
Measuring Currency Mismatch: Beyond Original Sin

A currency mismatch refers to how a change in the exchange rate will affect the present discounted value of future income and expenditure flows. This will depend on two broad elements. One is the currency denomination of financial assets and liabilities: the more sensitive the net financial worth to changes in the exchange rate, the greater, *ceteris paribus*, the currency mismatch. The other is the currency denomination of future income and expenditure flows (other than returns to capital assets). Once such a broad perspective is adopted, significant differences in the degree of currency mismatch are revealed both across emerging economies and over time.

As an analytical counterpoint to our proposed definition of currency mismatch, suppose one attempted to gauge aggregate currency mismatch by looking only at the share of international bonds and bank loans denominated in the borrower's local currency—that is, suppose one used measures of original sin as a sufficient statistic for drawing inferences about aggregate currency mismatch. How might the original sin measures lead one astray? It turns out that the answer is helpful in understanding what should be included in a good measure of currency mismatch.

Original Sin: A Misleading Measure

Table 3.1, taken from Eichengreen, Hausmann, and Panizza (2002), gives three measures of original sin. These measures are defined as one minus the percentage of own currency-denominated securities in the relevant

Table 3.1 Measures of original sin by country groupings, simple average (billions of dollars)

Group	OSIN1	OSIN1	OSIN2	OSIN2	OSIN3	OSIN3
	1993–98	1999–2001	1993–98	1999–2001	1993–98	1999–2001
Financial centers	0.58	0.53	0.34	0.37	0.07	0.08
Euroland	0.86	0.52	0.55	0.72	0.53	0.09 ^a
Other developed	0.90	0.94	0.80	0.82	0.78	0.72
Offshore	0.98	0.97	0.95	0.98	0.96	0.87
Developing	1.00	0.99	0.98	0.99	0.96	0.93
Latin America and the Caribbean	1.00	1.00	1.00	1.00	0.98	1.00
Middle East and Africa	1.00	0.99	0.97	0.99	0.95	0.90
Asia Pacific	1.00	0.99	0.95	0.99	0.99	0.94
Eastern Europe	0.99	1.00	0.97	0.98	0.91	0.84

a. For 1999–2001, it was impossible to allocate the debt issued by nonresidents in euros to any of the individual member countries of the currency union. Hence, the number is not the simple average but is calculated taking Euroland as a whole.

$$OSIN1_i = 1 - \left(\frac{\text{Securities issued by country } i \text{ in currency } i}{\text{Securities issued by country } i} \right)$$

$$OSIN2_i = \max(INDEXA_i, OSIN3_i)$$

$$\text{where } INDEXA_i = \left(\frac{\text{Securities} + \text{loans issued by country } i \text{ in major currencies}}{\text{Securities} + \text{loans issued by country } i} \right)$$

$$INDEXB_i = 1 - \left(\frac{\text{Securities in currency } i}{\text{Securities issued by country } i} \right)$$

$$OSIN3_i = \max \left(1 - \frac{\text{Securities in currency } i}{\text{Securities issued by country } i}, 0 \right)$$

Notice that $OSIN2 > OSIN3$ by construction and that, in most cases, $OSIN1 > OSIN2$.

Source: Eichengreen, Hausmann, and Panizza (2002).

total, so that the closer the ratio to one (zero), the greater (smaller) the original sin and implied currency mismatch. These original sin calculations suggest that currency mismatch is pervasive in all developing-country groups, and the mismatch has been persistent over 1993–2001. Another strong implication of table 3.1 is that developing countries face a much larger currency mismatch than not only issuers of the five major currencies but also small industrial countries.

Using original sin as a measure of aggregate currency mismatch would be misleading on at least five important counts. First, it ignores cross-country differences in export openness, reserve holdings, and the size of foreign assets more generally, which can be crucial for assessing currency risk. Consider two net debtor countries (A and B) that have identical shares of foreign currency–denominated debt in total external debt.

