while high-income countries seem to be well characterized by this regularity, the relationship does not seem to hold for low-income countries and for emerging economies. More important, for our analysis, LAC countries show excessive consumption volatility (relative to other developing countries, as well as industrial economies), which suggests their inability to diversify idiosyncratic risks.

Figure 1.6 Insurance abilities by income level



Note: The x-variable in the scatter-plot is the "normalized" income per capita, where the mean and standard deviation have been computed over the whole sample of countries. The y-variable is the insurance coefficient —represented by the estimated coefficient of negative shocks to domestic income in the consumption regression.
Source: Ventura (2007).

Insuring against idiosyncratic risks is desirable and particularly important among developing countries since a lack of insurance may lead to lower levels of income, investment, consumption, and savings--as well as higher inequality.[8] Idiosyncratic risks at the country level may not, however, be eliminated completely owing to such variables as

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[6] The reference equation is the following: $\Delta \log c_{it} = \beta_0 + \beta_1^{+} \Delta \log GDP_{it}^{id+} + \beta_1^{-} \Delta \log GDP_{it}^{id-} + \beta_3 \Delta \log(c_{at}) + \varepsilon_{it}$, where the dependent variable is the log difference of consumption in country *i* at time *t* , and the regressors are, respectively, a constant and positive and negative shocks to GDP growth. The estimates in the table distinguish between positive and negative realizations of the idiosyncratic income shock, Δlog (GDPit), and report the estimate of the coefficient for negative shocks, β_1^{-} . See Ventura (2007) and references therein.

[7] Our set of countries includes the following emerging economies: Argentina, Brazil, Chile, China, Cote d'Ivoire, Dominican Republic, Ecuador, El Salvador, Hungary, Korea, Mexico, Malaysia, Panama, Peru, Philippines, South Africa, Thailand, Uruguay, and Venezuela.

[8] See, among others, Townsend 1994, Greenwood and Jovanovic 1990, Banerjee and Newman 1993.

incomplete (real or financial) markets, limited participation, and limited savings opportunities.

Resilience: The welfare effects of macroeconomic volatility

The literature has focused more on the growth-poverty links than on the impact of output volatility and economic contractions on such microeconomic indicators as income inequality, poverty, or employment levels. Anecdotal evidence suggests, however, that aggregate volatility may raise income inequality through higher inflation and irreversible losses in human capital. In addition, the lack of safety nets may perpetuate inequality.[9]

Macroeconomic volatility may affect income distribution through different mechanisms. For example, financial crisis may worsen the welfare of urban residents through sharp declines in asset prices, while real shocks may have a bigger impact on the rural population. This effect would be permanent (rather than transitory) if income distribution and poverty respond asymmetrically to economic downturns and upturns. Asymmetric responses to cycles and crises are usually explained in the literature by irreversible effects on human capital (e.g., children who leave school during crisis may not return). Sharp declines in household assets after a crisis may reduce the ability of agents to smooth income shocks. Safety nets or access to financial markets to protect the less favored from negative income and employment shocks may be lacking.

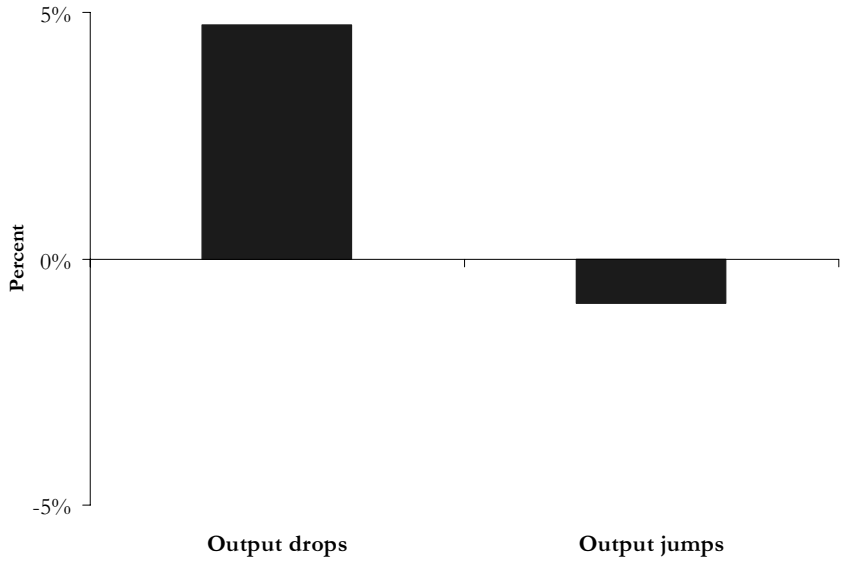
Output volatility has a permanent effect on income distribution. After identifying 36 episodes of output drops and 45 episodes of output jumps for the period 1975–2005, we find that income distribution deteriorates in the aftermath of sharp declines in output (drops) while it remains unchanged after surges in economic activity (jumps).[10] Specifically, we observe that the Gini coefficient rises by nearly 5 percent after the drop and falls by only about 1 percent after the output jump, although the latter effect is not statistically significant (Figure 1.7).[11]

[9] See Kraay (2006) for the impact of poverty on growth, and Lopez and Serven (2006) for the feedback of poverty and inequality on growth. Among the studies documenting this positive correlation we have Breen and García-Peñalosa (2005), Agénor (2004), Gavin and Hausmann (1998), and Laursen and Mahajan (2004).

[10] We define an output drop as the cumulative output loss in excess of 5 percent of the predrop real GDP level (that is the previous local maximum). An output jump is the cumulative output gain in excess of 5 percent relative to the pre-jump real GDP level.

[11] Evidence for Latin America shows that the poverty headcount ratio always increased after a crisis while income inequality deteriorated in only 75 percent of the cases (Lustig 2000).

Figure 1.7 Volatility, income distribution, and asymmetric effects:
Percent change in the Gini coefficient during episodes of output drops and output jumps



Source: Calderón and Levy-Yeyati 2007

Table 1.2 conveys the preliminary message that output volatility hurts income distribution.[12] Economically speaking, the Gini coefficient would increase by almost 3 percent if aggregate volatility doubles, while the income share of the poorest quintile may decline by 2.4 percent and that of the richest quintile may rise by more than 1 percent. Econometric evidence also shows that income shares tend to move regressively as volatility increases.

The increase in inequality does not imply, however, that low-income households are necessarily worse off in absolute terms in volatile economies. In other words, do we have a situation in which the rich gain at the expense of the poor in a zero- (or negative-) sum game? Or can rich people profit from a volatile growing environment at no cost in terms of the lower-income quintiles? Put differently: do the effects of income distribution reported in Table 1.2 translate into worsening poverty indicators or not? We show that the poverty gap and the headcount index increase as aggregate volatility rises. Doubling aggregate volatility expands the poverty gap by more than 15 percent and the headcount ratio by more than 10 percent.

[12] The findings of Calderon and Levy-Yeyati (2007) are robust to changes in the measure of inequality, changes in the measure of output volatility, changes in the sample of countries, and changes in the econometric technique used.

Table 1.2 Output volatility, income distribution, and poverty

	Baseline	Augmented Regression	
Dependent Variable	Output Volatility	Output Volatility	Output Drops *1/*
Gini Coefficient	0.0388 **	0.0173 **	0.0202 **
	(0.00)	(0.00)	(0.01)
Income Shares			
Q1 (poorest quintile)	-0.0339 **	-0.0049	-0.0843 **
	(0.01)	(0.01)	(0.03)
Q2	-0.0111 **	-0.0049	-0.0251 **
	(0.01)	(0.01)	(0.01)
Q3 (middle quintile)	-0.0151 **	-0.0249 **	0.0061
	(0.01)	(0.01)	(0.01)
Q4	0.0076 **	0.0069 *	0.0001
	(0.00)	(0.00)	(0.01)
Q5 (richest quintile)	0.0160 **	0.0108 *	0.0109 *
	(0.01)	(0.01)	(0.01)
Poverty			
Poverty Gap	0.272 **	0.195 **	0.111 **
	(0.06)	(0.07)	(0.06)
Headcount index	0.181 **	0.027	0.154 **
	(0.04)	(0.05)	(0.05)

Note: The variable output drop is a binary variable that takes the value of 1 if the adverse output event started within the five-year period of the panel data. We only report the coefficient estimates of our variables of interest for the baseline regression and for the regression augmented by output drops. Our regression includes other explanatory variables such as the level of income per capita (linear and squared), human capital (proxied by the secondary enrollment rate), financial development (as measured by the ratio of domestic credit to the private sector), and a measure of public spending.
Source: Calderón and Levy-Yeyati 2007.

In the same way that booms and busts tend to behave asymmetrically (Ranciere, Tornell, and Westermann 2007), they are likely to have asymmetric and nonlinear effects on employment and income. This means that the consequences of large protracted recessions are likely to be proportionally more important than traditional business cycles (Becker and Mauro 2006). Is it the effect of aggregate volatility or extreme adverse output events? Controlling for both output volatility and the likelihood of output drops (as defined above) reveals that the propensity to suffer extreme contractions (a feature in developing economies) adds to (or, in most cases, fully explains) the deterioration in inequality and poverty associated with business cycles. For example, doubling aggregate volatility would lead to an increase in the Gini coefficient of 2.3 percent and this increase would be even higher (4.7 percent) if the higher volatility occurred during an episode of falling output. This confirms the importance of non-linear effects of volatility on inequality (Table 1.2).

While poverty rises significantly in the aftermath of output drops–as the poorer segments of the population may experience irreversible losses in physical and human capital–poor people can be protected through appropriate mechanisms. For instance, countercyclical

public spending on the poor may shield them from adverse income shocks. In line with this hypothesis, we find that public spending plays a crucial role in mitigating the impact of aggregate volatility on income distribution, poverty, and human capital (Calderon and Levy-Yeyati 2007,Laursen and Mahajan 2004).

The case for country insurance

LAC countries are exposed to large and volatile exogenous (real and financial) shocks that may partly explain their excess output volatility relative to industrial economies as well as other developing countries. In addition, the inability to diversify idiosyncratic shocks to income is reflected in the excess consumption volatility found in LAC. We attribute this mainly to underdeveloped local financial markets.

In addition to the well-known effects of external shocks on growth, we also find robust evidence on the negative impact of aggregate volatility on individual welfare. Indeed, income inequality and poverty are hurt not only by rising aggregate volatility but also by sharp drops in real output. The microeconomic impact of aggregate volatility and economic recession is likely to be mitigated by the development of domestic financial markets and the presence of social safety nets (Calderón and Levy-Yeyati 2007). But to the extent that this takes time, in developing economies, measures aimed at reducing the aggregate income effect of external volatility remain an important policy issue. These measures, which we broadly denote here as country insurance policies, are the subject of Chapter 2.

In the coming chapters, we present a taxonomy of external shocks, describing the menu of country insurance policies currently available and how they are used (or may be used) by developing countries. We then introduce additional instruments, which could be engineered by financial markets or multilateral financial institutions to help mitigate the effects of those shocks.

2. Country Insurance

In Chapter 1, we argued that developing countries are more exposed and more vulnerable to exogenous shocks than developed ones. We also found that middle- and upper-middle-income countries in the LAC region exhibit higher volatility than their peers in other regions. This means that, in LAC, growth does not necessarily bring stability and thus that virtually all countries in the region need to increase their resilience to external shocks by investing more in country insurance policies. What, then, are the available strategies? For answer to this critical question, we now turn to the main trade-offs that countries face. The economic literature on insurance is a good starting point for this analysis.

A simple theoretical framework

In an early paper, Elrich and Becker (1972) identify three ways in which individuals can deal with possible negative income shocks: market insurance (a standard insurance policy with a private third party at a market-determined premium), self-insurance (saving income in good times for rainy days), and self-protection (investing to reduce the losses inevitable in the event of an adverse shock).

Natural disasters clearly illustrate these alternative ways of coping with risk. For example, a household living in an earthquake-prone area may either:

- buy a catastrophe insurance policy that pays a predetermined amount in the event of an earthquake (market insurance);
- save money to rebuild after the earthquake (self insurance); or
- invest in anti-seismic protection to reduce the incidence of an earthquake, should it materialize (self protection).

Which is the most effective strategy?

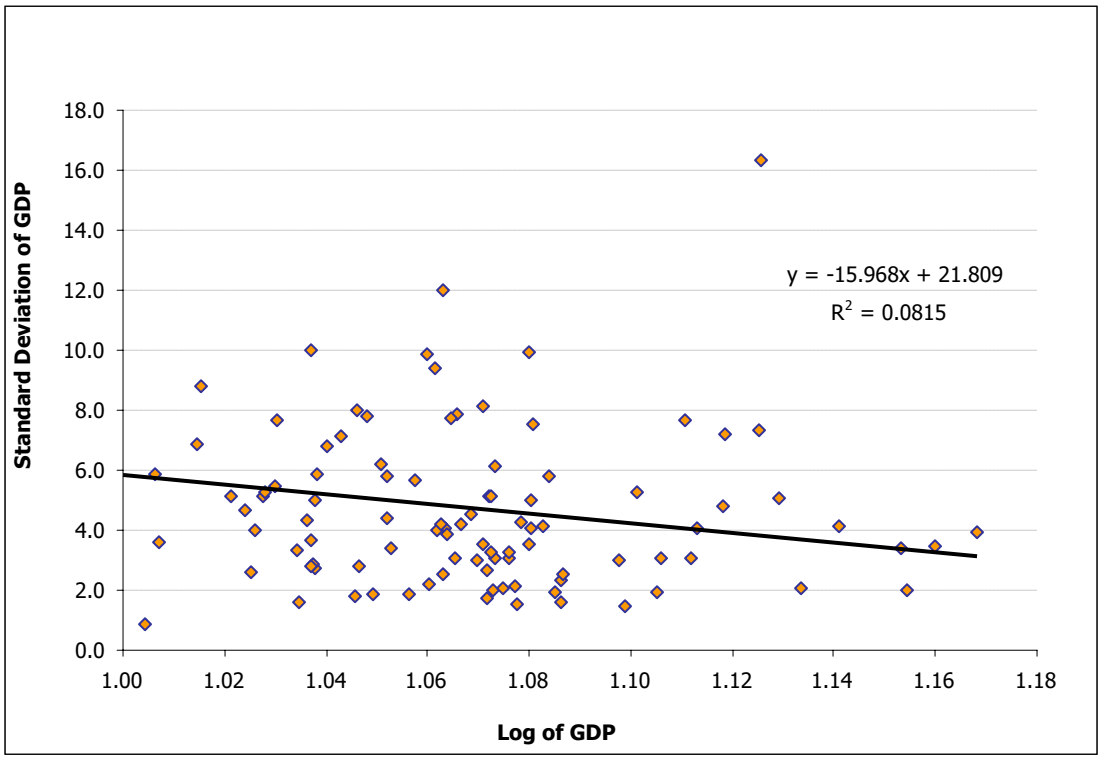
Elrich and Becker argue that market insurance is the most effective way for risk-adverse individuals to cope with rare, but large, losses such as those resulting from a natural disaster. In contrast, the self-insurance option, if at all feasible, would be too expensive in terms of foregone consumption, as it would require setting aside large sums of money to be used only in the rare event of a major disaster.[13] Therefore, a standard insurance policy—even one that is expensive (i.e., unfairly priced) and entails an expected income loss—would allow households to consume more in nearly all states of nature.[14]

[13] The incentive effects of market insurance and self insurance are different. The first decreases the incentive to invest in self protection, the second increases it.

[14] In the case of low-probability events, an insurance provider would charge in good states only a portion of the amount to be paid in the rare bad states, while self-insurance would require saving the full amount. The crucial distinction here is between income and consumption: expensive insurance transfers income to the insurer, but by transferring consumption from good to bad states, it allows households to increase consumption in all states.

The trade-off between market and self insurance applies, at least in principle, to sovereign countries as well: extreme and unlikely events are better insured externally. Note that in larger economies—presumably more diversified in both economic and geographic terms—macroeconomic volatility tends to decline, and with it, the propensity to sustain extreme income losses (Figure 2.1). In addition, the mitigating effect of financial markets that lend to a country in bad times is severely limited in small developing economies by financial constraints and the procyclical nature of private capital flows. Therefore, we should observe that, for any given cost of market insurance, economic development and diversification (or, more generally, economic size) should reduce a country's demand for market insurance–if such insurance is indeed provided by the market.

Figure 2.1 Economic size and economic volatility (1975-2005)



Source: Author's calculation based on data from World Bank, WDI.

The decision to act to mitigate these exogenous risks entails a second trade-off: the choice between the cost of insurance—the premium in excess of the fair one, or load, in the case of market insurance, or the foregone consumption if income is saved or invested in self-protection—and the cost of an uninsured adverse shock. To examine these trade-offs more closely, we divide our analysis according to different types of exogenous risks: liquidity risk on the financial side, natural catastrophe and terms-of-trade shocks on the real side.

Liquidity shocks

Many recent emerging-market financial crises have followed a similar script: a financial shock, usually a sudden increase in risk premiums, and increased perceived debt-rollover

risk, often leading to further rises in interest rates that in many cases make otherwise sustainable levels of debt unsustainable.

Why have emerging markets been so vulnerable to liquidity shocks? If we look at the crises in the late 1990s and early 2000s, it is easy to conclude that the main culprit was mismatches between the terms of assets and liabilities, including currency mismatches. This resulted from the presence of public or private financial dollarization--that is, by resident debtors holding foreign-currency liabilities. Whatever the reason for the buildup of these mismatches—which range from bad policy choices to the need for credible external anchors in the absence of central bank credibility—they make countries vulnerable to sudden dollar liquidity runs.

In the standard bank-run model (e.g., Diamond and Dybvig 1983), liquidity shortages ultimately lead to insolvency because of the deadweight loss associated with the liquidation of bank assets. In the case of a country, insolvency is caused by the need to roll over sovereign debt at rates so high that they compromise fiscal sustainability. Thus, the main source of dollar liquidity risk is a currency mismatch at short maturities--dollar payments that suddenly cannot be rolled over in the market—a fragility compounded by the negative balance-sheet effect of a real exchange rate depreciation that affects the debtor's solvency and further reduces its payment capacity.[15]

A natural implication of this analysis is the need to reduce currency mismatches by reducing dollar debt or switching to domestic-currency-denominated debt. Indeed, LAC countries have benefited in recent years from a gradual de-dollarization of sovereign liabilities based on the development of domestic markets that exploit the so-called "home-currency bias."[16] But for many reasons, this "solution" may only be put in place slowly and to a limited extent, which brings us to the different liquidity country insurance options.

If a country suffers from currency mismatches, it can cope in three main ways:

- create liquidity buffers, typically by holding a substantial stock of foreign-currency-denominated liquid assets, either at the central bank or, in the case of bank runs, by individual banks;
- obtain market insurance, through a contract with private providers of dollar liquidity (typically, a consortium of financial institutions) or through mechanisms of indexation of liabilities to variables correlated with the occurrence of financial shock; or

[15] A common confusion in this regard is to think that the concern about dollar runs is specifically associated with fixed-exchange-rate regimes. While a flexible exchange rate may reduce the scope for currency runs as it avoids large currency overvaluations, it would have no effect once the run actually materializes (e.g., for fear of bank insolvency owing to balance-sheet effects), as the crises in Argentina and Uruguay in 2002 dramatically demonstrate.