Table 3.2 Export openness, 1994–2002 (exports as a percent of GDP)

Region/country	1994	1995	1996	1997	1998	1999	2000	2001	2002
Latin America^a	14.4	16.9	17.7	16.9	16.3	18.0	19.5	19.2	22.5
Argentina	7.5	9.7	10.4	10.6	10.4	9.8	12.5	11.5	27.7
Brazil	9.5	7.7	7.0	7.5	7.4	10.3	10.7	13.2	15.8
Chile	29.3	30.5	27.3	27.1	26.3	29.3	31.7	34.7	34.0
Colombia	15.0	14.5	15.2	14.8	15.0	18.3	21.5	20.8	19.7
Mexico	16.8	30.4	32.1	30.3	30.7	30.8	31.0	27.4	27.2
Peru	12.8	12.5	13.1	14.2	13.2	14.7	16.0	15.8	16.1
Venezuela	30.9	27.1	36.5	28.4	19.9	21.6	28.4	22.3	31.4
Asia, large economies^a	20.8	21.0	20.7	22.6	23.4	23.1	26.4	25.6	28.2
China	22.0	21.0	20.9	22.9	21.7	22.1	25.9	25.1	29.3
India	10.0	11.0	10.6	10.9	11.2	11.8	13.8	14.2	15.2
Korea	27.8	30.2	29.5	34.7	49.7	42.3	44.8	42.8	40.0
Taiwan	43.9	48.5	48.4	49.0	48.4	48.0	54.0	50.2	53.7
Other Asia^a	37.9	39.6	39.1	44.0	60.4	53.5	60.4	57.5	54.4
Indonesia	26.5	26.3	25.8	27.9	51.2	34.9	42.4	41.1	34.7
Malaysia	89.2	94.1	91.6	93.3	115.7	121.3	124.8	116.3	113.8
Philippines	33.8	36.4	40.5	49.0	52.2	51.5	56.2	49.0	51.7
Thailand	38.9	41.8	39.3	48.0	58.9	58.4	67.0	66.4	64.8
Central Europe^a	31.8	36.5	36.5	39.4	42.9	42.7	48.8	48.4	45.7
Czech Republic	50.5	53.6	52.5	56.5	58.8	60.6	69.8	70.8	65.2
Hungary	28.9	44.4	48.5	55.1	62.6	65.2	74.9	74.4	64.5
Poland	23.8	25.4	24.4	25.6	28.2	26.1	29.4	28.4	29.6
Russia	27.8	26.9	24.2	23.9	30.6	43.8	44.1	36.2	34.4
Israel	32.6	30.6	29.8	30.4	31.6	36.0	40.6	35.5	36.9
Turkey	21.4	19.9	21.5	24.6	24.3	23.2	24.0	33.7	28.9
South Africa	22.2	23.0	24.6	24.6	25.7	25.7	28.6	30.6	34.0

a. Weighted average of countries shown, based on 1995 GDP and PPP exchange rates.

Note: Exports include goods and services per the national accounts definition, except China and Taiwan, for which the balance-of-payments definition is used.

Sources: IMF's *International Financial Statistics* and national sources.

Assume country A has twice as high a ratio of exports to income as country B. Should it then be concluded that the two countries face an identical currency mismatch? Of course not. Both sides of the net income statement and the balance sheet are relevant for gauging the extent of the currency mismatch. For most of the past decade, Argentina and Brazil, for example, have had ratios of exports to GDP that hovered in the 7 to 13 percent range—less than half that of Mexico and Chile and less than a fifth that of typical Asian emerging economies (table 3.2).¹ At identical original sin ratios, Argentina will, *ceteris paribus*, have a much larger currency mismatch than Mexico or Singapore. The same line of argument about

1. Argentina's ratio of exports to GDP mushroomed in 2002 because of the deep recession and the effects of the sharp fall in the peso exchange rate on both GDP measured in dollars and export earnings.

cross-country differences also applies to holdings of international reserves and foreign assets more broadly. Whereas monetary authorities of some emerging economies, such as Korea and Malaysia, have net foreign assets (in 2002) that are five to seven times larger than currency held outside banks, those in others, such as the Philippines, Brazil, and Poland, have much lower ratios (less than three). Likewise, data on net international investment positions taken from the IMF's *Balance of Payments Yearbook* reveal sharp differences among emerging economies. For example, foreign assets (in 2002) accounted for less than 10 percent of foreign liabilities in Ecuador but for 66 and 86 percent in Chile and the Czech Republic, respectively; in Hong Kong and Singapore, foreign assets exceed foreign liabilities (i.e., they are net creditors, not net debtors).² Since our preferred measures of currency mismatch consider both assets and liabilities, they are not subject to this pitfall.

Second, and in a similar vein, an original sin measure would ignore changes in foreign-currency receipts and assets over time. Consider a net debtor country where the share of foreign currency-denominated debt in total corporate debt increased from one-third in 1994 to one-half in 2000. According to the original sin measure, its currency mismatch would have increased. But suppose that over the same period its exports increased much more, so that the ratio of foreign-currency debt to exports fell from, say, almost four to one and a half. Clearly, the country's currency mismatch would have fallen, not risen. This is not a hypothetical case. It is in fact a summary of the evolution of (corporate) currency mismatch in Mexico (Martinez and Werner 2001). If one leaves out changes in the asset side of the aggregate currency balance sheet, one can miss much of the action in time-series variation of currency risk. When both sides of the balance sheet are considered, aggregate measures of currency mismatch are not nearly as persistent as original sin measures would suggest. In table 2.1, for example, the ratio of short-term external debt to international reserves in four Asian-crisis countries was roughly half as high in 1999 as it was in 1996. Another implication is that original sin ratios based on the liability side of the balance sheet are not likely to be good leading indicators of the timing of financial crises in emerging economies (since such ratios move very little over time).³ In contrast, and as discussed earlier,

2. Figures on foreign assets and liabilities don't reveal the currency composition of these positions but are suggestive of nontrivial cross-country differences in currency risk.

3. Measures of dollarization in the *domestic* financial system show more variation across countries and over time than do original sin ratios (of external borrowing). Yet even empirical studies of domestic dollarization have produced quite mixed results. Arteta (2003), for example, finds no evidence that high liability dollarization in the banking system heightens the probability of banking crises or currency crashes in emerging economies or that such crises are more costly in countries where bank liability dollarization is high. Reinhart, Rogoff, and Savastano (2003a) find, *inter alia*, that dollarization has little impact on the

currency mismatch measures that capture both sides of the balance sheet (e.g., the ratio of short-term external debt to reserves and the ratios of bank and corporate foreign debt to exports) have done well in leading-indicator exercises of currency and banking crises in emerging economies, and the output costs of such crises have been shown to be higher when currency mismatch (so measured) was large than when it was small.

Third, the original sin measure—like all aggregate measures of currency mismatch—ignores the key question of who bears the currency risk within an emerging economy. This is particularly relevant when producers of nontradables that do not generate foreign revenue to service the debt undertake a significant share of external borrowing. Once again, consider (net debtor) countries A and B with identical original sin ratios. But assume that exporters exclusively undertake country A's dollar borrowing whereas real estate companies that operate exclusively in the domestic economy undertake country B's dollar borrowing. Do these two countries face identical currency mismatches? Certainly not. Country A's mismatch is likely to be much lower than country B's. One of the lessons of the Asian financial crisis of 1997–98 is that using short-term external foreign currency–denominated borrowing to fund long-term real estate investments is hazardous. Similarly, a country where the government does the bulk of external borrowing is apt to have a larger currency mismatch than one where exporters do the bulk of the borrowing because government taxes are typically denominated in domestic currency while most external borrowing is denominated in foreign currency. Going in the same direction, firm-level studies have shown that the investment effects of a currency depreciation are different when firms have export revenues and when they do not. Again, original sin ratios would not pick any of this up. To capture the incidence of foreign exchange risk in the economy, one needs disaggregated data on the allocation of credit and on the characteristics of the borrower. None of the aggregate measures of currency risk will capture this incidence of risk very well. But original sin measures of currency risk can be particularly misleading because they ignore differences across (net debtor) countries and over time in the asset side of the balance sheet; they are thus more likely to miss even gross differences in the tradable/nontradable distinction.