[16] See Levy-Yeyati (2006) on the home-currency bias (the relative preference for the local currency by resident investors), and Cowan, Levy-Yeyati, Panizza, and Sturzenegger (2006) for supporting empirical evidence.

- rely *ex post* on international financial institutions (IFIs) that ensure access to dollar liquidity at reasonable financial costs.

Liquidity buffer

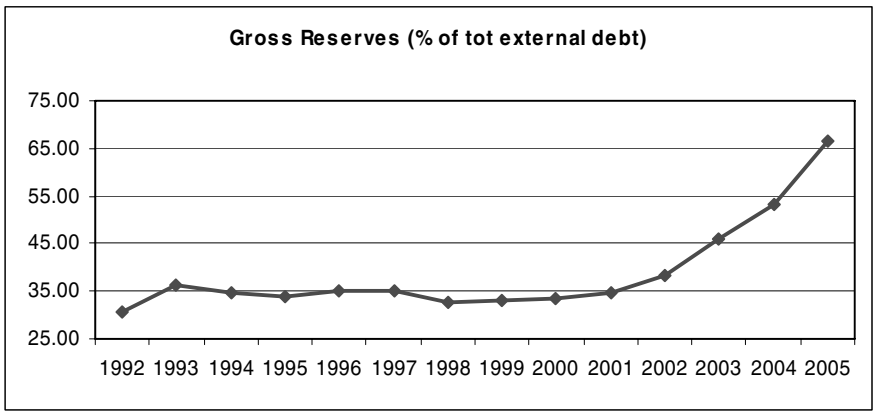
In recent years, we have witnessed a large and important increase in the stock of liquid international reserves in emerging economies. The evidence (summarized in Table 2.1) is extensive and has been debated both in academic literature and in the general press.[17] The increase in this dollar liquidity buffer reflects only one side of the emerging market reduction of their vulnerabilities to financial shocks. The other, far more critical for LAC emerging markets, is the reduction of the stock of foreign-currency-denominated external debt. Figure 2.2 illustrates the point. It shows the sharp increase in the ratio of central bank gross reserves and total external debt (a proxy for the aggregate currency exposure of the sovereign); in contrast, the reserve ratios of industrial countries have declined.[18]

Table 2.1 Reserves

	Reserves (as a percentage of the GDP)		
World Region	1992	1997	2006
Europe and Central Asia	5.27	13.38	19.59
South Asia	11.25	15.44	22.64
East Asia and Pacific	14.20	13.61	28.10
Latin America and the Caribbean	10.05	11.82	15.14
Middle East & North Africa	14.57	18.37	46.83
High Income OECD	5.82	6.54	11.29
Sub-Saharan Africa	10.15	14.32	17.92

Sources: IMF, International Financial Statistics and World Economic Outlook database

Figure 2.2 Emerging reserves



Source: Author's calculation based on Global Development Network (GDN)

[17] While the trend of reserve accumulation is common to most emerging markets, reserve accumulation has been stronger in countries that have suffered a financial crisis (Aizenmann and Lee 2005) and exhibit domestic financial dollarization (Levy-Yeyati 2006), in line with precautionary motives.

[18] Assuming that fiscal resources are proportional to GDP, this ratio should approximate the trend, if not the level, of currency exposure. But foreign-currency private debt could be regarded as a contingent public liability, as dollar debtors are likely to be subsidized by the government in the event of a dollar liquidity crisis. In addition to reserve accumulation, vulnerabilities have also been reduced as mismatches have been declining dramatically in most emerging economies, most notably in LAC (Cowan and others 2006).

While reserve hoarding in emerging markets may well reflect a gradual convergence to the optimal dollar liquidity coverage level, it has also been seen as a consequence of exchange rate policies that lean against the recent appreciation winds to protect domestic producers (Aizenman and Lee 2006, Levy-Yeyati and Sturzenegger 2007). In other words, building a liquidity buffer may no longer be the binding motive for reserve accumulation in emerging markets.

With this caveat in mind, the question remains: How costly it is for a country to build up international reserves for prudential reason? In principle, the cost of holding a unit of excess reserves should reflect the country's risk premium, [19] as the government finances the purchase of excess reserves by issuing new debt (or, equivalently, by postponing the payment of outstanding debt) and uses the proceeds to purchase liquid foreign assets (e.g., U.S. treasury bills). This back-of-the-envelope calculation, however, may overstate actual costs because it does not take into account the contribution of reserve holdings in lowering the country risk premium paid on the full stock of debt (Box 2.1).

Indeed, the standard association of liquidity buffers with the concept of self insurance is somewhat misleading. This is because the role of the buffer is not to make up for lost income in the event of a financial shock, but rather to limit the increase in borrowing costs (i.e., the income loss) attributable to the shock, and to reduce the probability of the shock altogether. This is more in line with the concept of self-protection.

Intuitively, the likelihood of a self-fulfilling run should be endogenous to the size of the liquidity buffer, since nobody has the incentive to incur the cost of running if the borrower is expected to repay in full. Ultimately, a country with a substantial stock of liquid reserves should be immune to a non-fundamental dollar liquidity run. Similarly, a credible liquidity insurance policy would virtually eliminate the probability of a run, and therefore would seldom be called.

Box 2.1 The cost of reserves

The practice of hoarding international reserves as self-insurance to cope with, and ultimately discourage, self-fulfilling dollar liquidity runs entails a non-negligible "cost of carry." This cost is the return the government pays on its debt in excess of the return on liquid foreign assets. Such a cost, it has been argued, can be substantive and may justify alternative forms of liquidity insurance.

Jeanne and Ranciere (2006) use this as the starting point for estimating the optimal amount of precautionary reserves. They assume an exogenous probability of a capital account reversal (sudden stop) and an exogenous fixed cost of a financial crisis. They then compute the stock of reserves that balances the cost of carry previously described (which they measure as the sum of a credit risk plus a maturity risk premium) and the gains in terms of a reduced conditional probability of a financial crisis (assuming that the

[19] If reserves are built up for leaning against the wind of appreciation, the cost of holding reserves is the cost of sterilization.

larger the stock of reserves, the larger the sudden stop the country can survive without falling into a full-blown financial crisis).

One of the drawbacks of this back-of-the-envelope exercise is the premise that reserves should be of the same maturity as the liabilities they intend to insure against, which adds to the cost of reserves and reduces the optimal stock. Indeed, a precautionary buffer stock only needs to have a liquid market in which it can be sold as needed without a discount--a characteristic common to most short-term, risk-free debts of developed countries.

But perhaps the main shortcomings of the model are the assumptions of the constant probability of a financial shock and a constant spread. To the extent that reserves help prevent a crisis, and that the sovereign risk premium precisely reflects the probability of such a crisis, an increase in the reserve stock should have a benign effect on the spread.

The premise of the constant probability of a sudden stop also overlooks the fact that, even if the originating shock (e.g., increases in global risk aversion or international interest rates, a re-pricing of the risk of the asset class after an unexpected event, or financial contagion attributable to proxy hedging) is truly exogenous, the likelihood that it leads to a sudden stop (alternatively, the size of the capital outflow that follows) is not independent of the presence of the liquidity buffer. In other words, the shock may be endogenous but the exposure that determines the final outcome is not.

These two effects combined would indicate that the purchase of reserves has a marginally negative effect on the spreads paid on the full stock of sovereign debt, adding to the marginal benefits of reserve accumulation. For small reserve-to-debt ratios, this effect may reduce the cost of reserves considerably. Levy-Yeyati (forthcoming) presents a quick computation: modeling emerging market spreads as a function of the stocks of reserves and sovereign external debt with the private sector, he finds a large spread elasticity with respect to the stock of reserves that exceeds that of the stock of debt. A debt-financed increase in reserves should [thus] contribute to lower spreads. The impact is even stronger if the indirect effect of improved credit ratings is taken into account.

Two conclusions can be drawn from these exercises: First, the cost of self-insurance is higher for countries that need it the most (i.e., those with a large crises propensity and high sovereign spreads). Second, the financial savings owing to better ratings and lower spreads may outweigh the financial cost of carry, even ignoring the benefits associated with a lower incidence of sudden stops. Indeed, at moderate reserve-to-debt ratios, the cost of self-insurance may be widely overestimated.

Market insurance

In the preceding discussion of liquidity, we argued that if liquidity runs are self-fulfilling, rather than triggered by bad fundamentals, an external insurer with big pockets should be able to offer full liquidity insurance at a very low cost.[20] This begs the question of why

[20] This point is raised by Cordella and Levy-Yeyati (2005) to argue that international financial institutions should provide a non-contingent country insurance facility to cope with non-fundamental, self-fulfilling

countries do not resort to market-liquidity insurance more often, particularly given the risk of [?] large and rare financial shocks.

The most obvious answer lies in the fact that liquidity runs are often partly bred by endogenous causes (ranging from political crises to misguided policies), and that the insurable event (e.g., a sudden stop) and the associated losses (e.g., the country's financing gap) are difficult to specify unambiguously. This introduces moral hazard concerns and raises the insurance premium accordingly.

A number of other, more specific factors also conspire against a market solution to the problem of liquidity insurance. This is clearly illustrated by the few real-life examples of market-liquidity insurance, which took the form of a contingent repurchase contracts with international banks. Similar contracts were signed by the Argentinean central bank and a consortium of foreign banks in the late 1990s. Under these contracts, the central bank was allowed to withdraw funds in the event of a crisis from a three-month, renewable credit line collateralized by dollar-denominated government bonds. While the insurance cost was seen as moderate relative to holding reserves, the contract suffered from major drawbacks.

First, the fact that the same large international players are likely to be both insurers and investors creates a potential agency problem. It is hard to prevent insuring banks from hedging by selling the same government bonds used as collateral in the run-up to the crisis, which accelerates the collapse of bond prices.[21] Second, the diversification margin is relatively limited in light of the high correlation of credit risk within the emerging market class. This limits the potential size of credible coverage and increases its costs. This limitation could be seen, alternatively, as an insurer's commitment problem whereby insurers—tempted by juicy commissions to take on more risks than they can reasonably handle—fail to deliver once the credit line is called.[22]

These factors help explain why the coverage under the Argentinean contract was relatively limited. They also explain why execution was delayed until August 2001, when the liquidity run was well under way, in the context of an agreement with the International Monetary Fund (IMF) that drove up, albeit momentarily, the price of bonds.[23] In turn, Mexico's failed experience with this type of contract illustrates the insurer commitment problem (Box 2.2).

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liquidity runs. If all risk were non-fundamental, however, a sufficiently large stock of reserves would also eliminate the sovereign risk premium, reducing the cost of carrying reserves.

[21] See Broda and Levy-Yeyati (2003). The margin call also adds to this negative feedback. Although the insuring banks know that by hedging they increase the probability of activating the repo, they face a coordination problem as the negative impact of their actions is diluted in the aggregate, while the benefits from hedging accrue entirely to individual banks. Thus, the argument implicitly assumes that no individual bank will be willing or able to insure the country single-handedly.

[22] The case is similar to the introduction of a lender's commitment problem in reputation models of sovereign debt, which severely limit the possibilities of cash-in-advance insurance policies (Kletzer and Wright 2000).

[23] The contract ultimately provided just $1.77 billion (out of $4.75 billion available at the beginning of 2001). Moreover, owing to the ongoing liquidity run, the decline in the price of the bonds used as collateral

Box 2.2 Two experiences with private liquidity insurance: Argentina and Mexico[24]

Argentina

The Argentinean swap contract stipulated an annual commitment fee of 32 basis points (bps), plus an interest rate on withdrawn funds equal to the London interbank offered rate (LIBOR) plus 205 bps. The insurance cost was less than that of holding reserves: the average government bond yield in 1998 was about 900 bps--using the spread over the average return on reserves reported by the central bank for the same year. As a crude proxy for the average cost of carry of international reserves, we obtain a "fee" cost of about 570 bps (which, for the stock committed under the contract, would have entailed a flow cost of roughly $380 million a year); this cost is well above the commitment fee of the swap arrangement.

Under this contract, the central bank was allowed to withdraw, in the event of a crisis, from a credit line in exchange for dollar-denominated government bonds. The maturity of the contract was three years, with an "ever-greening" clause that, every three months, extended the life of the program by an additional three months. (The high frequency of this revision clause, while it helped reduce the commitment fee, ultimately proved to be a severe drawback.) Argentinean dollar-denominated bonds were taken at 80 percent of their market value. (If the price of the bonds fell by more than 5 percent, additional bonds had to be delivered as margin.)

The coverage of this contract was relatively limited; its execution was delayed until August 2001, when the liquidity run was well under way And it was executed only in connection with an agreement with the IMF that raised the price of the bonds, albeit momentarily. All in all, the contract ultimately provided just $1.77 billion (out of $4.75 billion available at the beginning of 2001). Moreover, because of the ongoing liquidity run, the decline in the price of the bonds used as collateral implied a reduction in the size of the line, whose value fell to $1.35 billion at the first three-month renewal. This generated a financing gap for the difference—exactly the opposite effect as the one motivating the contract in the first place.[25]

Mexico

In November 1997, the Mexican government subscribed to a contingent credit line with a consortium of 31 private international banks. This was intended as a preventive measure against possible contagion effects from the Asian crises and aimed at ensuring the funds

implied a reduction in the size of the line, which dropped to $1.35 billion at the first three-month renewal (generating a financing gap for the difference).

[24] This box is based on Ize, Kiguel, and Levy-Yeyati (2005).

[25] Among the reasons preventing the issuance of additional collateral at the time, we can note budgetary constraints on debt issuance and legal restrictions (curiously enough, the covenants of the contract specifically detailed the bonds that could be used as collateral, and many of these issues could not be reopened at the time). At any rate, issuing bonds in private markets was not a sensible option amid a run. A more reasonable alternative would have been to describe the bond type (rather than the bond issue), or to issue additional eligible bonds to be stored and used by the central bank solely in connection with the swap.

needed to meet Mexico's external debt service in the event of a closure of international capital markets. The facility provided the government with $2.5 billion (later extended to $2.66 billion with the addition of two new institutions) for up to 18 months, at a rate equal to 3-month LIBOR plus 50 bps during the first semester (rising by 25 bps each subsequent semester), with an annual commitment fee of 30 bps (or approximately $7.6 million).

The line was withdrawn by the Mexican authorities in its entirety on September 30, 1998, based on a worsening of financial access and a decline in oil prices that reduced fiscal revenues. Insuring banks contested the decision of the government to use these resources, however, on the grounds that the prevailing external conditions did not warrant the execution of the contract. Although they finally agreed to comply with the contract, they subsequently refused to renew it. Among the factors underlying this controversy were the difficulty in unambiguously defining the event that triggers the contingency clause and the insurer's reluctance to assume the costs of the contract. Some even argue that the contract was already "in the money" when launched and that banks expected the government not to call it because of reputation concerns. At any rate, the arrangements failed as a viable liquidity insurance scheme.

Source: Author's elaboration

Although an external insurer would be in a better position to diversify the required liquidity stock than the local government, it would still be subject to costly dollar liquidity requirements. After all, the insurer would be exposed to the same runs as the local government: a bank that retains a significant portion of the insured country's liquidity risk without a concomitant stock of liquid assets would be penalized by lower ratings and a higher cost of capital. This means that either the cost of carrying liquidity or the higher borrowing costs would ultimately be reflected in the insurance premium. The relatively low cost of the two episodes reviewed above reflects their limited size and their last-resort nature. Full insurance of a medium-sized emerging economy, even dispelling moral hazard concerns, would be far more costly. Indeed, only the issuers of the foreign currencies of reference are able to offer the optimal solution, either through contingent liquidity lines or through a specialized multilateral agency.

IFIs and the role of an international lender of last resort

Two of the main drawbacks of private insurance--the hedging and the commitment just discussed--can be overcome by contracting insurance from regional financial arrangements (e.g., the Asian Chiang Mai initiative, CMI, or the Latin American Reserves Fund), multilateral financial institutions (such as the IMF), or by having access to an international lender of last resort (ILLR) that plays in the international arena the same role a central bank plays in the domestic banking sector. In the event of a dollar shortage, an ILLR should be able to provide temporary liquidity assistance at a premium over normal (i.e., pre-crisis) interest rates.[26]

[26] The traditional Bagehot view dictates that funds should be made available with certainty, at a penalty rate (relative to normal levels) to illiquid (but solvent) banks (see Goodhart 1995).

It bears noting, however, that liquidity assistance, as typified by standing central bank facilities, seeks to minimize ambiguity in the terms and conditions of access. While no net transfer is involved, by placing a ceiling on rollover costs the ILLR offers what essentially amounts to interest rate insurance (equal to the difference between the rate charged by the central bank and the market rate). Liquidity assistance, however, is typically collateralized by a well-defined list of eligible assets, which is hard to reproduce in the international arena when the recipients of assistance are countries. Perhaps for this reason, attempts to engineer schemes that replicate an ILLR have been few and unsuccessful.[27]

Should an ILLR exist, the natural candidate would be the IMF. But existing IMF facilities are based on the premise that crises are symptoms of weak fundamentals. For this reason, they are designed to foster corrective actions by attaching *ex post* conditionality. Thus, the availability of funds is unpredictable and backloaded—at odds with the nature of a lender of last resort. This caveat also applied to the IMF's contingent credit line (CCL) initiative— the closest to a liquidity insurance scheme ever launched by an IFI. The CCL required a complex prequalification process at the countries' request, which, combined with the line's limited size, reduced its potential attractiveness. As a result, the facility was never used and was ultimately eliminated.[28]

In sum, a review of the feasible options explains why, in the absence of international insurers or feasible market options, reserve hoarding has become the liquidity insurance strategy of choice. More recently, the absence of an ILLR has prompted a revamping of regional financial institutions (e.g., the CMI, in East Asia) or the creation of new ones (e.g., the South American Banco del Sur).[29] While these regional financial agreements are often hampered by their limited size and, in LAC, by the lack of a large country with reliable access to dollar liquidity willing to enter the agreement, regional insurance in LAC seems promising. For example, Fondo Latinoamericano de Reservas (FLAR) has been able to fund small-scale liquidity loans in international markets at interest rates below those of the participating countries (Figure 2.3). The same is true for the Andean Financial Corporation (CAF), a regional development bank.[30] This suggests that regionalization may enhance individual members' creditworthiness and access to finance.

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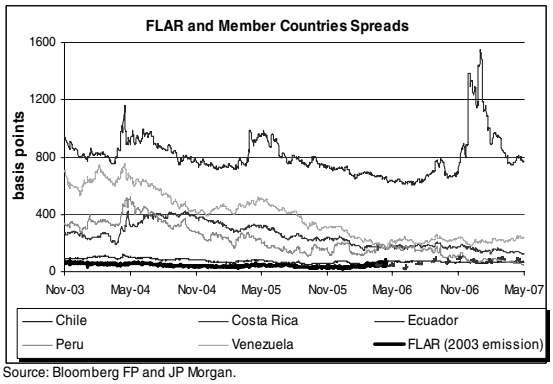
[27] See Ize and others (2006).

[28] The need for prequalification only highlighted a well-known problem (associated with asymmetric information) that often leads banks to postpone resorting to central bank assistance. Moreover, whereas troubled banks have an incentive to pay the cost of a weakened reputation exchange for immediate assistance, the incentives are much weaker in economies that are years away from the next crisis. For a discussion of conditionality in the context of liquidity crises, see Jeanne and Zettelmeyer (2002), Cordella and Levy-Yeyati (2006), and Ostry and Zettelmeyer (2005).