Yet a fourth problem with the original sin measure of mismatch is that it would restrict attention to international bonds and bank loans. It therefore ignores the currency composition and increasing importance of the domestic bond market, the participation of global investors in domestic bond markets, and bank lending by the domestic affiliates of foreign-

effectiveness of monetary policy, that output fluctuations are fairly similar in countries with different degrees and varieties of dollarization, and that exchange rate–linked government debt increases crisis vulnerability. De Nicolo, Honohan, and Ize (2003) find that financial intermediaries in dollarized financial systems are prone to higher risk.

Table 3.3 Bond market development, end-2001

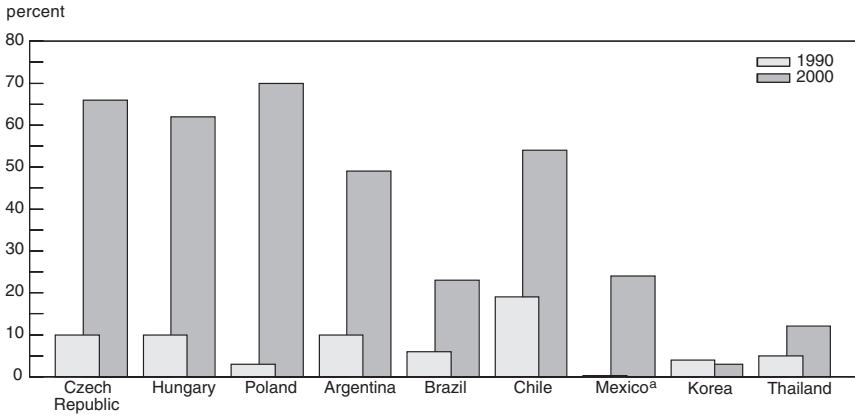
Region	Bonds outstanding (percent of GDP)	Local currency– denominated (percent of total)	Dollar-denominated (percent of total)
Euro area	109	88	5
Japan	116	99	1
United Kingdom	92	74	15
Canada	92	71	23
Latin America	30	47	42
Emerging Asia	41	88	10
Other	59	75	13
Total non-US	85	87	7
United States	142	98	—

Sources: Burger and Warnock (2002). Data on dollar-denominated bonds and notes are from security-level data underlying table 14B (International Bonds and Notes by Country of Residence) in BIS, *International Banking and Financial Market Developments*. Local currency-denominated debt is the sum of the long-term debt component of BIS table 16A (Domestic Debt Securities) and the local-currency portion of table 14B. Domestic debt for countries not available in table 16A is from the IMF's *Government Finance Statistics Yearbook* and Merrill Lynch (2002). Total non-US includes only the 50 countries in Burger and Warnock's sample.

owned banks operating in emerging economies. It turns out that these exclusions are crucial for drawing conclusions about if and how emerging economies differ from industrial countries as well as about how significant financial activity in domestic currency vis-à-vis that in foreign currency is. What's more, one should guard against any suggestion that only external borrowing by emerging economies (because it involves a transfer of resources to relatively poor countries) should be considered in examining the path to lower financial fragility there; recent research indicates that domestic financial intermediation generates significant benefits and may well reduce some of the vulnerabilities associated with heavy reliance on external borrowing.

Until recently, it was not possible to get comprehensive data on the currency composition of domestic bond markets in emerging economies. In recent years, however, the scope of the Bank for International Settlements' banking and financial market statistics has been broadened to include domestic debt securities in emerging markets, complementing the data on international bond issuance. In a recent paper John Burger and Francis Warnock (2002) summarize and analyze these data (as of end-2001) for 50 countries (table 3.3). The key observation is that once the total bond market is considered, the share of the bond market denominated in local currency is not that different between emerging economies and industrial countries. In Asian emerging economies, the local-currency share of the bond market is 88 percent—higher than the local-currency

Figure 3.1 Market share of foreign-owned banks in emerging markets



a. If the foreign-owned banks that have effective control without holding more than 50 percent of equity are included, the proportion would be over 40 percent in 2000.

Note: Data include banks where foreigners hold more than 50 percent of equity.

Source: Central banks.

share in Canada (71 percent) and the United Kingdom (74 percent) and identical to the local-currency share in the euro area (88 percent). It is in Latin America that the local-currency share of the bond market (47 percent) is significantly lower than elsewhere. Since global investors do participate in local bond markets and since local bond markets in all regions (including the industrial countries) represent the largest share of the total bond market, excluding them from the analysis of currency mismatch would be hard to defend.⁴ As Burger and Warnock (2002) emphasize, the data in table 3.3 suggest that if there is a robust difference between industrial and emerging economies as regards bond markets, it is that the size of the total bond market (relative to GDP) is much smaller in emerging economies than it is in industrial countries—not a difference in the currency composition of the bond market, as the original sin hypothesis (OSH) suggests.

Similarly, a lot of the action in emerging-market finance is missed when one concentrates only on cross-border bank lending in domestic currency. A more comprehensive picture needs to include lending in local currency by foreign affiliates of industrial-country banks operating in emerging economies. Foreign presence in emerging-market banking systems has been increasing in the 1990s and now stands above 50 percent in Hungary, Chile, Poland, and the Czech Republic (figure 3.1). Also, lending

4. Reinhart, Rogoff, and Savastano (2003b, 42) share this view when they argue that “the view that only external debt is a completely separate matter is clearly wrong. Foreigners often hold domestically-issued debt, and domestic residents often hold foreign-issued debt—indeed, the process of liberalization encourages active arbitrage across the two markets.”

Table 3.4 Foreign banks' consolidated claims, local and international, 1990–2003 (billions of dollars)

Region	1990	1995	1996	1997	1998	1999	2000	2001	2002	2003 Q3
Developing countries										
Local	52	124	153	251	279	304	434	523	542	575
International	531	752	855	995	938	881	885	838	802	884
Africa and Middle East										
Local	6	14	12	14	16	22	24	27	34	36
International	110	115	111	122	136	140	137	130	134	144
Asia and Pacific										
Local	27	56	65	73	81	95	117	123	143	165
International	134	307	368	421	337	299	278	252	238	282
Europe										
Local	3	9	12	36	39	38	62	87	112	128
International	103	118	135	171	175	165	184	181	202	235
Latin America and Caribbean										
Local	15	44	64	128	144	149	231	287	253	245
International	184	212	242	280	290	277	285	275	228	223

Note: Local claims comprise those of BIS reporting banks' foreign offices denominated in local currency. International claims are the sum of cross-border claims in all currencies and local claims of BIS reporting banks' foreign offices denominated in foreign currency only.

Source: Bank for International Settlements.

by foreign affiliates of industrial-country banks has been on a steady upward trend (as cross-border bank lending to developing countries has declined). Indeed, as shown in table 3.4, such local claims (denominated in local currency) by foreign affiliates now amount to more than a third of total foreign-bank claims (in all currencies) in developing countries as a group; in Latin America and the Caribbean, the local-claims share is above half. Why might foreign banks prefer to do domestic-currency lending via their foreign affiliates within emerging economies rather than via cross-border flows? One plausible answer is that foreign-bank affiliates take in domestic-currency deposits; as such, the degree of currency risk (for the lending bank) is much lower for local lending than it is for cross-border lending (where there is no obvious offset). This distinction is also reflected in the regulatory capital structure facing international banks: whereas cross-border bank lending in local currency (of the borrower) faces a capital charge for foreign exchange risk, domestic-currency lending by affiliates with domestic-currency deposits is not subject to such a capital charge.⁵

5. On this shift, see Hawkins (2003); Wooldridge, Domanski, and Cobau (2003); and Lubin (2003).

Some might argue that expanding the sources of local currency-denominated finance beyond international bonds and cross-border bank lending to include bank lending by local affiliates of foreign banks and domestic bonds is inappropriate—either because foreign banks merely displace lending by locally owned banks or because domestic bond markets make little use of foreign saving (and hence do not involve the transfer of real resources associated with cross-border purchases of bonds). We disagree.