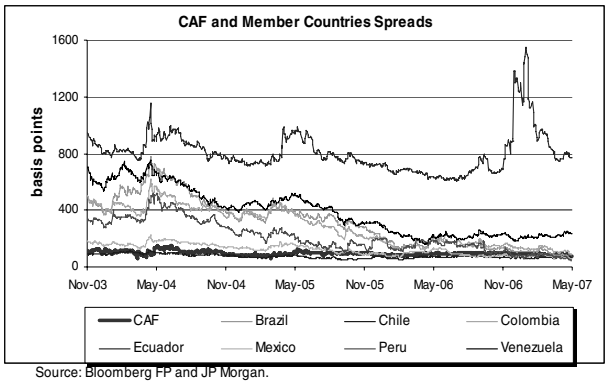
[29] Launched in May 2000 by the 10 members of the Association of Southeast Asian Nations (ASEAN) plus China, Japan, and Korea, the Chiang Mai Initiative (CMI) involves bilateral (one- or two-way) currency swap arrangements totaling near an estimated $30 billion. While currency swaps between ASEAN countries date back to 1977, they were rarely used because of their small volumes. The CMI represented a substantial increase in the amounts involved.

[30] Unlike Fondo Latinoamericano de Reservas (FLAR), the Andean Financial Corporation (CAF) may benefit from a broader membership that includes investment-rate countries such as Chile and Mexico, as well as an industrial economy such as Spain.

Figure 2.3 FLAR, CAF and member countries' spreads



Source: Bloomberg FP and JP Morgan.



Source: Bloomberg FP and JP Morgan.

Real shocks

While liquidity risk (specifically, the risk of self-fulfilling liquidity runs) is intimately related to the presence of mismatches in the terms of a country's assets and liabilities, external real shocks are inherent to any open economy. In theory, temporary real shocks can be smoothed out in international capital markets. In practice, they require alternative solutions. We begin the discussion of real shocks with the extreme case of natural disasters, which combine both liquidity and solvency issues, before moving on to other real shocks in general.

Natural Disasters

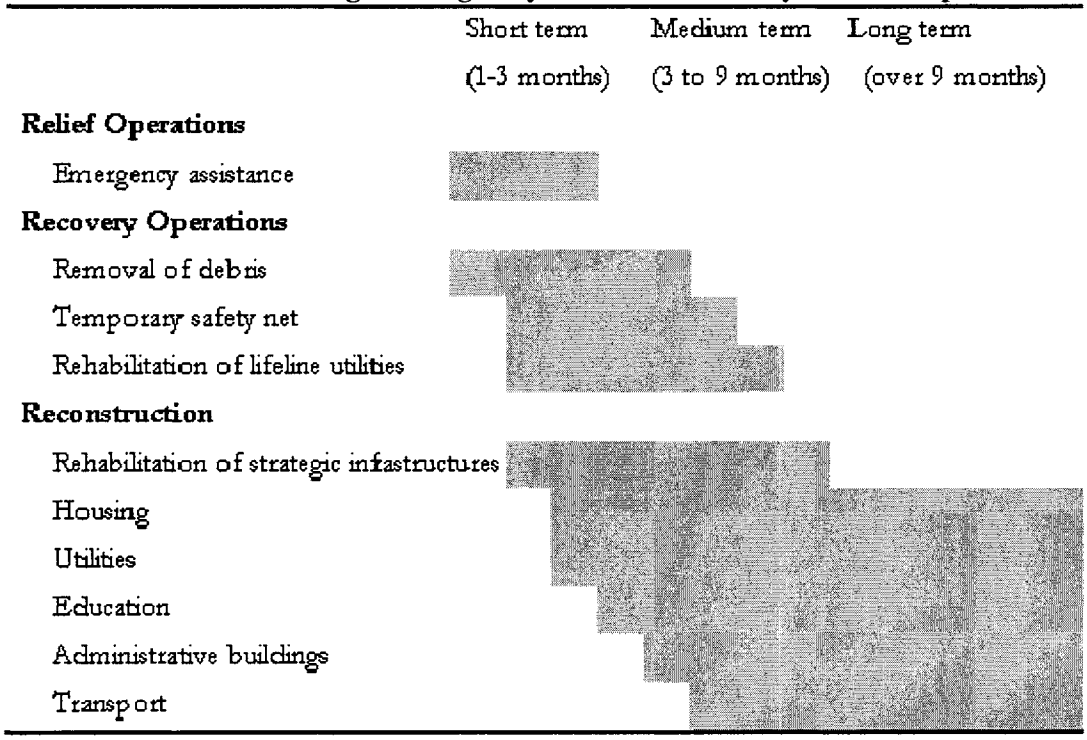
Natural disasters provide a good illustration of the complexities of insurance against liquidity shortages and real income shocks. Schematically, the budgetary implications of a natural disaster are reflected into the financing needs faced by a government during the three main phases of post disaster recovery operations: relief, early recovery, and reconstruction.

Relief operations, such as emergency assistance provided to the affected population to ensure basic needs (shelter, food, medical attention) need to be financed in a matter of hours after a disaster strikes. Early recovery operations following the initial relief efforts include the emergency restoration of lifeline infrastructure (water, electricity, key transportation lines), the removal of debris, and the financing of basic safety nets, and are crucial for limiting secondary losses and ensuring that reconstruction can begin at the earliest. Finally, reconstruction operations generally center on rehabilitating replacing assets damaged by a disaster, such as public buildings and infrastructure.

Table 2.2 illustrates the different timing of financing needs resulting from relief, recovery, and reconstruction operations, while Table 2.3 classifies risk-financing instruments based on the availability of funds in the short, medium, and long term

following a catastrophe.[31] Whereas *ex post* disaster fund sources tend to be generally cheaper than *ex ante* instruments, resources available through the former are generally constrained in the immediate aftermath of a disaster. This is particularly true when limited fiscal space circumscribes a country's capacity to rely on *ex post* borrowing or tax increases.

Table 2.2 Estimated timing of budgetary outflow caused by a catastrophic event



Source: Ghesquiere and Mahul 2007

Thus, in the case of natural disasters, the role of insurance is not only to compensate for lost income (its traditional income-smoothing objective) but also to mitigate the potential liquidity gap resulting from the mismatch between resource needs and availability–a role associated with liquidity insurance. Figure 2.4 illustrates this gap in a dynamic framework: over time, more post-disaster resources become available and allow the government to address its financial needs. In this example, the government faces a (short-term) liquidity gap but not a (long-term) resource gap.

A resource gap tends to indicate a shortfall in the resources needed to address disaster losses in the long run. This is often the case for countries with a high debt-to-GDP ratio because such countries would not be able to access external credit to the full extent of their needs in the event of disaster. These countries have literally lost the possibility of spreading risk over time. The analysis conducted by the Inter-American Development

[31] The timing of fund availability is based on the experience of recent operations (e.g., in Colombia, Mexico, Mongolia, and Turkey) and can vary depending on a country's economic and financial characteristics.

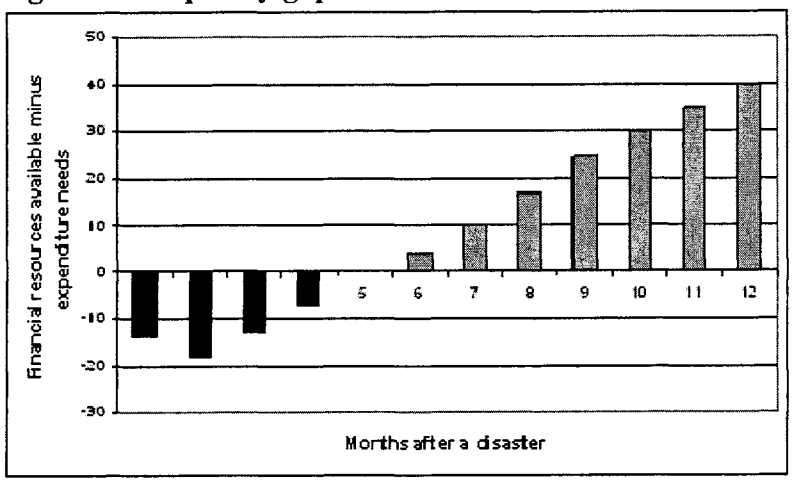
Bank (2005) shows that a number of countries in LAC face significant resource gaps. This momentum has been changing in the last two-three years as several LAC countries have been reducing their debt-to-GDP ratio and improving their public debt management. These welcome developments may have reduced the resource gap.

Table 2.3 Availability of financial instruments over the short, medium, and long term

	Short term (1-3 months)	Medium term (3 to 9 months)	Long term (over 9 months)
Ex post financing			
Budget contingencies			
Donor assistance (relief)			
Budget reallocation			
Domestic credit			
External credit			
Donor assistance (reconstr.)			
Tax increase			
Ex ante financing			
Reserve fund			
Contingent debt			
Parametric insurance			
Traditional insurance			

Source: Ghesquiere and Mahul 2007

Figure 2.4 Liquidity gap



Source: Author's elaboration based on data from IMF, *International Financial Statistics*

How have countries traditionally coped with natural disasters? We can classify catastrophic-risk-management instruments under two broad categories: risk retention (similar to self-insurance) and risk transfer (similar to traditional insurance). Risk-retention instruments include financial reserves, contingent debt agreements, post disaster tax increases, the reallocation of funds from other budget items, access to domestic and international credit, and borrowing from multilateral finance institutions. Risk-transfer

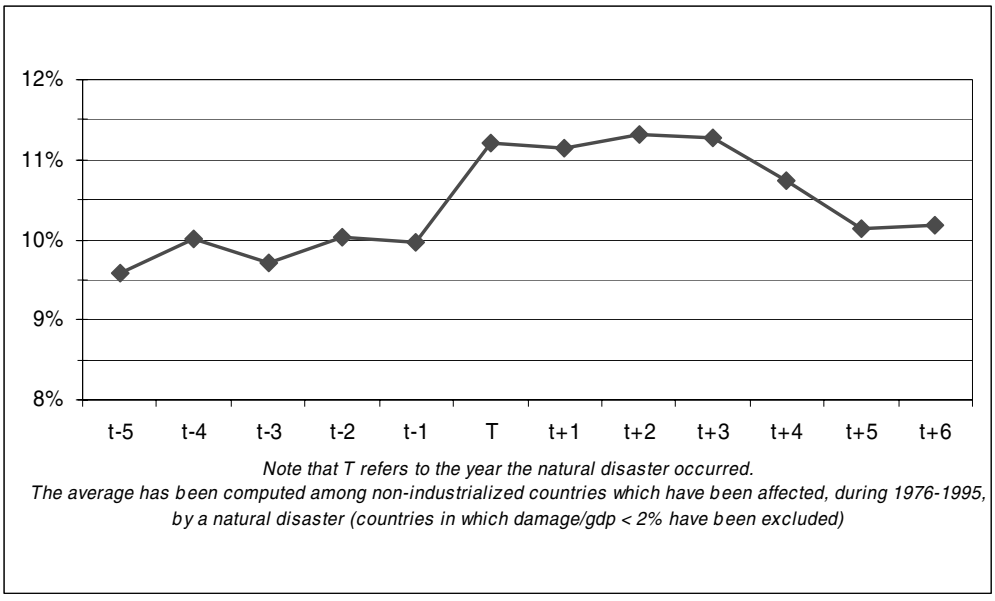
instruments include catastrophe risk insurance and reinsurance pools, and catastrophe bonds.

In larger developed countries, losses from natural disasters are typically funded through a combination of private risk-financing arrangements and an efficient public revenue system relying on wide and deep taxation catchments. Governments pay for reconstruction using different domestic sources, such as reorienting the national budget, raising taxes, creating new domestic credit, and accumulating financial reserves (Caballero 2003).

In the case of developing countries, which have relatively low tax ratios and ongoing fiscal pressures, these risk-retention strategies may entail significant costs, as raising new domestic debt in procyclical capital markets in the aftermath of a shock may significantly affect the country's debt service. In these cases, raising taxes may provide limited additional resources and discourage new private investments that are key to restarting the economy.

Moreover, while developing countries do have access to donor assistance in the aftermath of a shock (Figure 2.5), such assistance has been highly dependent on the visibility of a given event in the international press. This makes it a fairly unreliable instrument for risk management. In summary, it is easy to make a case for developing countries to rely more on risk-transfer instruments. In Chapter 3, we discuss some of the possible options, including such innovative instruments as catastrophe bonds or the creation of risk pooling through special- purpose vehicles

Figure 2.5 Aid over GDP (average per year)



Source: Author's elaboration based on data from World Bank,WDI, and IMF, *World Economic Outlook*

Real economic shocks

Most agree that adverse real shocks have large welfare effects. For example, persistent terms-of-trade deterioration would permanently reduce the expected income flow of the country and force it to cut consumption. Access to standard forms of finance can smooth the effect of the shock over time but cannot eliminate it. In contrast, insurance schemes that offer a net positive income transfer to the country in bad states (at the cost of a net payment in good states) can effectively mitigate the consumption volatility associated with exogenous systemic shocks. Insurance schemes, in turn, can be emulated by state-contingent financial contracts—those with net cash flows correlated with the macroeconomic context. Indexation provides a natural proxy for those contracts.

The debate about real insurance could be more generally framed along two dimensions: the gross and net position of the country, and the trade-off between liquidity and basis risk (e.g., between customized growth-indexed coupons and more standard, and liquid, commodity derivatives).

Assets, liabilities, and the relevance of the gross position

The precautionary approach to sovereign asset and liability management (i.e., the approach aimed at minimizing the impact of income shocks) has tended to be partial and to treat potential solutions in isolation. Among the preferred options, the one that has received most attention is the indexation of liabilities to GDP.

The argument in favor of a consolidated asset management can be further extended to include non-financial assets and contingent liabilities. To the extent that real insurance has to do with solvency considerations (i.e., the country's ability to pay a reasonable cost), its influence on debt sustainability could be assessed by looking at the global portfolio of the consolidated public sector, much in the same way as in a standard value-at-risk analysis (Levy-Yeyati and Sturzenegger 2006).

This approach is not restricted to debt sustainability issues: it can be applied to any assessment of the impact of a systemic shock on fiscal income. In particular, in non-default states when market access is not interrupted, financial markets can help smooth the effect of the shock on the fiscal account over time but cannot eliminate it.

While the boundaries of the sovereign portfolio (what is included or not, and how it is valued) are not always obvious, any attempt to attenuate the consequences of external shocks on the fiscal accounts through insurance instruments must evaluate, in an integrated way, the characteristics of the sovereign assets and liabilities.

Does this imply that the net-asset position is the only relevant aspect? Is the underlying asset-liability composition neutral in terms of the aggregate exposure to real shocks? Not necessarily. First, there is default, by which a country can temporarily drive the gross liability position to zero in the event of a negative shock. It follows that, for a given initial

net position, the larger the asset position, the larger the "gains" from default.[32] The view that defaults make debt a de facto state contingent has been noted in the sovereign debt literature, although the empirical evidence on its effect on flows is not conclusive.[33]

In terms of incentives, the notion that a country would deliberately issue debt to purchase assets at a cost in order to be able to default and earn [?] the difference in bad times sounds rather far-fetched, particularly because the evidence shows that countries tend to go a long way to prevent defaults, exhausting foreign assets in the process.[34]

From the analysis earlier on in this chapter, we know that assets play an important role as a liquidity buffer to cushion temporary closures of international capital markets for dollar debtor countries. It follows that, for most of these countries, decisions about debt structure and reserve management cannot be taken in isolation. On the contrary, the optimal structure of assets and liabilities should reconcile both liquidity and real insurance motives.

The quest for efficiency: Liquidity risk versus basis risk

A technical aspect that figures prominently in the policy discussion of country insurance against real shocks, if not in the theoretical debate, is the choice between perfect but illiquid instruments and imperfect but more liquid ones. Paraphrasing the traditional trade-off in standard insurance contracts, insurance-type financial instruments face a trade-off between liquidity and basis risk.

Hedging instruments are generally similar in structure to the asset being hedged, but they are still different enough to lead to significant cash flow mismatches. In our context, for example, in the attempt to hedge against a decline in fiscal revenues attributable to an economic downturn using a commodity-indexed asset, there is a risk that commodity prices and fiscal revenues may not mirror each other. On the other hand, a perfect hedge would need, by definition, to be customized to the point that little or no secondary trading appears.

A current example is provided by the academically popular GDP-indexed debt, which can be seen as a variety of a broader "hedging" approach to real shocks. This broader approach is founded on Barro's tax-smoothing argument (1995); it is also related to the early literature on indexed-interest-rate debt (Bailey 1983 and Lessard and Williamson 1985) spurred by the debt crises in the 1980s. Such literature was, predictably, revived by the financial crises in the late 1990s (Athanasoulis, Shiller, and Wincoop 1999,

[32] Denote the country's assets and liabilities by A and L. Consider 2 cases: A_1=100, L_1=100; A_2=200, L_2=200. The initial net asset position (zero in both cases) turns to 100 in the first case and 200 in the second if the country defaults.

[33] Net outflows tend to increase contemporaneously with default (Levy-Yeyati 2006), but this is likely to reflect the capital flight that led to default in the first place, of booming capital inflows in the preceding years .

[34] See Levy-Yeyati and Panizza (2006).

Borensztein and Mauro 2004, Drèze 2000, Obstfeld and Peri 1998, Chamón and Mauro 2006).

The first wave of literature focused on the potential moral hazard (the adverse incentives associated with growth-indexed coupons, particularly in heavily indebted economies) of GDP indexation and the relative advantages of the more exogenous commodity prices indexes (Krugman 1988). But recent work has centered on the preventing financial crises originating in sudden capital account reversals—the argument being that sudden stops are fostered (and, in some cases, originated) by economic downturns that increase the debt burden (see Appendix for a survey).

GDP-indexed debt, while possibly a better alternative in terms of smoothing the fiscal effect of real shocks, has been infrequently used (if at all) because of its high transaction costs. Indeed, although growth-indexed bonds are feasible in practice, real-life examples include GDP-based value recovery rights in relatively small restructurings in Bosnia, Bulgaria, and Costa Rica. Indeed, value recovery rights linked to commodity prices were more common in the context of the Brady deals (Chamón and Mauro 2006). In contrast, most countries have focused on local-currency-denominated debt or even CPI-indexed debt instead, even though their cash flows are less perfectly correlated with fiscal revenues.

A taxonomy of instruments

We can illustrate this trade-off with a succinct taxonomy of existing, or currently feasible, financial instruments. As noted, the debate so far has centered on the relative advantages of alternative debt structures. The standard fixed-and floating- rate, foreign-currency debt has in recent years been supplemented by GDP-indexed debt and domestic CPI-indexed debt.

Terminology, however, is not always transparent. The popular Argentinean GDP-indexed debt—the only real-life example of a traded GDP-indexed security—is a rare animal. On the one hand, it is imperfectly indexed to GDP; a fixed-rate coupon is enhanced with a warrant that distributes a percentage of the local-currency GDP in excess of a threshold.[35] More critically, strictly speaking, it is a GDP-indexed interest rate debt, as it indexes the coupon but not the principal. In other words, it hedges the flow during the life of the bond but leaves the country exposed to changes in the real value of the principal.

In contrast, the literature has tended to highlight the benefits of a debt with its principal indexed to GDP, as is implicitly assumed in real models with short-term debt. This instrument is a natural choice for hedging against real shocks. Assuming that fiscal revenues are highly correlated with nominal GDP, a plain-vanilla, GDP-indexed bond would stabilize the ratio of future debt payments over fiscal resources. [36]

[35] Payments are computed as a fraction of the gap relative to a virtual GDP path, subject to a minimum current growth rate, and a cap on cumulative payments equal to 48 percent of the principal.
[36] See for example, Borenzstein and Mauro (2002) and Sandleris and Taddei (2007).

In addition, most of these real models, by construction, do not specify the bearer of the currency risk. In fact, in the Argentinean case, the dollar coupon is effectively indexed to nominal GDP, as the warrant distributes the excess local-currency GDP (converted into dollars for dollar bondholders). As such, the detached warrant is equivalent to a GDP deflator—indexed security plus a real GDP option. Interestingly, given that real-exchange-rate variability will in most cases dwarf real GDP risk, the warrant could be seen as an enhanced CPI-indexed securityin that it provides a hedge against both GDP and currency risk; this may explain why the bond received a hefty discount at issuance.

In this light, how does GDP indexation compare with its natural alternative: the CPI-indexed debt? Does the price paid on the real GDP adjustment justify the additional hedging benefits? Moreover, GDP indexation could be achieved separately, for example, as a combination of CPI indexation and a real GDP warrant. Is it more efficient to package both risks together or separately?

A second question relates to the distinction between real and financial (liquidity) risks. While a GDP-sensitive debt structure may mitigate the real effects of a dollar liquidity run by reducing the payments as dollar output declines, it does not prevent the output contraction. Thus, these instruments insure against the second-order, not the first-order, effect of a financial shock. To the extent that liquidity runs are self-fulfilling, indexed debt may deter speculators from running in the first place. In particular, CPI- or nominal-GDP-indexed debt help eliminate the currency mismatch underlying self-fulfilling runs. In contrast, dollar-denominated debt indexed to real GDP does little to protect against dollar liquidity shortages.

On the asset side, unlike in financial markets, where VIX[37] and commodity options are commonly used as hedges, there is nearly no real-life example of their use for country insurance purposes (Caballero and Panageas 2003), despite their apparent advantages. Countries have preferred to adopt simpler, albeit less efficient, safeguards by accumulating liquid high-grade assets. One can attribute this lack of interest to unsophisticated debt managers or, more often, to unsophisticated politicians who would cast doubt on instruments that, as any insurance contract, may entail frequent payments in exchange for no visible gain. But, judging by the Argentinean experience with GDP-indexed securities, the costs associated with limited liquidity may be a more pressing issue.[38]

Insurance and incentives

What are the incentive effects of increasing insurance coverage? Would it create a moral hazard or would it yield sounder policies?

The recent literature on liquidity runs underscores the potential contribution that liquidity insurance can make to strengthen the government's reform incentives. This contrasts with

[37] The ticker symbol for the Chicago Board Options Exchange Volatility Index.

[38] An alternative hypothesis, namely, that sophisticated financial instruments are potentially more costly from a political standpoint, is discussed in Chapter 3.

the traditional moral hazard view that insurance and international safety would undermine the adoption of sound policies aimed at preventing crises.

Cordella and Levy-Yeyati (2005) argue that insurance protection against adverse macroeconomic events, even if it does not alter the probability of facing a financial shock, lowers the probability that the shock results in a terminal crisis that erodes political support for the government. This implies that liquidity insurance increases the value of sustaining current policy choices: it enhances the survival probability of the government, reducing its discount rate and lengthening its horizon. Critical to the argument is the use of an exogenous shock to condition the insurance contract: a blanket guarantee would only create a moral hazard.[39]

Corsetti and others (2004) present a related argument. They develop a model in which international liquidity, by reducing liquidation costs in the event of a run, creates the incentives for a government to implement costly reforms. Again, underlying their thesis is the presence of self-fulfilling (hence, exogenous) liquidity runs. In turn, Morris and Shin (2006) show that if currency crises are triggered by a coordination failure among creditors, international bailouts that induce the rollover decision of private creditors (i.e., that lower the probability of a run) may enhance a government's incentive to adopt preventive measures.

This literature recognizes two channels through which liquidity insurance could help reduce the incidence of financial shocks: a catalytic effect that "crowds in" private finance and preempts self-fulfilling runs (similar to a deposit insurance scheme in the original bank-run model), and a safety-net effect that substitutes for private capital, which reduces the need for a costly fiscal adjustment (and the probability of a debt default). In both cases, by lowering the exogenous probability of a loss, the link between policymakers' decisions and the final outcome (and the incentives for policies oriented to that outcome) is strengthened. Under liquidity insurance, both effects (on exposure and propensity to financial shocks) are likely to be combined.

The catalytic role of insurance

The economic literature often assumes that a country's ability to borrow depends (among other things) on its per-capita-income level. Indeed, developed countries (e.g., Belgium, Italy, and Japan) can have indebtedness levels well above 100 percent of GDP and still issue virtually risk-free debt. Emerging markets, on the other hand, face more restricted access and are credit constrained if they need to tap capital markets to compensate for fiscal imbalances in the event of an negative external shock.

The reasons underlying these shortcomings have been studied extensively in the sovereign debt literature. One of the main tenets of this literature, and one more in line with the empirical evidence on sovereign defaults in developing countries, is that borrowing constraints simply reflect the country's ability to pay. Either because the

[39] The model builds on a similar argument in the context of lender-of-last-resort assistance in the banking sector discussed in Cordella and Levy-Yeyati (2003). Borenzstein and others (2006) present evidence on the political cost of debt crises.

output cost of a debt default is smaller in bad times (after the crisis itself has taken its toll), or because political restrictions make fiscal adjustment prohibitively expensive, the probability of default rises with the probability of suffering substantive adverse shocks. Accordingly, countries subject to larger negative shocks are likely to face higher borrowing costs and tighter financial constraints.

It follows that any scheme that reduces the income effect of the shock would enhance access to finance and reduce its costs, in two distinct ways: By reducing the size of the needed fiscal adjustment, it tilts the cost-benefit balance in favor of the repayment option. And by contributing to national income, insurance increases investment and reduces the output contraction in bad times, again, raising the cost of default (Cordella and Levy-Yeyati 2007).[40]

Can insurance schemes be replaced by financial access, possibly through a multilateral lending facility that insulates developing countries from procyclical swings in private market access? If the gains from insurance are associated with enhancing access, why can't a multilateral state-contingent facility that guarantees access in bad times do the trick? Why doesn't the implicit international safety net (IMF-led bailouts of financial crises and development banks' concessional loans in the event of massive real shocks) relax the borrowing constraints of middle- and low-income countries?

The answer has to do with a key distinction between insurance and lending in terms of *ex-post* wealth. While full insurance fully compensates for the income losses stemming from the shock--making the income flow independent of external shocks-- lending only distributes their consequences over time. Indeed, it is easy to show that, because a state-contingent multilateral lending facility would only dilute the claims of past lenders in bad states, it should have no benign effect on *ex-ante* borrowing costs beyond that associated with any subsidy component embedded in the facility's interest rate. This is because the two options differ in one crucial aspect: the loan has to be paid back after a bad shock, while the cost of insurance is transferred to good states.

Box 2.3 Catalytic insurance

To illustrate the catalytic role of insurance, Cordella and Levy-Yeyati (2007) propose a model in which a country is exposed to catastrophic shocks that destroy a fraction of its productive capacity, and where default costs are proportional to national income (i.e., a country defaults after a sharp drop in income). This is reflected in the borrowing constraint: the larger the shock relative to the GDP, the tighter the constraint. In this setting, insurance, by offsetting the income effect of the shock, reduces the incidence of default for any given distribution of shocks; this, in turn, relaxes the borrowing constraint and increases expected income. The reasons are not dissimilar to those of Erlich and Becker (1972): for large but rare shocks, the country pays a small insurance premium to dispel default fears and benefits from lower *ex ante* borrowing costs.

[40] This catalytic effect adds trivially to the income-smoothing benefits for which insurance is typically chosen.

Insurance money also mitigates the output drop attributable to the shock. In the particular case of catastrophic events, infrastructure rebuilt with insurance funds is put to work to expand output, the implicit collateral of international lenders, which "crowds in" private capital. Not surprisingly, the catalytic effect of catastrophe insurance benefits most the medium-income countries facing tight financial constraints (and, as a result, important output losses) after a shock–but not very poor countries without access to capital markets.

Source: Author's elaboration

Country insurance: A road map

External vulnerability has historically played a critical role in the fate of the developing world. Its financial manifestations have been a topical theme since the start of the dollar liquidity crises of the late 1990s, resulting in numerous discussions and proposals. The economic discussion of this issue has tended to present as distinct alternatives specific examples of the broader financial and real insurance categories-- with the goal of ensuring the availability of foreign-currency liquidity for dollar-indebted economies, or of cushioning the impact of sharp fluctuations of terms of trade on real activity and the fiscal accounts in small open economies with limited resort to financial markets. Because of this, the debate has often appeared more complex and variegated than it actually is.

In this chapter, we have tried to clarify the relevant distinctions (e.g., between different sources of risk) and, above all, to stress the similarities of alternative proposals. In this way, we intended to simplify the analysis of what is ultimately a standard asset-liability management strategy.

The analysis helps explain why reserve accumulation can be regarded as a suboptimal but nonetheless logical choice for economies recently threatened or hit by financial crises--in the absence of an ILLR and in light of the limitations of market-liquidity insurance. The same argument, inverted, explains the surge of regional-liquidity arrangements, a second-best alternative to the often proposed but hard to realize standing liquidity facility funded by multilateral financial institutions.

Similarly, the discussion showed how the many varieties of indexed assets and liabilities put forward in the financial crisis debate could be grouped within a single class of hedging instruments, which is more properly framed as insurance against real shocks. Indeed, a cursory assessment of recent developments in LAC suggests that, as a result of the considerable efforts made to reduce financial vulnerabilities, real exposures are likely to be the main external source of macroeconomic volatility.

Moreover, deliberately abstracting from moral hazard issues more pertinent to endogenous sources of risk, we highlighted the benign effect of country insurance (against both financial and real shocks) on the insured country's cost of capital, to the extent that it reduces the incidence of extreme output events and thus the frequency of credit events attributable to the inability to pay.

Finally, the chapter highlighted a practical trade-off usually downplayed by the academic literature: the dilemma between adopting exotic customized strategies tailor-made to neutralize risk (e.g., GDP-indexed debt), at the cost of a hefty liquidity premium; and settling for standard instruments only partly correlated with the underlying risk (e.g., CPI-indexed or local-currency debt) but readily available from the markets at a reasonable price. Based on the available anecdotal evidence, which indicates that borrowers tend to prefer the latter, and the costly Argentinean experiment with GDP indexation, one could tentatively conclude that novel instruments may be sub-optimally costly, particularly for small economies with narrow financial market.

After having broadened the country-insurance discussion to real exposures, and having reduced the analysis to a few relevant aspects, we are ready to discuss the policy dimension and the application of these concepts to real-life country risk management.

3. The Policy Dimension: Diagnosis and Prognosis

Country insurance schemes remain quite underdeveloped apart from hoarding precautionary reserves (by far the protection mechanism most used by developing countries); a few incipient and still untested regional contingent arrangements, such as the Chiang Mai Initiative (CMI) and the Latin American Reserve Fund (FLAR); and a limited instance of GDP indexation (Argentina's growth-indexed debt warrant). Why is this so, when developing countries remain exposed to large (and largely insurable) shocks with heavy economic costs? Is it because of inadequate—or excessively costly—supply, or is it the result of lack of appetite owing, for example, to such political economy problems as the myopic behavior of policymakers? In the latter case, can this problem be mitigated by alternative instrument designs?

In this chapter, we explore these issues from various angles. First, we suggest the main aspects of a comprehensive risk management strategy, in line with the conceptual distinctions and analytical discussion in Chapter 2. Next, we look at the supply-side constraints to the use of country insurance products, examining the menu of existing instruments (offered both by the market and by multilateral institutions) and highlighting their current limitations. Finally, we put forward a few ideas about what additional instruments the IFIs could provide to fill the gaps left by the market.

Toward a risk-management framework

Several governments in LAC have profited from the benign environment of the last few years by strengthening their balance sheets and moving ahead to improve their strategies for managing sovereign liabilities. Countries such as Brazil, Chile, Colombia, Mexico, and Peru are seeking to manage more effectively their balance sheets to reduce vulnerabilities. The effort has mainly concentrated on the liability side but not exclusively. Chile and Mexico, for example, have also worked on the asset side to manage the risks of copper and oil prices. Colombia and Mexico have taken steps to better manage the consequences of natural disasters. Some of the actions taken by these countries to manage and reduce risks include funding operations, buy-backs, and derivative transactions.

Indeed, the financial exposure of the government's balance sheet does not arise exclusively from its debt portfolio, where most governments in LAC have been concentrating their effort. The asset part of the balance sheet also plays an important role and should be explicitly taken into account in a comprehensive risk-management framework. In formulating a comprehensive strategy, governments should ideally seek to match the characteristics of their financial assets and liabilities. Any residual risk needs to be measured and managed. A framework should be developed to manage the trade-offs between expected cost and risk in government asset and liability portfolios.

Sovereign strategies to cope with exogenous shocks

Broadly speaking, sovereigns can use three basic strategies to cope with exogenous risks:

- do nothing, absorb the shocks as they come and, if possible, diversify them within the country system (perilous but nonetheless not an unusual choice for emerging economies);
- retain risk but self-insure by building a reserve buffer or by contracting standing credit lines (the self-insurance strategy described in Chapter 2); and
- implement a hedging strategy by using derivative transactions to transfer the risk to the market.

Of these three strategies, only the last two could be broadly classified as country insurance ones.[41] But these two strategies are significantly different from a cost/risk perspective. They represent a trade-off between the portion of risk being assumed and/or transferred to the market and the potential cost of that transfer should the exogenous shocks not materialize.

Hedging oil revenues

To illustrate the potential coverage and cost of insurance, we consider a hypothetical scenario of oil price insurance using actual indicative market pricing for an oil exporter. Suppose country A exports 100 million barrels (bbl) of oil a year in each of the following five years.[42] The barrels are sold evenly throughout each year. The government decides to ensure the price for only 20 percent of the exports, leaving the other 80 percent without insurance. Thus, the amount of barrels to be sold evenly throughout the year at a fixed price is 20 million annually. What follows are two examples illustrating different ways of reaching this benchmark.

In the first example, the government attempts to cover the downside risk while keeping the upside potential from a rise in oil prices. To cover the risk, the government buys 10,000 contract put options (of 1,000 bbl each) for June and December for each of the following five years. The strategy requires that the put options be rolled over every six months thereafter. In the first year, this strategy gives the government the right to sell 20 million barrels of oil throughout the year at a price of X_t. If the quoted option prices are P_1 for the six-month contract, P_2 for the 12-month contract, and P_n for the n-month contract, then the total cost of the hedging strategy would be $\sum P_t \, x \, 10{,}000$. This strategy provides the government with insurance; it guarantees that a certain percentage of oil exports can be sold at least at X_t while still allowing the government to benefit from favorable price movements.

[41] Both strategies could be implemented to mitigate the risks of exogenous shocks. When using market instruments such as options, futures, or swaps, governments could choose to have a stand-alone derivative transaction with a counterparty to cover the risk, or embed the instrument in structured notes that could be used on both sides of their balance sheet.

[42] Although government revenues are more complicated than portrayed here, the case is intended to illustrate how certain products help in the implementation of risk-management strategies.

Table 3.1 provides the indicative costs of this strategy for the next five years. Each set of options would cover a period of six months and would be settled monthly. If an exporter wants to cover all its downside risk, the cost of this strategy would be almost 10 percent of the prevailing price of exports for the next five years. A more reasonable strategy is to cover any intolerable downside risk. This price could be determined by the circumstances of the exporter--for example, by the price of the commodity used in the budget or the price at which the government would need to start digging into its commodity funds, thus reducing the nation's net worth.

Table 3.1 Premium for put option strategy (June 29, 2007)

	Strike price = $**70 / barrel**		Strike price = $**40 / barrel**	
6 month period ending	**Put Option Premium ($/bbl)**	**Put Option Premium ($)**	**Put Option Premium ($/bbl)**	**Put Option Premium ($)**
12/31/2007	2.88	28,800,000	0.01	100,000
06/30/2008	5.21	52,100,000	0.11	1,100,000
12/31/2008	6.25	62,500,000	0.34	3,400,000
06/30/2009	6.79	67,900,000	0.51	5,100,000
12/31/2009	7.2	72,000,000	0.66	6,600,000
06/30/2010	7.54	75,400,000	0.81	8,100,000
12/31/2010	7.86	78,600,000	0.97	9,700,000
06/30/2011	8.08	80,800,000	1.13	11,300,000
12/31/2011	8.34	83,400,000	1.29	12,900,000
06/30/2012	8.55	85,500,000	1.44	14,400,000
12/31/2012	8.71	87,100,000	1.59	15,900,000
		774,100,000		88,600,000

Source: Investment banks

In the second example, the government attempts to lock in the price *for* 20 percent of its oil exports. This *hedging* strategy would use instruments such as forwards and swap contracts to eliminate downside risk at the expense of forfeiting the upside potential. This strategy is used extensively in interest-rate and currency-risk management by sovereigns, but it can prove politically challenging when applied to commodity price volatility, to the extent that the country ceases to benefit from commodity price booms.[43] On the positive side, this strategy, unlike the purchase of puts, has no up-front cost.

To illustrate it, we return to the example of an oil producer. To hedge the risk associated with the volatility of oil prices, the government uses forwards and swaps to build a "ladder" strategy. More precisely, the government enters into a five-year non-deliverable commodity swap agreement,[44] and subsequently into forward agreements every time there is an exchange of payments of the swap. Payment exchanges occur every six months after the initiation of the agreement. Five-year swaps would fix receivables at $71.73 a bbl, eliminating the risk of a price decline as well as the windfall of a price increase.[45] (Figure 3.1 illustrates the concept.)

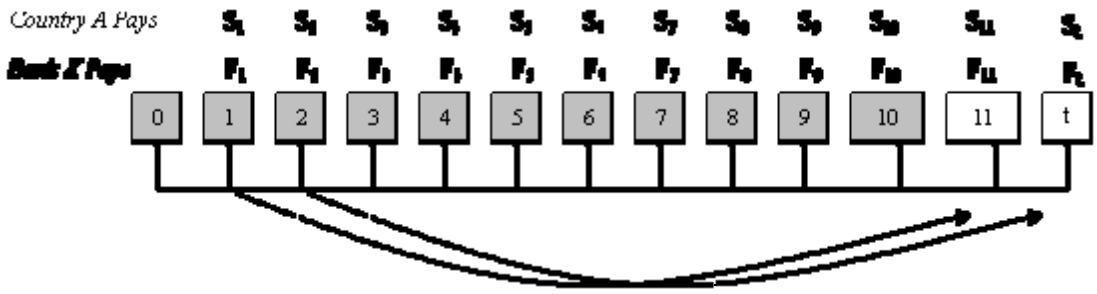
The government pays the financial institution S_t (oil spot price in time t) times 10 millions barrels (100M x 20% / 2). The financial institution pays the government F_t (the fixed

[43] The current oil price boom is a case in point: countries that chose to hedge in the early 2000s would have had to explain why they have failed to benefit from the oil bonanza.
[44] A series of forward contracts on oil with different maturity dates covering the next five years.
[45] This is the real indicative market price as of June 29, 2007. The spot price was $70.68 a bbl.

price for the exchange that would take place on time *t,* which is agreed at initiation) times 10 millions barrels. On every exchange date, in order to add another rung to the ladder, the government enters into a short position in a five-year non-deliverable forward contract covering the period from five to five-and-a-half years, creating a dynamic and continuous hedge.

When using the ladder strategy for hedging, the swap and the subsequent forward contracts are designed to manage the risk by fixing the price the government receives for a barrel of oil. Hedging strategies like this one enable the government to reduce its exposure to oil prices without having to pay an up-front fee –at the cost of giving up the upside potential. In addition, credit risk exposure that market counterparties are willing to take vis-à-vis the government may severely reduce (or even eliminate) the availability of this type of instrument.[46]

Figure 3.1 Ladder strategy



From a political economy perspective, the trade-off between the two illustrative hedging strategies involve the up-front cost that the country must pay in the former (which may be difficult to justify if the expected shocks do not materialize) and the potential opportunity cost that the government incurs if prices rise and the hedged country does not benefit from a price bonanza. In this context, Mexico offers a good practical example of hedging through derivatives (Box 3.1).

Finally, it is difficult to compare the cost of these two hedging strategies as their final outcomes depend on the realized price of the underlying commodity. With hindsight, one could evaluate that hedging before the latest oil boom would have had a major upfront cost or deprived oil exporters of an important upside—and may have cost the policymaker in charge a reprimand. Taking uncertainty at face value, both strategies have their advantages and disadvantages. Ultimately, the political economy dynamics in the country would determine which strategy was implemented.

[46] The credit risk arises from the possibility of a default by the government when the value of the contract to the counterparty is positive, or when the counterparty defaults (Hull 2006).

Box 3.1 Mexico oil hedging

Insurance against a dropin oil prices using derivatives

Types of derivatives. The authorities are using put options referenced to West Texas Intermediate (WTI). The basis risk is left unhedged.

Time horizon. One year.

Volumes. The volume of crude oil hedge was 357 million barrels in 2005. Since the oil fiscal regime required Pemex to transfer the oil revenues amounting to 60.8 percent of the crude oil export, the hedging volume approximately corresponded to the above-mentioned share of the estimated amount of crude oil exports of Pemex for 2005.

Risk tolerance. The estimated reference oil price for the fiscal budget is used to determine strike prices for put options. In 2005, the hedge was to guarantee the price of Mexican Blend between $23 and $25. In choosing the strike price of put options, the Mexican authorities took into account the price differential between WTI and Mexican Blend.

Hedging budgets. In 2005, the Mexican government spent $579 million for premium payments of put options (with a strike price of WTI $39.22 and a volume of 357 million barrels) to determine the price of Mexican Blend within the range of $23 to $25. Since 2005, as per the operational regulations of Fondo de Estabilizacion de los Ingresos Petroleros (FEIP),[47] option premiums are paid out of FEIP. They are not considered budgetary expenses.[48]

Governance. The technical committee of FEIP comprises three sub-secretaries of the finance ministry. The committee decides on the hedging strategy after the reference oil price for the budget is established for the coming year.

Source: Ministry of Finance and Public Credit, United Mexican States (UMS)

Catastrophe instruments

As discussed in Chapter 2, the transfer of catastrophic risk constitutes a key financial challenge in the economic management of disaster-prone countries. With this in mind, a new generation of parameterized macro-insurance instruments to guard against the impact of natural disasters is being developed. "Catastrophe bonds" ("cat bonds") are a kind of insurance-linked security (ILS) that transfers catastrophic risk to capital markets (Box 3.2); such bonds typically use parametric triggers based on scientifically measurable characteristics (e.g., wind speed or earthquake intensity), protecting investors from moral hazard and allowing for quick payments.

In March 2006, Mexico was the first sovereign emerging market to issue cat bonds (worth $160 million) to cover the risk of earthquakes. The bonds where placed among institutional investors in the United States and Europe. Despite the fact that the Mexican cat bond issuance was probably the cheapest in history (less than three times the fair premium), one may wonder why an investment-grade country should pay expensive insurance for a relatively limited amount that could easily be borrowed from the

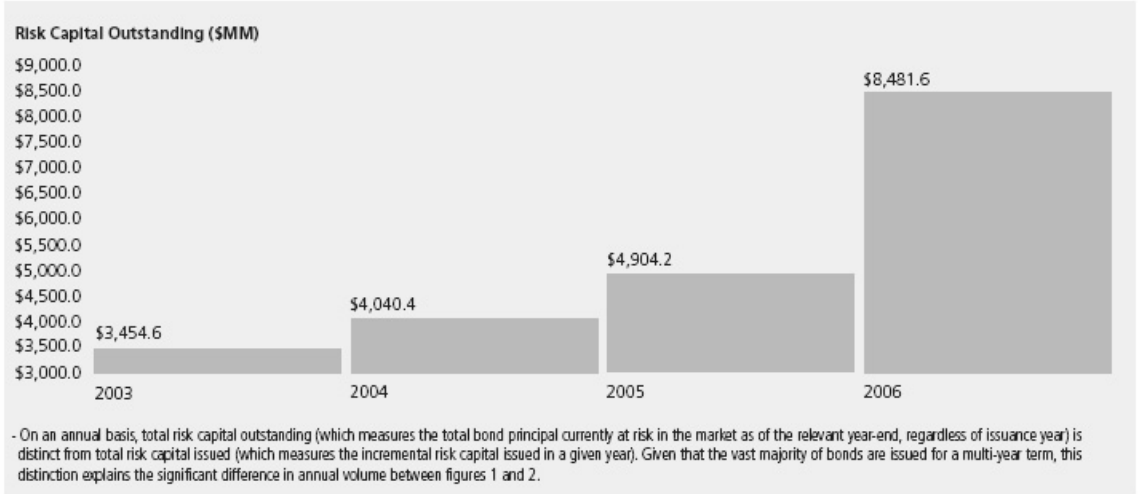
[47] Fondo de Estabilizacion de los Ingresos Petroleros (FEIP) is the oil revenue stabilization fund of the Mexican federal government.
[48] When windfalls are allocated to the FEIP, they are recorded as a budgetary expense.

international capital markets in the event of a shock. The dynamic liquidity gap discussed earlier provides a potential explanation: the $450 million coverage is the amount that Mexican authorities estimate they may need for relief assistance to complement the existing natural disaster emergency fund-- that is, without having to enter costly negotiations with the parliament for a new budget allocation.

Box 3.2 Catastrophe bonds

The capital raised by issuing catastrophe bonds is generally invested in safe securities such as treasury bonds, which are held by a special-purpose vehicle (SPV). This arrangement keeps the transaction off the balance sheet of the issuer and insulates investors from the counterpart credit risk. The bond issuer holds a call option on the principal in the SPV, with triggers spelled out in a bond contract. The triggers can be defined in terms of the issuer's losses from a predefined catastrophic event, by hazard characteristics, and/or by location. If the defined catastrophic event occurs, the bond issuer can withdraw funds from the SVP to pay claims, with part or all of the interest and principal payments forgiven. If the defined catastrophic event does not occur, the investors receive their principal plus interest, which includes a risk spread usually between 300 to 500 basis points over LIBOR.

The average size of a catastrophe bond issuance is about $100 million, varying from $10 million to almost $600 million. The typical maturity of such bonds is between 1 year and 10, with an average maturity of 3 years. The catastrophe bond market is developing rapidly. In 2006, new catastrophe bonds worth about $4.69 billion were issued, representing a 136 percent increase over the market's record performance in 2005. When we measure the catastrophe bond market size in terms of total risk capital outstanding, we get a figure of about $8.5 billion, representing almost a twofold increase over 2005.



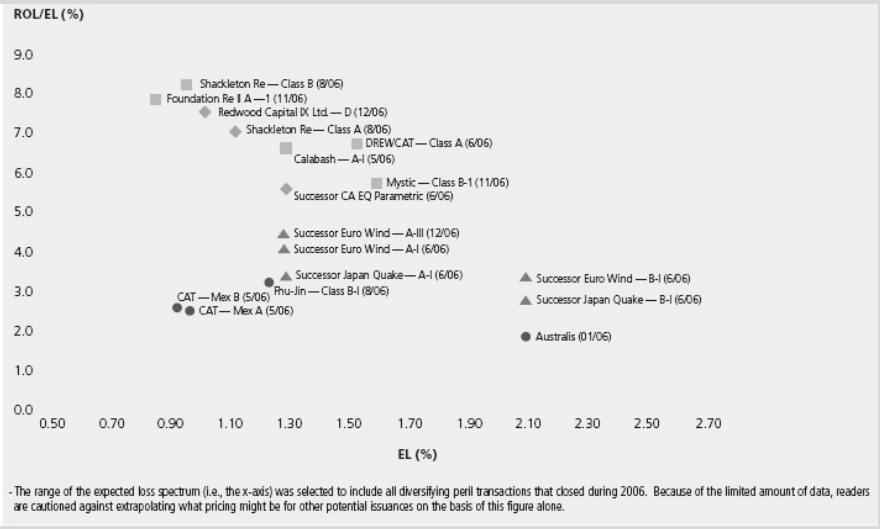
Source: Carpenter 2007.

Despite the increase in market size, catastrophe bonds are generally expensive and their prices are highly variable. As we can see from the figure below, the insurance load--measured as the ratio of return on equity on expected losses--varies between 2 and 8. A look at the figure suggests that bond-covering events with larger expected losses were

priced at more compressed multiples. This reflects the better diversification characteristics of the latter.

Figure 3: Comparison of 2006 Peak, Non-Peak and Diversifying Peril Transactions
ROL vs. EL — All Issues

- Peak Perils (U.S. Earthquake)
- Peak Perils (U.S. Hurricane)
- Non-Peak Perils (European — Wind, Japanese Earthquake)
- Pure Diversifying Perils (Australian Typhoon and Earthquake, Mexican Earthquake, Japanese Typhoon)



- The range of the expected loss spectrum (i.e., the x-axis) was selected to include all diversifying peril transactions that closed during 2006. Because of the limited amount of data, readers are cautioned against extrapolating what pricing might be for other potential issuances on the basis of this figure alone.

Source: Carpenter 2007.

Finally, the variability of catastrophe bond prices may also reflect the capitalization need of the industry: bond prices spike in the aftermath of a major disaster.

An alternative new development in the same direction is the creation of insurance pools**.** Resource pooling is oriented, in principle, to enhancing risk diversification, which, in turn, should be reflected in reduced insurance premiums. But the risk diversification margin (risk pooling) does not imply (and should not be confused with) the self-insurance margin associated with resource pooling. Joint insurance does not require the accumulation of reserves typically associated with insurance pools, which increases risk retention and reduces the need for insurance. Indeed, while risk diversification represents an unambiguous gain for the countries involved, whether or not resource pooling is a good thing will depend on the opportunity cost of capital for pooling countries. The Caribbean Catastrophe Risk Insurance Facility (CCRIF) is an example of how a regional insurance pool can offer affordable insurance to a number of small countries highly vulnerable to natural shocks (Box 3.3).[49]

Box 3.3 The Caribbean Catastrophe Risk Insurance Facility

The Caribbean Catastrophe Risk Insurance Facility (CCRIF) allows Caribbean Community and Common Market (CARICOM) governments to buy insurance coverage to finance immediate post-disaster recovery needs. The facility acts as a risk aggregator as it allows participating countries to pool their country-specific risks into one, better-diversified portfolio. As for catastrophe bonds, claims payments depend on parametric triggers, while insured countries pay an annual premium commensurate with their specific risk exposure. Annual premiums typically range from $200,000 to $4 million for

[49] The extent to which these gains are attributable to diversification or greater risk retention is discussed in the next section.

coverage starting at $10 million and extending to $50 million. As of June 1, 2007, 15 Caribbean countries were members of the facility. The total premium volume is $17 million for a total sum insured of more than $400 million.
The facility has been created as an insurance-captive special-purpose vehicle, with financial support from donors who have pledged almost $50 million. These funds will be used to pay for such things as operational expenditures and reinsurance costs and will allow the facility to more quickly build reserves from countries' insurance premiums and participation fees.

CCRIF transfers the risks it cannot retain to international financial markets. It was able to secure claims worth $110 million on the international reinsurance and capital markets. The reinsurance structure consists of four layers: CCRIF retains the first layer of $10 million; reinsurers underwrite the second ($15 million) and third layers ($25 million); and the top layer ($70 million) is financed with reinsurance ($50 million) plus $20 million coverage through a catastrophe swap between the World Bank (International Bank for Reconstruction and Development, IBRD) and CCRIF. IBRD hedged its risk through a companion catastrophe swap with the market.

Source: Ghesquiere and Mahul 2007.

A final instrument is contingent capital. Unlike the previous two mechanisms, contingent capital is essentially a risk-retention alternative, through which capital funding is extended to the client after the occurrence of some specific risk-related loss, often on pre-loss financing terms. Designed to provide immediate and less expensive capital to the client when it is most needed –such as in the wake of a natural disaster– this facility can help bridge the liquidity gap by supplying a country with lower-cost capital, although its risk transfer is limited to the gains embedded in the lower interest rate. Since capital is lent –rather than risk being transfered as in the insurance case– it contributes to the future debt burden of the country. Because of this, the facility is more suited for middle-income countries likely to regain access to capital in the medium term.[50]

The supply side

The few illustrations provided in the previous section are the exception rather than the rule in emerging economies. Very few countries have institutionalized an asset-liability management framework to efficiently manage exogenous risks and their effect on public finances. And those that do have the framework face market restrictions on the type of instruments that they can use or on the terms—including the cost and the tenor—on which they can manage the risks. Some of the most efficient instruments, such as long-term swaps, are in fact credit sensitive; these limit the ability of countries, because of their credit rating, to access them efficiently. More generally, the minimal use of

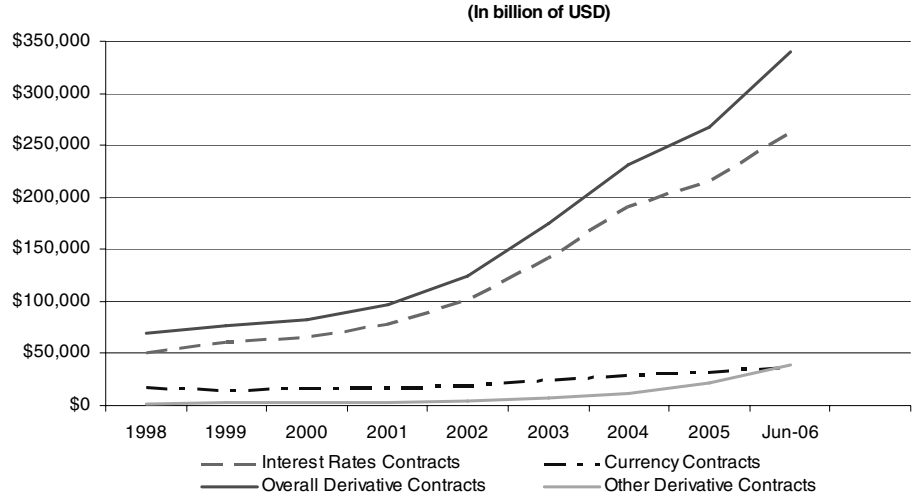
[50] A good example of a contingent capital arrangement is that between the World Bank and the Colombian government. Colombia strides the Andean mountain region and the Pacific "belt of fire," where high seismic potential combines with volcanic activity. In the last 25 years, the country has suffered 6 major earthquakes, 3 volcanic eruptions, major landslides, avalanches, petroleum and chemical explosions/leaks, and extensive flooding. The government of Colombia and the World Bank arranged a $150 million contingent credit line that would provide the Colombian government with immediate liquidity in the event of a major disaster occurring.

derivatives to hedge shocks to commodity prices could in part be attributed to the supply constraints faced by most emerging economies, specifically, transaction costs associated with the lack of liquidity and these economies' typically high-credit risk.

1.1.1 Derivatives

Despite the explosive and increasingly widespread use of derivative products globally (Figure 3.2), emerging market governments have often not been able to exploit the opportunities offered by these instruments. There are two main reasons for this: One is related to the supply side: government access to key risk-management tools has been sporadic and expensive because of relatively low credit ratings, which increase transaction costs significantly. The second reason is associated with demand constraints: governments tend to lack the financial skills, experience, and technology to anticipate, measure, and manage their exposure, as well as the governance structures and political economy consensus to use these risk-management tools without potentially damaging their political reputations, and sometimes even exposing them to legal risk.

Figure 3.2 Global OTC derivative market 1998–2006



Source: Bank for International Settlements (BIS).

Over the past several years, these limitations have diminished somewhat as emerging-market countries have gained more experience in managing their debt portfolios. Several governments in LAC have institutionalized public debt and risk management. Countries such as Colombia, Mexico, and Peru use the OTC derivatives market to manage risks related mainly to their debt portfolio. Although actual data on the use of OTC transactions are hard to obtain, given the nature of the market, we do know that several countries in LAC have used derivatives, either embedded in IBRD loans or in stand-alone form executed with a market counterpart. Some countries have even used such exotic structures as extinguishable currency swaps to cover currency risk at reduced costs.

Table 3.2 lists the main commodities produced in Latin America and illustrates the liquidity and tenor available for each commodity in the Chicago Board of Trade (CBOT),

New York Board of Trade (NYBOT), and the New York Mercantile Exchange (NYMEX)--as well as the willingness of investment banks to trade OTC transactions. The table also illustrates the lack of long-term instruments and liquidity. But if the market, in principle, appears to offer products that allow high-grade, middle-income economies to partially insure against interest rate and commodity risks, there are important gaps related to currency risk and natural disasters. Markets for exotic currencies, if liquid at all, are usually limited to resident savers and catastrophe insurance, and are often exceedingly costly. This is immediately evident when we compare the use of derivatives in the most developed economies in LAC with other developed country commodity producers (Table 3.3).

Why can't developing countries do the same? Possible reasons include illiquid foreign exchange markets, currency risks (which would explain nonresidents' lack of interest in holding a position in the local currency), plus the already-noted demand constraints (lack of financial sophistication, political economy conundrums, even the presence of implicit guarantees in heavily dollarized economies).

These shortcomings are only partly addressed by the instruments offered by the international financial institutions. Because of the implicit preferred-creditor status enjoyed by IFIs, they are expected to bear credit risk on their balance sheets, but no other risk is explicitly allowed.[51] Thus, currency or interest rate hedges are currently not available from IFIs when they cannot off-load their risk to the market through a currency or interest rate swap–precisely where new hedging instruments are most needed.[52]

[51] We will return to alternative interpretations of the statutory limits to risk management for the IBRD.

[52] The use of IBRD risk-management products may require the signing of a master derivatives agreement (MDA) when it is not embedded in a structured loan. IBRD has signed MDAs with the governments of Colombia and Peru. It is in negotiation with several other governments.

Table 3.2 Commodity derivative volumes

	Futures / Forward (# of Contracts)											
	Up to 6 Months		*6 Months to 1 Year*		*1 Year to 2 Years*		*2 Years to 3 Years*		*3 Years to 5 Years*		*Greater than 5 Years*	
	Daily Volume	Open Interest	Daily Volume	Open Interest	Daily Volume	Open Interest	Daily Volume	Open Interest	Daily Volume	Open Interest	Daily Volume	Open Interest
Crude Oil												
- NYMEX	358	7,214	731	21,767	1,588	21,229	-	3,379	-	15,254	N/A	N/A
- IB A	Will trade futures up to 2012 and OTC swaps up to 2036											
Soybean												
- CBOT	86,517	418,048	5,953	36,797	4,817	54,264	123	1,534	N/A	N/A	N/A	N/A
- IB A	Will trade OTC swaps up to 5 years											
Coffee												
- NYBOT	12,784	125,657	3,885	26,603	783	11,362	N/A	N/A	N/A	N/A	N/A	N/A
- IB A	Will trade OTC swaps up to 3 years											
Wheat												
- CBOT	34,701	247,902	9,442	85,476	1,014	28,404	110	2,396	N/A	N/A	N/A	N/A
- IB A	Will trade OTC swaps up to 3 years											
Corn												
- CBOT	99,844	550,993	51,263	524,944	4,788	153,347	67	17,377	41	1,939	N/A	N/A
- IB A	Will trade OTC swaps up to 5 years											
Copper												
- NYMEX	13,106	72,771	569	8,083	13	795	N/A	N/A	N/A	N/A	N/A	N/A
- IB A	Will trade OTC swaps up to 8 years											

	Call Options (# of Contracts)											
	Up to 6 Months		*6 Months to 1 Year*		*1 Year to 2 Years*		*2 Years to 3 Years*		*3 Years to 5 Years*		*Greater than 5 Years*	
	Daily Volume	Open Interest	Daily Volume	Open Interest	Daily Volume	Open Interest	Daily Volume	Open Interest	Daily Volume	Open Interest	Daily Volume	Open Interest
Crude Oil												
- NYMEX	40,911	732,721	6,178	374,969	1,656	172,138	-	35,367	N/A	N/A	N/A	N/A
- IB A	Will trade OTC options up to 2036											
Soybean												
- CBOT	18,737	256,892	4,939	4,137	311	10,184	N/A	N/A	N/A	N/A	N/A	N/A
- IB A	Will trade OTC swaptions up to 5 years											
Coffee												
- NYBOT	3,117	106,439	172	26,973	17	242	N/A	N/A	N/A	N/A	N/A	N/A
- IB A	Will trade OTC swaptions up to 3 years											
Wheat												
- CBOT	13,689	103,494	2,681	47,810	975	1,522	N/A	N/A	N/A	N/A	N/A	N/A
- IB A	Will trade OTC swaptions up to 3 years											
Corn												
- CBOT	16,859	405,341	6,649	529,968	773	115,716	-	10,330	N/A	N/A	N/A	N/A
- IB A	Will trade OTC swaptions up to 5 years											
Copper												
- NYMEX	26	1,478	6	264	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
- IB A	Will trade OTC options up to 8 years											

	Put Options (# of Contracts)											
	Up to 6 Months		*6 Months to 1 Year*		*1 Year to 2 Years*		*2 Years to 3 Years*		*3 Years to 5 Years*		*Greater than 5 Years*	
	Daily Volume	Open Interest	Daily Volume	Open Interest	Daily Volume	Open Interest	Daily Volume	Open Interest	Daily Volume	Open Interest	Daily Volume	Open Interest
Crude Oil												
- NYMEX	44,205	664,472	985	418,033	257	194,995	-	32,159	N/A	N/A	N/A	N/A
- IB A	Will trade OTC options up to 2036											
Soybean												
- CBOT	17,494	179,204	39	2,448	81	9,355	N/A	N/A	N/A	N/A	N/A	N/A
- IB A	Will trade OTC swaptions up to 5 years											
Coffee												
- NYBOT	3,468	51,075	102	24,804	-	70	N/A	N/A	N/A	N/A	N/A	N/A
- IB A	Will trade OTC swaptions up to 3 years											
Wheat												
- CBOT	4,049	68,628	144	34,010	-	762	N/A	N/A	N/A	N/A	N/A	N/A
- IB A	Will trade OTC swaptions up to 3 years											
Corn												
- CBOT	13,674	260,706	10,950	387,471	315	60,173	3	9,732	N/A	N/A	N/A	N/A
- IB A	Will trade OTC swaptions up to 5 years											
Copper												
- NYMEX	16	894	-	675	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
- IB A	Will trade OTC options up to 8 years											

Source: Selected investment banks

Table 3.3 Turnover in derivative markets

Foreign exchange derivatives turnover, 2004						
	Australia	Canada	New Zealand	Brazil	Chile	Mexico
Derivative turnover as a % of:	%	%	%	%	%	%
Spot currency turnover	235.7	222.9	433.8	48.5	62.0	42.4
Trade flow	23.2	5.7	9.6	0.7	1.4	1.1
Trade and capital flows	20.3	5.7	9.2	0.6	1.2	1.0
Gross domestic product (GDP)	9.2	4.2	5.7	0.2	1.0	0.7

Single currency interest rate derivatives, 2004						
	Australia	Canada	New Zealand	Brazil	Chile	Mexico
Derivative turnover as a % of:	%	%	%	%	%	%
Spot currency turnover	50.0	66.0	88.0	35.2	1.3	13.0
Trade flow	4.9	1.7	2.2	0.5	0.0	0.3
Trade and capital flows	4.3	1.7	2.1	0.4	0.0	0.3
GDP	1.9	1.2	1.3	0.1	0.0	0.2

Sources: BIS and World Bank, World Development Indicators (WDI).

The IFI menu

Most countries in LAC are sub-investment-grade borrowers. Therefore, only few governments have been able to obtain ready access to long-dated derivatives that require banks to take the country's credit exposure. IFIs are natural providers of these products as their mandate requires assuming developing countries' sovereign credit risk. In using its intermediation capacity and leveraging its triple-A credit rating to make hedging products available to client countries--rather than crowding out the private sector--IFIs could arguably "crowd in" participation by private sources by removing some of the constraints faced by emerging countries in accessing these products.

The actual use of these products by IFI member countries was initially very low--mainly because of both unstable emerging market conditions and limited risk-management capacity–but picked up in the new millennium (Table 3.4). In this respect, it bears noting the leading role taken by such countries as Mexico and Colombia, and other countries that followed in their path such as Brazil and Peru (Box 3.4 describes a practical application, and Box 3.5 gives an example of IBRD's local-currency-lending menu).

Today, when most emerging country governments issue regularly in the market, sovereign members have been asking for instruments to help mitigate risk in the areas of liquidity, interest rate, currency, and catastrophe. While IFIs assume the credit risk, they transfer all other risks to the market, which limits the availability and size of these instruments owing to IFIs' need to off-load the position in the market. As an example, Table 3.5 shows where the World Bank is able to execute swaps to structure local-currency financing.[53]

[53] In the case of the IBRD, there is no restriction in its Articles of Agreement to prohibit using risk capital to manage risks other than credit.

Table 3.4 Fixed spread loans (FSL), customized repayments, and use of embedded flexibility

	Total FSLs		Customized repayments[1/]		Used of embedded options[2/]	
	Amount (millions$)	No. Loans	Amount (millions$)	No. Loans	Amount (millions$)	No. Loans
Africa (AFR)	192	9	29	4	75	4
East Asia and Pacific (EAP)	3,360	35	1,518	13	1,150	17
Europe and Central Asia (ECA)	9,746	83	5,747	37	3,064	15
Latin America and the Caribbean (LAC)	34,372	282	18,836	144	7,052	73
Middle East and North Africa (MENA)	4,669	59	2,024	30	1,599	25
South Asia (SAR)	932	10	335	4	–	–
	53,271	**478**	**28,489**	**232**	**12,940**	**134**

Source: IBRD

Note: (1) Borrowers have flexibility during project preparation to customize the FSL's repayment terms (e.g., grace period, repayment period, and amortization structure) within existing financial policy limits. Once agreed, repayment terms may not be changed. This would help reduce the refinancing risk in government debt portfolio. (2) The IBRD's FSL affords, through embedded options, flexibility to change the currency of the loan on disbursed and undisbursed amounts, fix/unfix the interest rate on disbursed amounts, and cap and collar the interest rate on disbursed amounts. In LAC, borrowers in Colombia and Mexico have used the currency conversion option to change the currency of the loan to local currency.

Box 3.4 Peru: Interest-rate management

Peru's stated goal was to reduce the interest-rate risk profile of its overall sovereign debt portfolio by gradually increasing the percentage of fixed-interest-rate debt to total debt (from 51 percent in 2004 to 59 percent in 2006).

IBRD banking products were used to transform the financial characteristics of existing IBRD loans.

The Peruvian government exercised the option to fix the interest rate embedded in IBRD loans, which allowed for conversion from a floating to a fixed interest rate. The conversion of existing IBRD loans represented a total of $500 million. The Peruvian case highlights the ease and potentially quick execution of these types of transactions in helping implement governments' debt and risk-management strategies. Going through IBRD helped Peru save its credit lines with commercial banks for other needed transactions.

Source: IBRD

Table 3.5 Currency swaps in U.S. dollars (August 2007)

Latin America, Country	*Currency*	*Trade size*	*Max Maturity*
Argentina	Argentine Peso	$ 100m	7 -10yrs
Brazil	Brazilian Real	$ 200-300m	10- 15 Yrs
Chile	Chilean peso	$ 200m	10 - 20 Yrs
Colombia	Colombian Peso	$ 100m	20 Yrs
Costa Rica	Costa Rican	$ 50m	10 Yrs
Dominican Republic	Dominican Republic Peso	$ 50m	5 Yrs
Guatemala	Guatemalan Quetzal	$ 50m	3 Yrs
Jamaica	Jamaican Dollar	$ 25m	7 Yrs
Mexico	Mexican Peso	$ 200-400m	30 Yrs
Paraguay	Paraguayan Guaraní	$ 100m	5 Yrs
Peru	Peruvian New Sol	$ 50 -100m	10 -15 Yrs
Uruguay	Uruguayan Peso	$ 50m	3 Yrs

Source: Investment banks

IFIs have yet to adjust their risk-management framework to effectively manage different types of risk. The first reason is that the implicit preferred creditor status enjoyed by IFIs protects them from credit risk (but not from other types of risks). But this behavior may also be attributed to a combination of historical reasons and institutional inertia,[54] particularly at a time when capital is at a record high both in absolute terms and relative to the IFIs' loan portfolios (Table 3.6). In this regard, it bears noting that the IBRD Articles of Agreement (or charter) require that borrowed funds be lent in the same currency but do not limit the deployment of paid-in capital and retained earnings to attend to other risks.[55] This means that the IBRD should, in principle, be able to allocate capital to take risks other than those that the market is already willing to take and further help its members mitigate risks.

[54] For example, the fact that the World Bank's financial structure is designed to offer developing countries loans in "hard currencies" is a legacy of the Bretton Woods world of fixed-exchange-rate regimes.

[55] In section 4b(ii), the Articles of Agreement of IBRD indicate that "the total amount outstanding and payable to the Bank in any one currency shall at no time exceed the total amount of the outstanding borrowings made by the Bank under Section 1(a)(ii) and payable in the same currency."

Table 3.6 Multilateral development banks (MDBs): Equity-to-loan ratio

	FY97	FY98	FY99	FY00	FY01	FY02	FY03	FY04	FY05	FY06
IBRD	22.06	21.44	20.65	21.23	21.54	22.9	26.59	29.35	31.44	32.94
ADB	44.54	36.79	34.29	35.23	35.1	38.79	46.37	50.89	49.48	47.72
IDB	35.66	31.86	28.88	28.68	28.91	29.24	33.38	37.13	38.38	41.17
AfDB	39.73	41.6	41.8	48.16	50.34	62.28	70.24	80.84	76.55	82.03
EBRD	73.08	60.18	52.49	55.5	62.7	62.03	65.71	63.93	82.12	91.08

Note: Except for IBRD, the fiscal years of other MDBs coincide with calendar years.
Source: World Bank.

One important caveat applies to IFIs' recent attempts to help reduce currency exposure. Experience has shown that the pricing advantage of borrowing from IFIs in foreign currency disappears when borrowing in local currency. IFI bonds in local currency are close to the government yield curve. Despite their triple-A credit rating, IFIs can only get a minor discount relative to the treasury in domestic local-currency markets.[56]

The lack of IFIs' advantage in issuing domestic-currency-denominated debt reflects the perceived lower credit risk associated with local-currency debt (Figure 3.3), which is typically seen as safer and is rated one to three notches above foreign-currency government obligations. But it also reflects a lower elasticity of the spreads with respect to ratings. This can be seen clearly in the scatter plots in Figure 3.4. The relationship between spread and rating is indeed much flatter for domestic-currency-denominated than for foreign-currency-denominated debt.

In a context of low nominal volatility (lower and more stable inflation and devaluation rates), combined with historically low-credit risk (tight spreads), the previous findings imply that the economies eligible for local-currency lending are also those that can issue in the local currency, making the IFIs' role inefficient at the sovereign level. This would only reinforce the view that IFIs should intervene in countries that are further away from the investment-grade status, even if the costs and risks in those cases may be larger and more varied.

Box 3.5 Local-currency lending

Understanding the importance for both micro and small- and medium-sized enterprises (SMEs) in emerging markets to access long-term local-currency financing, the Netherlands Development Finance Company (FMO) and the International Finance Corporation (IFC), through a pilot program, are offering local-currency funding to private companies and local banks that would, in turn, lend the funds to local businesses. Funds are granted for projects in countries where no local-currency financing exists or where prices are prohibitive. The two institutions have developed two different models:

The FMO's Massif Fund[57]

The Massif Fund is a joint effort between the FMO and the Dutch ministry for development cooperation. This fund provides risk capital and loans in local currency (the FMO assumes the

[56] When adding the IFIs' margin, the pricing of the local-currency loan is close to the sovereign's own bonds.

currency risk) to banks in developing countries that would be able to serve local micro- and small-scale businesses and consumers more effectively.

FMO furnishes local financial intermediaries with long-term financing in the form of debt and equity. These institutions can then pass on the advantages to their client base. By 2006, the portfolio for micro- and small-scale businesses amounted to €219 million, and it is projected to reach €300 million by 2010. The current amount is outstanding with 107 clients in 42 countries in Africa, Asia, Europe and Central Asia, and Latin American.

The IFC's MATCH Pilot Program

In April 2007, the IFC Board of Directors approved the Matching Assets through Currency Hedging (MATCH) Pilot Program. The IFC would allocate up to $30 million to the pilot program. The funds would be used to issue to IFC investment departments currency hedge commitments for their own local-currency loans. These currency hedge commitments are expected to permit IFC investment departments to book approximately $100 million in direct local-currency, long-term loans.

To be MATCH-eligible, the local-currency loans (mainly in the microfinance and SME sectors) would be in countries where the IFC has no other cost-effective alternative for meeting its clients' growing needs for local-currency funding. The MATCH Pilot Program is expected to be increasingly active, creating a diversified portfolio of loans in at least 10 different currencies, with relatively low correlations, which would allow the MATCH account to diversify the currency risk. If the pilot is successful, it is hoped that the MATCH program would be extended with donors' funds.

The Currency Exchange Fund (TCX)

The Currency Exchange Fund (TCX), a global partnership of some of the emerging world development finance institutions, has initiated a unique and sustainable alternative to the very limited access to long-term financing denominated in their local currencies. TCX is a unique cooperative effort of a large number of investors, enjoying clear benefits of size and scope. The investors joining TCX in the first phase will commit a combined figure of about $300 million in equity. Initial transaction capacity will reach up to $1.2 billion, increasing with expected additional commitments in the short term. TCX investors will pay special attention to the sub-Sahara Africa region, and to the microfinance, housing, and infrastructure sectors.

Addressing market failure
TCX assumes the currency risks previously transferred by international financiers to the local entrepreneurs and their local banks; this improves their business sustainability and reduces defaults. The upsides are profound for both financier and companies alike. Companies are no longer exposed to currency risks that they cannot manage and systemic risk becomes limited. At the same time, financiers have a much broader commercial market to address with long-term local-currency products.

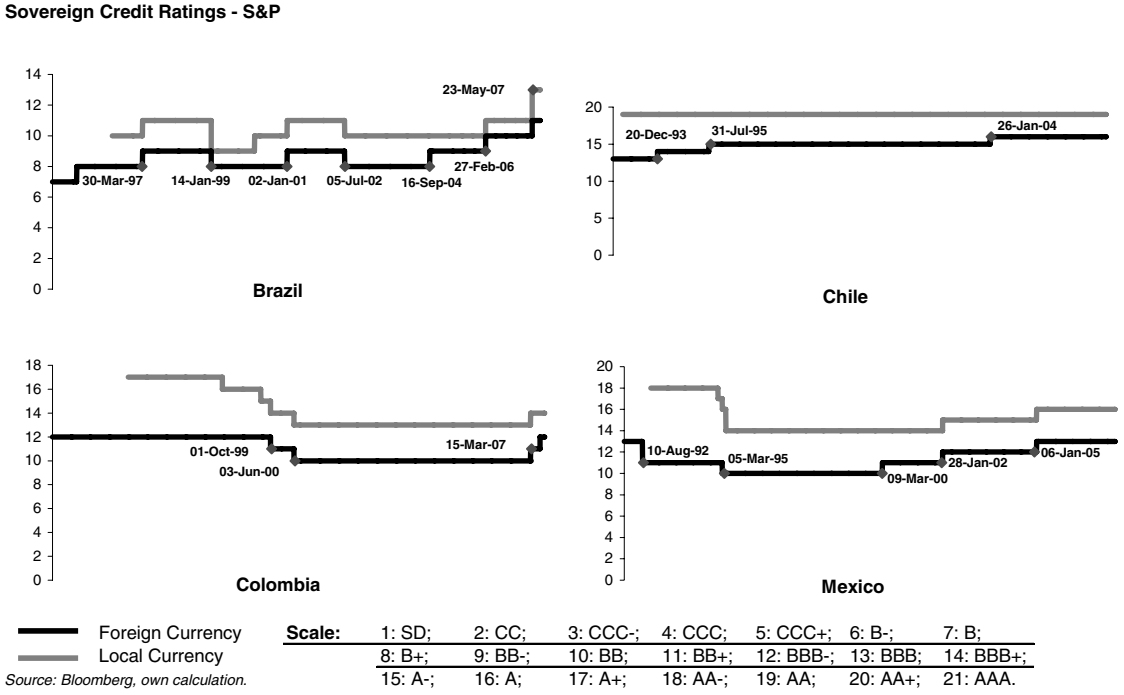
Spreading the risk
TCX research proves that the risk of investing in a spread portfolio including a large number of currencies and interest rates, diversified across all regions in the developing world, is only 25

[57] Source: www.fmo.nl

percent of the risk of investing in any single currency. In other words: true global risk diversification works much better than regional diversification, especially under highly stressed market circumstances. By pooling local currency risk, TCX is the first to introduce the concept of a well-diversified portfolio of developing country currencies.

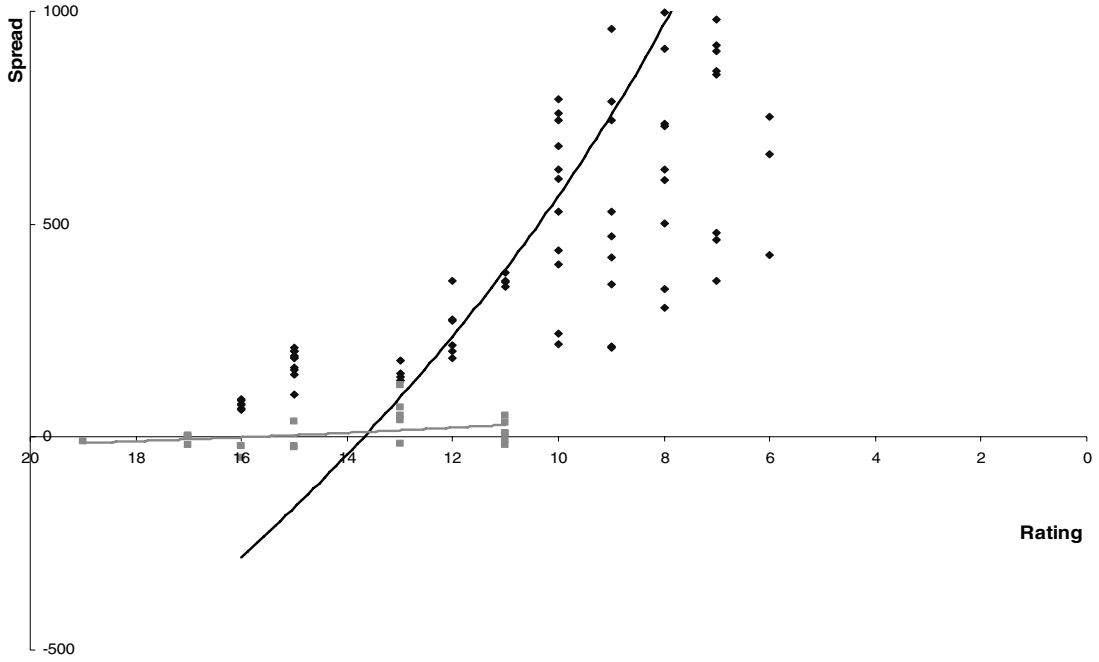
Source: FMO Annual Report 2006 (www.fmo.nl), TCX (www.tcxfund.com), and the World Bank.

Figure 3.3 The local-currency advantage: Ratings in local currencies and dollars in selected countries in LAC



Source: Bloomberg, own calculation.

Figure 3.4 The local-currency advantage: Sovereign spreads in local currencies and dollars in LAC



Source: The World Bank

Looking ahead: Market failures and the case for IFI involvement

The lessons from the previous discussion are sobering. External vulnerabilities are an important source of volatility in emerging-market countries. Markets and IFIs offer some alternatives to mitigate them. But these alternatives are barely used by the countries concerned. What can be done to enhance country-insurance instruments and promote their use?

The fact that insurance mechanisms are not being used by developing economies does not warrant, in and of itself, the need for active IFI involvement. Are developing countries uninsured because of market failures that make insurance instruments unnecessarily costly or unavailable? Are IFIs able to mitigate these failures and, if so, is this objective in line with their respective mandates? As it turns out, the answer to these questions is positive: there are indeed margins along which IFIs could efficiently contribute to country insurance without resorting to subsidized lending or deviating from their mandated goals.

From the discussion so far, we can identify at least two forms of market failure that IFIs can help mitigate. The one that more naturally comes to mind is the imperfection associated with the lack of commitment mechanisms underlying sovereign credit risk in sovereign debt markets where collateral is not available. Thanks to their implicit preferred creditor status, IFIs have traditionally been able to lend at low rates to countries

facing sizable spreads in capital markets–and to get repaid when these same countries choose to default on private creditors.

The best example of this risk transformation role is the fact that the triple-A rating (and spreads) of multilateral lending institutions are hardly affected by the credit ratings of their asset portfolio (typically, non-investment-grade sovereigns and corporate): IFIs can borrow from the same creditor that demands a hefty premium from developing countries and on-lend to these countries without a premium--thus reducing both the risk and the cost of development finance simply by intermediating the funds. This risk transformation role of IFIs is critical in many aspects of the country insurance menu. It allows the IFIs to provide liquidity assistance at a time when credit risk spreads tend to be at their peak, and facilitates access to derivative contracts by intermediating away counterparty risk.

A second, potentially important failure already flagged in our discussion is the lack of market liquidity and tenor . This market failure does not arise because of market participants' lack of financial engineering skills or unwillingness to innovate, but rather from insufficient initial volume. This highlights the development role of IFIs as providers of financial services in under-serviced countries, as well as their contribution as venture capitalists jump-starting markets, which, as they gain in volume, can be taken over by the private sector.[58] IFIs have been active–albeit in an incipient way–in this market-developing role, exploiting financial externalities and mitigating coordination problems.

Natural disasters are a good example of these two channels, through which IFIs can optimally contribute to providing country insurance (Box 3.6).

Box 3.6 Why is catastrophe insurance so expensive?

A good starting point for clarifying the factors behind the high cost of catastrophe insurance is the premium formula:

Technical premium = pure premium + load + operating costs + return on equity (ROE),

where the *pure premium* is the average annual loss (i.e., expected loss per year when averaged over a long period) usually expressed as percent of the value of the insured asset; the load is the cost of capital associated with the reserves the insurer must set aside to pay unexpected losses; operating costs include development costs (which can be quite high when a new line of business is developed), delivery costs, and adjustment/monitoring costs; and return on equity (ROE) is the firm's profit.

Abstracting from ROE (which nonetheless can be high in opaque and highly concentrated insurance markets) and assuming away operating costs for expositional simplicity, we can express the multiple (the ratio between the premium and the annual average insurance outlays) as:

multiple = 1 + *(probable maximum loss / annual average cost)* capital cost*

The multiple (the measure of what the insured country pays over what it receives) depends on the amount and cost of capital at risk, which in turn depends on the joint

[58] This mirrors the practice of development banks serving rural regions or financing infant industries.

distribution of individual losses. Specifically, risk capital tends to be zero for a large number of policies covering uncorrelated random losses (e.g., , in car insurance). Conversely, the higher the degree of correlation among insured losses (the lower the diversification margin), and the higher the variability of individual losses, the higher the risk capital per policy. Accordingly, risk capital would be particularly high for systemic risks (where extreme events tend to occur simultaneously, as in global financial crises) and event risks (where losses are zero most of the time and only rarely catastrophic).

How can IFIs lend a hand? First, in their market-making role, IFIs can help reduce operating costs, for example, by exploiting their unique relationship with sovereigns to ensure a commitment from potential members. (It is unlikely that a consortium of private insurers could have coordinated among themselves and with the many countries involved to launch a multilateral facility such as the CCRIF Once this commitment is achieved, IFIs can absorb many of the up-front development costs.

Second, IFIs can help by exploiting their lower cost of capital—which is attributable to their preferred creditor status--particularly when applied to large rare event risk. Consider, for example, the case of a policy with an average annual loss of $5 million and a probable maximum loss (in a 100-year period) of $150 million: the insurance cost as a multiple of the average annual loss would be 4 percent with a cost of capital of 10 percent, 4 = (5+150*.10)/5, and just 2.5 with a cost of capital of 5 percent.

Source: IBRD, 2007

In recent years, such IFIs as the World Bank have made substantial (analytical and practical) efforts to provide clients with new financial products aimed at strengthening their country insurance framework. As a result, they have been able to play an increasingly important role in three dimensions by:

- providing currency and interest-rate swaps at competitive rates (exploiting their triple-A credit rating and the associated lack of counterparty risk); [59]
- embedding hedges in their lending instruments to reduce the already- noted political economy risk (structuring the financial subtleties of the hedge in a bundled and simpler final product); and
- providing technical advice on how to improve countries' risk-management frameworks (mitigating the noted demand problems).

There are, however, serious limitations to the degree to which IFIs can help countries cope better with exogenous risk, particularly because they typically can only retain credit risk on their balance sheets.

This valuable, but limited, IFI assistance can be usefully expanded in at least two ways: complementing the markets by contributing new customized instruments (e.g., automatic contingent credit lines or collective catastrophe insurance arrangements) [60]; and

[59] Since 1999, IBRD offers also commodity swaps and risk-management products that have not yet been used by members.

[60] Instruments that IFIs could introduce to attend to natural disasters were explored in Chapter 2.

enhancing their role in helping develop markets by expanding the scope of existing products (e.g., long-dated local-currency loans) and allocating risk capital to bear noncredit risk.

Contingent facilities

As discussed in Chapter 2, the experience with designing private credit lines to cope with liquidity crises has been, at best, disappointing. On the other hand, existing IFI facilities have generally been more able to help countries cope with the consequences of crises rather than helping them prevent them in the first place. The debate, however, is still open to the possibility of building an effective international safety net—an endeavor in which multilateral institutions such as the World Bank could play an important role.

Liquidity insurance. IFIs have been reluctant to provide pure liquidity instruments without conditionality (usually in the form of prior policy actions that would require review before funds could be available), a restriction that introduces uncertainty and undermines the effectiveness of the facility as a preventive scheme to deal with liquidity crises. An example is the IMF's contingent credit line[61] (CCL), which, owing to moral hazard considerations and an emphasis on crises that were driven by fundamentals rather than self-fulfilling crises, was subject to a restrictive, and not always a transparent, process of prequalification to ensure access. As a result, the CCL elicited no demand from potential clients and was eliminated. This reluctance by IFIs to provide automatic access to funds under such a facility also stems from a fear that such a facility would undermine their policy lending.

In contrast, some have argued that a preventive liquidity facility fashioned after the traditional lender-of-last-resort function—rather than back-loaded lending programs subject to corrective actions—should take the form of a budgetary-support facility that allows national treasuries to have immediate and automatic (albeit limited) access to funds at a spread over pre-crisis borrowing costs, to be withdrawn if external conditions deteriorate.

The appeal and feasibility of such a country insurance facility (Cordella and Levy-Yeyati 2006) hinge on the balance between two basic principles: predictability and sustainability. The first requires that at each point in time there is certainty about a country's ability to access the funds immediately when needed—that is, no "constructive ambiguity" should be allowed. The second requires that, at the pre-fixed interest rate spread and without the need for unrealistic improvements in the fiscal stance, eligible countries should be able to repay their obligations. Maastricht-type criteria on debt-to-GDP ratios and the fiscal deficit are natural candidates for eligibility criteria.

In order to dissuade liquidity runs, the facility should be able to commit sizable amounts of liquidity.[62] The commitment of unlimited funds, however, ultimately results in unlimited risk, including the possibility of strategic defaults and holdup problems that

[61] The IBRD also introduced, in 2001, as part of its development policy lending, the deferred drawdown option (DDO), which lacked the certainty of disbursement.
[62] This assumes that other risks on the government balance sheet are not being managed in other ways.

may arise as the facility's share of total claims on the country starts to mount. The challenge is thus to strike the right balance between these two conflicting objectives and to develop a facility that is able to commit enough liquidity to avoid runs while keeping the country's incentives aligned with those of the IFIs. This may be a difficult task. Indeed, in order to dissuade liquidity runs, the facility may need to commit resources that are a multiple of credit lines currently available from the main IFIs.

The IFI as market developer

Looking forward, it seems clear that what IFI members need the most from IFIs are those instruments that they cannot obtain from the market—or that are only available at prohibitively high prices or short maturities. As noted, despite the varied menu of alternative instruments, IFIs have retained (almost) only credit risk on their balance sheets and hedged all remaining risks in the market. Some of these products have indeed been very attractive to countries for at least three different reasons: "bundled" technical assistance, political economy considerations, and the favorable terms multilaterals have been able to offer.[63]

Apart from the benign countercyclical nature of their lending, which mitigates the real impact of cyclical borrowing costs, and the more efficient access to existing markets, IFIs have been able to offer mainly hedging products that they can intermediate in the market. Indeed, because of their traditional focus on long-term development project finance, most existing initiatives have been applications of the considerable financial know-how that these institutions have accumulated in managing their own portfolios.

For IFIs to significantly expand their country insurance portfolio—a critical component in the demand from their middle-income members—they may need to either expand their scope for non-credit risk-taking, which in turn may require a revision and broadening of their statutes along with a clear direction from their boards; or use more aggressively their internal know-how, market presence, and convening power to intermediate country insurance products in a efficient manner. These restrictions notwithstanding, the IFI menu can be usefully enhanced and expanded in a few important ways.

One initiative that uses this know-how is the Global Bond Fund for Emerging Market Local Currencies (GEMLOC) launched by the World Bank at the beginning of 2008, which is oriented to providing liquidity to local-currency markets. The local-currency-dedicated fund will target a portfolio of local-currency, onshore, fixed-interest and inflation-indexed bonds, with country weights determined by the tradable market size and adjusted for investability criteria, and a country ceiling of 10 percent.[64] In addition, the initiative envisages developing a Global Emerging Markets Bond Index (GEMX) to be

[63] Sovereigns using a bank as an intermediary in a swap could obtain longer tenor and more efficient cost because of credit risks.

[64] Minimum local market size will be $3 billion, minimum issue size $200 million, and maximum holdings 10 percent. Over time, it is planned to broaden country coverage, to extend duration of benchmark bonds, to introduce corporate benchmark issues, and to invest in up to 40 developing countries. The World Bank plans to select a fund manager to run the fund for a period of up to 10 years, when involvement of the World Bank Group will terminate. The manager will commit to raising $5 billion in initial capital.

used as a benchmark for GEMLOC and more generally for the local-currency emerging debt asset class. A share of the fees generated by the fund will be applied to technical assistance in developing domestic local-currency markets.

Box 3.7. GEMLOC

The GEMLOC Program--or Global Bond Fund For Emerging Market Local Currencies Program--is designed to move more institutional investment into local-currency bond markets in developing countries. All of the target countries included in the first stage of the fund (and most of those included in the second stage) listed in IBRD (2007) already have fairly developed local-currency bond markets with an international investor base.

Making local-currency bond markets deeper and stronger can lower the cost of borrowing, and a liquid corporate debt market can help firms better manage risk. Institutional investors, both domestic and international, could benefit from investing in a diversified portfolio of local emerging-market bonds as they offer diversification with low correlations and potential returns from an improving credit environment and currency appreciation.

GEMLOC has three components:

The GEMLOC Fund. The first component is the creation of a $5 billion GEMLOC Fund to investment in developing debt markets. The selection of a fund manager by the World Bank Group is the first step. The fund will be market-based, including official and private institutional investors, with an emphasis on long-term investments across emerging markets.

Debt-Market Indices. The second component is the creation of an independent, transparent index for emerging markets local-currency debt. This will create significant benefits as a public good and as a benchmark for this asset class. So far, less than 2 percent of local-currency debt is benchmarked against leading market indices, which include relatively few countries and instruments. The index will open the way for a wide range of countries to be considered for investment.

Technical Assistance. Finally, the World Bank will provide assistance to emerging market stakeholders in developing their local fixed-income markets; in facilitating related policy reforms, especially on access and taxes; and possibly in creating exchange-traded funds as liquid benchmarks, as appropriate. This process seeks to establish a clear link between reforms, technical assistance, and investments.

Source: www.gemloc.org

One important difference between this proposal relative to similar ones in the past is that GEMLOC does not entail any risk transformation. Since the fund will not issue new bonds, it will not create credit-risk-free, local-currency assets that could potentially crowd

out the existing pool of local-currency loanable funds. This aspect is possibly also its main challenge, as in the first stage the fund's contribution would be limited to providing liquidity to existing issues—that is, allowing diversification at a transaction costs lower than what is already provided by the market—without any gain in terms of credit or currency risk. Thus, while GEMLOC is clearly a step forward relative to existing IFI initiatives—and a promising new avenue to help mitigate the liquidity risk associated with currency mismatches—it still depends on the willingness of market participants to bear exotic currency risk in their portfolios. To the extent that GEMLOC facilitates the manifestation of this external demand but does not create new demand its ability to attract investments to countries with little or no investor base is yet to be tested.[65]

A foreign debt relief initiative (FDRI) can be conceived to expand the IFIs' local-currency products, depending on the desired scope and financial complexity. As noted, the IBRD has been able to offer local-currency financing in a number of financially advanced developing economies (Brazil, Colombia, and Mexico) that have already issued similar bonds in the Eurobond market. But these products are needed most in countries where there is no swap market to allow the IFI to off-load the currency position. In these cases, the extent to which the IFI can offer local-currency financing would depend on the availability of an international investor base for the IFI bonds—or on the IFIs' willingness to retain some currency risk on their balance sheets.

Therefore, there are two ways in which IFIs could contribute more aggressively to creating a local-currency investor base. First, they can exploit their risk transformation capacity by issuing high-grade paper denominated in exotic currencies (Levy-Yeyati 2006). In its strictest form, this would entail the issuance of a global bond denominated in a basket of emerging-market currencies, the proceeds of which would fund fresh loans or currency swaps of old loans up to the amount in each exotic currency raised in the market, for the purpose of minimizing or eliminating the IFIs' currency exposures.[66] On the positive side, the issuance of this global bond (targeted to hedge funds or large investment banks) would minimize the crowding out of domestic borrowing, thus bringing new money to the table. On the negative side, demand for this exotic instrument may be limited, and the net supply of local-currency funding may need to be complemented by the IFIs' own currency positions.

To complement the need for external financing, IFIs should be able to structure loans that are serviced in U.S. dollars linked to the local currency. In this case, however, IFIs would take the currency risks on their balance sheets. Structuring debt linked to local currency could be done throughout LAC, especially where the bond and swap market are not an option. These loans would be priced to include a premium covering the currency and

[65] All of the target countries included in the first stage of the fund (and most of those included in the second stage) listed in IBRD (2007) already have fairly developed local-currency bond markets with an international investor base.

[66] See Hausmann and Rigobón (2002) for an early version of this scheme. A natural way to mitigate the crowding out would be to focus the fund on international issues. In order to avoid convertibility and transfer events (essentially, the risk that foreign exchange and capital controls prevent the conversion and repatriation of the local-currency cash flows associated to the bond), the fund can structure both bonds and loans to be settled abroad in U.S. dollars for a value linked to the local currency.

interest-rate risk that would be assumed by the IFIs. The premium could be based on the required rate of return of the risk capital allocated to this facility. This instrument, which would be free from such cross-border problems as convertibility and transferability issues, would offer countries the ability to fund in local currencies where markets do not exist, and to reduce currency and refinancing risks.

Conclusions

In the previous chapters, we reached one recurring conclusion: countries should cover themselves against insurable external shocks, so long as insurance is offered at a reasonable cost. This point is at the center of the policy debate on country insurance. The debate hinges not on the convenience of smoothing macroeconomic volatility (in the context of imperfect financial markets that offer limited scope for individual consumption smoothing) but on the choice of efficient (reasonably priced) insurance and the ways in which sovereigns, private markets, and IFIs could make insurance more efficient. In a nutshell, the country insurance debate narrows down to a single, complex trade-off between insurance benefits and insurance costs.

This conclusion was apparent in the discussion of alternative country insurance strategies to cope with natural disasters. In light of the well-documented high premium of catastrophe insurance, only when the welfare impact of a disaster merits it (in particular, only in the case of small island nations for which a natural disaster carries truly systemic consequences), the resort to expensive market insurance may be warranted. Two corollaries followed from this analysis:

- In most cases, insurance is justified to cover the most urgent needs for funds right after the disaster, including many small, low-income island economies that usually rely on concessionary lending or grants that mitigate income losses but fall short of filling this short-term liquidity gap.
- While catastrophe insurance has some irreducible cost components (associated with the share of catastrophe risk that is not globally diversifiable), it could be made more affordable (insurance markets are opaque and concentrated). Financial development (e.g., developing the market for parametric cat bonds) and more active participation of IFIs (e.g., by creating such vehicles as the recently launched CCRIF or even through catastrophe-contingent credit lines) have a substantive role to play.

Catastrophe risk is the perfect starting point for approaching the issue for two reasons. First, it is truly exogenous, and therefore, truly insurable. Moral hazard considerations that plagued the country insurance debate so far should play no role here.[67] Second, it is concentrated and big, and difficult to diversify. As a result, it is served by specialized and often inefficient markets, where financial innovation can play a decisive role.

[67] While self-protection may affect the losses, owing to a catastrophe, our discussion–as much of the recent debate on catastrophe insurance–is centered on parametric insurance, where insurance outlays are, *a fortiori*, independent of the actual loss sustained by the insured party.

The same considerations apply, albeit to a lesser extent, to other real and financial shocks. On the positive side, these shocks are smaller, more frequent, and more easily diversified. On the negative side, derivative markets and contingent financial contracts, when available, are offered at a moderate but still substantive premium because of insufficient liquidity or credit-risk considerations. The relevant question is, again, not whether countries should insure against cyclical shocks or financial contagion but rather whether they should do so at current costs –and what can be done to reduce these costs.

The solutions adopted by emerging economies reflect these trade-offs: there are very few insurance experiences. Indeed, the high propensity to self insure against liquidity runs by accumulating reserves speaks of the high cost (and low reliability) of contingent finance, the natural insurance option. Similarly, the popularity of stabilization funds rather than hedging through derivatives partly reflects the lack of capacity and integrated asset-liability management strategies in the countries and the limitations, in terms of coverage and cost, of derivative markets. Political economy considerations may also explain the scarcity of insurance which requires paying a premium every year in exchange of a transfer than might never materialize.

More generally, the lack of efficient and politically manageable sources of country insurance against liquidity runs has led most countries to misallocate scarce resources to precautionary reserves (financed either through debt or through reduced investment and consumption) or to retain the risk, relying on forms of *ex-post* assistance (such as IFI lending), rather than transferring part of these risks to the market through an insurance arrangement. This is a choice that explains, in turn, the characteristic macroeconomic volatility of most developing countries and their chronic dependence on external flows.[68]

A few LAC countries particularly exposed to commodity prices have bought short-term hedges against large price movements. But, as we have illustrated with the Mexican example, the government's decision has covered risk for just one fiscal year. This type of short-term hedging strategy is sometimes used to cover liquidity shortfalls and to provide a "breathing space" for the country to adjust to a changing environment.[69] Whereas it is difficult to think of a country insurance scheme that could really insure an economy against the lasting effects of a major shock, a hedge could be designed to allow the government the time needed to introduce policies to deal with the effects of the shock. Even in this light, one fiscal year seems too short a horizon.

What strategies then should LAC countries use to reduce their vulnerability to exogenous shocks? At the very least, the strategy should seek to create sufficient fiscal space to pursue countercyclical fiscal policies. This requires increasing access to local and international capital markets to enhance the ability of LAC countries to effectively

[68]The self insurance and especially self-protection strategies that many middle-income (and most LAC) economies have pursued in recent years, while costly, are not without benefits. In particular, many LAC countries are now much less vulnerable to dollar liquidity runs than they have ever been in the past, which suggests that the economic cycle will be increasingly determined by real rather than financial shocks.

[69] For example, a cat bond allows the government to cover its short-term post-disaster liquidity needs, while oil put "insures" its current budget allocation and avoids the political cost of having to issue a new budget appropriation law to deal with a temporary revenue shortfall.

smooth consumption and investments across time–rather than amplify cyclical swings as in the recent past. This would require the development and execution of a risk management strategy by LAC countries using such tools as derivatives and contingent debt to reduce their vulnerability. Ultimately, debt management is the first-resort country insurance strategy and the front on which financial innovation and outside assistance could most usefully concentrate.

In the case of less diversified economies, risk-transfer strategies could play a bigger role in coping with the "fat tails" of volatile output, complementing countercyclical monetary and fiscal policies, to an extent that will depend on the availability and cost of the proper instruments. Here is where the IFIs should intervene to complement the market, developing underdeveloped hedging markets and even bearing part of the risks themselves.

On this front, the IFIs–with IBRD arguably taking a more proactive role–have started to develop products and/or financial schemes that specifically address the need and the desire for emerging economies to enjoy better and more cost-efficient access to country insurance solutions. Thus, several initiatives are currently under way to help catalyze market-based solutions to mitigate natural catastrophe risks within the context of a country's overall catastrophe risk management strategy. Among these initiatives, two are specially worth mentioning:

The first initiative is the *Global Catastrophe Mutual Bond (GCMB) or "global cat bond*" (refer back to Box 3.2 for a description of cat bonds). This facility would involve creating a special purpose vehicle (SPV) that would write insurance contracts with individual ceding countries. The contracts would provide the countries insurance coverage for catastrophe risk in the desired amounts and probabilities of occurrence of the risk events, and would be written for multi-year periods (three-five years). The contracts would provide insurance coverage on a "parametric" rather than an "indemnity basis." This means that payouts under the contracts would be based on the actual values of pre-specified parameters (such as the intensity of an earthquake as measured by a Richter scale), rather than an actual assessment of damage and loss. This would allow the insurance payouts to be made promptly after the occurrence of a risk event. The SPV would also issue a catastrophe bond in the capital markets. The proceeds of the bond would be invested in triple-A assets and kept in a collateral trust. These assets would form the source of payouts under the insurance contracts if a covered risk event were to occur. The remaining asset values would be returned to the investors at the maturity of the bond. If no risk event occurred during the life of the bond, the entire principal would be returned to the investors at maturity. Thus, the investors in the bond take the risk that part or all of their principal would be lost owing to the occurrence of covered risk events during the life of the bond. The investors would receive a coupon reflecting a premium for this risk. Essentially, the GCMB is a multi-country/multi-peril capital market insurance instrument that transfers natural catastrophe risk to capital market investors, with the objective of reducing the overall cost of insurance. The risk-taking capacity in global markets and the diversification offered by the pool should result in attractive pricing for the bond and therefore in low insurance premiums. IBRD is already working

together with some of its member countries to assemble a pool of regions/risks that will, as described above, be structured as a cat bond and placed in capital markets.

Another initiative is the IBRD's effort to help its client countries insure themselves against external shocks is the recently approved proposal to enhance the *IBRD Deferred Drawdown Option (DDO)* and to introduce a DDO Option for Catastrophic Risk (Cat DDO). This initiative aims to address two separate, yet interconnected, issues: the need of most emerging economies to enjoy ready access to contingent credit lines for either general liquidity purposes (i.e. the Development Policy Loan DDO (DPL DDO)) or to be able to cope with natural disasters (Cat DDO). Thus, under the DPL DDO facility, the IBRD would provide borrowers with access to long-term IBRD resources to maintain ongoing structural programs if a financing need materializes. It would also provide a formal basis for continued policy-based engagement with the Bank when the borrower has no need for immediate funding but values Bank advice and access to immediate liquidity whenever deemed necessary. Conversely, under the CAT-DDO, the IBRD would work with its members to develop or enhance the capacity of borrowers to manage natural hazard risk, and to provide a source of immediately-available liquidity that could serve as bridge financing while other sources (e.g., concessional funding, bilateral aid, or reconstruction loans) are mobilized following a natural disaster. The CAT-DDO is consistent with the Bank's emphasis on disaster prevention, as opposed to disaster response, as the presence of a hazard risk management program would be a prerequisite.

These two initiatives, together with the already mentioned Caribbean Catastrophe Risk Insurance Facility (refer back to Box 3.3) are just a few examples of the IFIs' ongoing efforts to help their clients gain–in a cost efficient manner–better access to insurance instruments for general liquidity needs and/or catastrophic events. These initiatives represent only a small component of the ever-expanding spectrum of risk management instruments and products that IFIs are currently providing to their member countries, in the context of a country's overall insurance strategy against external shocks.

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Appendix: Real indexed sovereign instruments: A survey[70]

Existing proposals

Proposals to improve the design or legal framework of sovereign-debt contracts can be grouped broadly under two categories: those focused on diminishing the costs of debt crises and those aimed at reducing their frequency. Proposals aimed at limiting the cost of crises include suggestions to introduce collective action clauses in contracts of sovereign bankruptcy institutions that may simplify and reduce the costs of the restructuring process once a default occurs. Proposalas aimed at limiting the frequency of debt crises, on which we focus in this survey, emphasize the potential benefits of making sovereign debt contracts explicitly contingent, indexing debt payments to real variables related to the economic performance of the debtor country.

Proposals to index sovereign-debt payments to real variables have been around for nearly twenty-five years, since the debt crisis of the 1980s. Around that time, Bailey (1983) suggested that debt should be converted into claims proportional to exports, and Lessard and Williamson (1985) made the case for real indexation of debt claims. A few years later, Shiller (1993) discussed the importance of creating macromarkets for perpetuities linked to GDP.

The recent string of sovereign-debt crises in Russia, Ecuador, Pakistan, Ukraine, and Argentina generated a second wave of interest in contingent sovereign-debt contracts for emerging countries. Haldane (1999), Daniel (2001), and Caballero (2003) suggested that countries would benefit from issuing debt indexed to some relevant commodity price. Drèze (2000) argued for the use of GDP-indexed bonds as part of a strategy to restructure the debt of the poorest countries, and Borensztein and Mauro (2002, 2004) tried to revive the case for GDP-indexed bonds for emerging countries.

The basic idea behind all of these proposals is to use contingent sovereign debt to improve risk sharing between debtor countries and international creditors and, in so doing, reduce the probability of occurrence of debt crises. One important difference among the proposals is whether they suggest indexing the debt instruments to variables partially under the control of the government or beyond it. While indexation to such broader measures as GDP or exports that are partly under the control of the government would likely provide greater insurance benefits, potential investors may be concerned about the authorities' incentives to tamper with data or undertake less growth-oriented policies. These concerns about the potential risks of moral hazard were first discussed in this context by Krugman (1988) and Froot, Scharfstein, and Stein (1989).

It is not clear how relevant these moral hazard issues are in reality. But, if they were, the option of indexing debt contracts to commodity prices outside the control of the

[70]This appendix, prepared by Sandleris and Taddei (2007), draws extensively on Borensztein and Mauro (2002) and Borensztein and others (2004).

government would only be useful to a small group of emerging-market countries since GDP growth is poorly correlated with these variables in most emerging markets.

Existing experiences

Although more than twenty developing and developed countries have issued inflation-indexed debt, experience with bonds indexed to real variables is far more limited. Table A.1 summarizes these experiences.

Table A.1 Countries issuing real indexed bonds

Type	Country
GDP-indexed	Costa Rica (1990), Bosnia and Herzegovina (1990s), Bulgaria (1994), Argentina (2005)
Commodity-indexed	US (1864), France (1970s), Mexico (1990s), Nigeria (1990s), Venezuela (1990s)

Source: Borensztein and others 2004.

Argentina's GDP warrant

The most recent experience with sovereign bonds indexed to real variables is Argentina's GDP warrant. In March 2005, Argentina completed the debt-restructuring process that followed the default and financial crisis of 2001.[71] Each new bond issued in the restructuring included a unit of GDP-linked warrants. These warrants were tied to the bonds for the first 180 days and became detachable thereafter.

Given the magnitude of the restructuring, Argentina's GDP warrants are the first sovereign-debt instruments indexed to real variables for which there is a sizable market. The GDP-linked securities have a notional amount equal to the corresponding defaulted debt tendered and accepted in the 2005 restructuring, converted to the corresponding currency using the exchange rate as of December 31, 2003 (roughly $62 billion).

Payments on the GDP-linked securities take place only if the following three conditions are met:[72] actual real GDP exceeds the base-case GDP for each reference year; annual growth in actual real GDP exceeds the growth rate in the base-case GDP for the reference year (base-case GDP real annual growth rate is 3.5 percent a year initially, gradually converging to 3 percent); and total payments made on the security do not exceed the payment cap of 48 percent of the notional amount during the life of the security.[73]

Whenever these three conditions are met, the formula used to calculate the payments for each notional unit of the warrants is:

Payment = 0.05*Excess GDP*unit of currency coefficient,

where excess GDP is the amount by which actual real GDP is converted into nominal GDP using the GDP deflator, exceeds the base case nominal GDP, and the Unit of

[71] A relatively small number of holdout creditors have still not accepted the restructuring.
[72] In all cases, calculations are based on the data published by Argentina's Bureau of Statistics (INDEC).
[73] The GDP warrants expire when the $0.48 per dollar cap is reached, and no later than December 15, 2035.

currency coefficient is defined as: USD: 1/81.8 = 0.012225, EUR: (1/81.8)*(1/0.7945) = 0.015387, ARS: (1/81.8)*(1/2.91750) = 0.004190.

As GDP data are usually published with a lag of a couple of months and are usually revised in subsequent months, payments are calculated in November following the relevant reference year and are made effective a month later. This creates a lag of one year between the economic performance that might trigger a payment and the payment itself. Thus, potentially troublesome situations may arise for the government. For example, assume that after a year of very high growth (which meets all the conditions for the payment), an adverse shock pushes the economy into recession. The lag in the payments of the GDP warrants implies that the government will have to make a large payment precisely during the recession.

Trading of GDP warrants began in a "when and if" market before they were detached. In May 2005, the consensus value of the GDP warrant with dollar coupon among investors was $0.02 per dollar—although pricing models placed its fair value between $0.06 and $0.08, suggesting the presence of a strong market discount that reflected a liquidity premium and the complexity of the instrument itself. On July 21, 2005, the first available date with data from the "when and if" market, the bid price for the GDP warrants was $0.03 per dollar coupon (already a 50 percent increase in two months). By the end of 2005, Argentina's outstanding growth rates and a better understanding of the instrument led the markets to reevaluate their assessment of the value of the GDP warrant. The price almost tripled relative to the consensus value on issuance. By the end of 2006, its price reached $0.13 per dollar coupon, six times the consensus value at the time of the exchange and four times the first available trading price; this increase reflected the lower discount rate and the positive growth surprise, as well as the decline in the premium that penalized the bond at the time of its primary issuance.

The first payment of the GDP warrant took place in December 2006, amounting to $387 million. In fact, given the current consensus forecast for GDP growth in Argentina, payments on the indexed component are expected to triple in the next two years. In 2008, payments of the indexed component are expected to be roughly equivalent to total coupon payments (plus capitalization) on the three new bonds issued in the restructuring considered together.

Despite the weak interest initially shown by investors, the market for Argentina's GDP warrant has taken off in recent years, fueled by the strong performance of Argentina's economy. This is good news for GDP-indexed bonds, as it would be the first successful case of such an instrument. But, it is inevitable to wonder whether it was a good idea to include them in the exchange from the point of view of Argentina, given that the bonds did not seem to have any significant impact in the level of acceptance of the proposal (despite the fact that expected payments at the time of issuance were relatively high). More generally, the Argentinean experience raises the question of the liquidity-versus-basis-risk trade-off--namely, that between customized instruments with high hedging potential, on the one hand, and steep liquidity premiums, on the other.

Brady bonds with value recovery rights

Some years before Argentina's experience with GDP-warrants, a handful of emerging-market economies issued bonds with elements of real indexation. For example, various Brady bonds issued by Bosnia and Herzegovina, Bulgaria, Costa Rica, Mexico, Nigeria, and Venezuela in exchange for defaulted loans in the early 1990s included value recovery rights (VRRs). The VRRs were designed to provide the banks with a partial recovery of value lost as a result of the debt and debt-service reduction contemplated in the Brady exchange, in the event of a significant increase in the debtor country's capacity to service its external debt. Mexico's VRRs, for example, provided for the possibility of quarterly payments, beginning in 1996, based on certain increases in the price of oil.

Brady bonds issued by Bosnia and Herzegovina, Bulgaria, and Costa Rica contained elements of indexation to GDP. In the case of Bulgaria, for example, its discount Brady bonds had a component called additional interest payments (AIP) that was indexed to GDP. The AIP are triggered when two conditions are met: Bulgaria's GDP exceeds 125 percent of its 1993 level, and GDP increases on a year-over-year basis. For these years (not including the year in which the threshold is reached), the semiannual interest supplement was defined as half of that year's GDP growth. The outlays themselves were scheduled to occur "as soon as practically possible" and were to coincide with regular interest payment dates. The AIP were not warrants, detachable or otherwise, although they were intrinsically equivalent.

Bulgaria's GDP-linked bond was generally seen as a failure because of two characteristics. First, the bonds were callable at par. This meant that the government could decide to repurchase the bonds rather than pay out when faced with onerous GDP-linked payments, and, as a result, investors would miss out on the lucrative upside. In fact, this is exactly what happened. A second problem with Bulgaria's bonds was that the conditions were fairly vague. In effect, the GDP itself was not well defined, so the exact measure to be used was open to interpretation. The government exploited this ambiguity for a while, choosing definitions of GDP that prevented the AIP from being triggered.

Bosnia and Herzegovina's GDP-linked Brady bonds included additional interest payments whenever GDP growth exceeded a predetermined growth rate for two years and GDP per capita rose above $2,800 (1997 rate, adjusted by the German CPI). These bonds have also suffered problems in the definition of GDP, and their trading activity has been very limited.

In general, the experience with VRRs has not been positive. Indexation formulas were complex and often ambiguous. There were restrictions on their tradability and many times were not detachable, and some of the bonds were callable.

Commodity-linked bonds

The main advantages of bonds indexed to commodity prices are that the data are available without a time lag and are not subject to government manipulation. Compared with GDP-linked bonds, however, their main disadvantage is that for most countries the correlation between economic performance and commodity prices is relatively low.

Bonds whose repayments are indexed to commodity prices have been used, although rarely, since the 1700s. In 1782, the State of Virginia issued bonds linked to the price of land and slaves. In 1863, the Confederate States of America issued "cotton bonds," whose payments increased with the price of cotton. "Gold clauses," effectively indexing payments to the price of gold, were widespread in the United States in the 19th century through 1933. France also experimented with gold-price-indexed bonds, the "Giscard," in 1973, but the losses caused by the depreciation of the French franc caused the government to cease offering this instrument.

Oil-backed bonds appeared in the financial markets in the late 1970s. Mexico is considered the first country to offer oil-linked bonds in April 1977. The "Petrobonos" were issued domestically on behalf of the government by NAFINSA, a development bank owned by the Mexican government. They had a relatively active domestic secondary market in which most investors were Mexican. The bond promised to pay an annual rate of 12.6 percent and had a three-year maturity. Upon maturity, the Petrobonos were redeemed at a value equal to the maximum of the face value, or the market value of the referenced units of oil plus all coupons received during the life of the bond.

Other countries and private companies have also experimented with commodity-linked bonds. For instance, Venezuela issued oil-linked bonds as part of its Brady agreement. India issued oil-linked bonds to oil companies in April 1998 in payment for debts it had incurred by receiving oil products below market cost. Malaysia accepted a loan from Citibank indexed to palm oil.

More recently, loans combined with protection (through swaps) from commodity price fluctuations have also been made available by the World Bank to member countries, beginning in September 1999, although interest has thus far been limited.