Considerable empirical literature now supports the view that lower entry restrictions on foreign-owned banks in emerging economies improve the efficiency of the banking system, are associated with significant upgrades in the quality of regulation and disclosure, and reduce vulnerability to a crisis.⁶ Affiliates of foreign banks not only bring with them risk capital but also permit a diversification of risk and can serve as high-quality counterparties in hedging contracts. According to Gerard Caprio and Patrick Honohan (2001), there is no hard evidence that the local presence of foreign banks has destabilized the flow of credit or restricted access to small firms. Entry of foreign banks is thus by no means a zero-sum game for the host emerging economies—especially when it comes to reducing their financial fragility.

Likewise, as Richard Herring and N. Chatusripitak (2001) have convincingly argued, bond markets are central to the development of an efficient economic system, and further development of the domestic bond market in developing countries would offer significant benefits. Bond markets make financial markets more complete by generating market interest rates that reflect the opportunity cost of funds at each maturity; they avoid concentrating intermediation uniquely on banks; and they provide a useful market signal and disciplining device for macroeconomic policy. Having a well-functioning domestic bond market improves the supply of local currency-denominated finance and thus can help to reduce excessive reliance on (largely) foreign currency-denominated external finance. The existence of such a market also benefits those borrowers who rely on banks for finance: banks will be more able to offer long-term credit terms because they can use bond markets to hedge their maturity mismatches. Hence customers of banks, who never directly use bond markets, gain indirectly.

Summarizing a large body of cross-country empirical evidence, Caprio and Honohan (2001) report that there is a strong positive association between the level of financial development and economic growth and that both banking and market finance support economic growth.⁷ They find

6. See Barth, Caprio, and Levine (2000). Caprio and Honohan (2001) also show that foreign bank ownership (i.e., the percent of total banking assets owned by foreign banks) has been lower in crisis countries than in noncrisis ones. For a recent review of foreign banks in emerging markets, see CGFS (2004).

7. For other studies analyzing the link between financial market development and growth, see King and Levine (1993a, 1993b) and Khan and Senhadji (2000).

that the deeper the financial system, the lower (*ceteris paribus*) the economic volatility. While legitimate questions remain as to whether it is preferable to first develop a local bond market before relying on the external bond market or vice versa, we are unaware of robust evidence from the empirical literature that indicates that external bond markets offer large benefits for economic growth and crisis prevention but domestic ones do not. It is true that domestic debt markets, especially new ones, tend to be thin and the pricing volatile. This often discourages local debt managers from using these markets. But it is all too often forgotten that the pricing of the sovereign debt of highly indebted borrowers in international markets is also very volatile—witness the sharp swings in Brazilian spreads from mid-2002 to mid-2003. There are reasons to believe—and some evidence—that pricing in local markets improves as debt markets deepen. Accepting volatility in the early stages of local-market development can be regarded as an investment in the future. Just running to international markets “because deals can be done faster” does not constitute such an investment.

Indeed, some analysts have even begun to suggest that the presumption may have begun to shift against unconditional or premature financial globalization (at least for those developing countries in the early phases of financial integration and with relatively poor quality of domestic institutions). In this connection, the conclusions of a recent IMF study (Prasad et al. 2003) that reviews and evaluates the empirical evidence on the effects of financial globalization on developing countries are worth noting. Financial integration or globalization is measured in the IMF study in a variety of ways, including by government restrictions on capital account transactions and by the observed size of capital flows crossing the border. The authors conclude: (1) “an objective reading of the vast research effort to date suggests that there is no strong, robust and uniform support for the theoretical argument that financial globalization per se delivers a higher rate of economic growth” (p. 5); (2) “procyclical access to international capital markets appears to have had a perverse effect on the relative volatility of consumption for financial integrated developing economies” (p. 9); and (3) “A number of researchers have now concluded that most of the differences in per capita income across countries stem not from differences in capital-labor ratios, but from differences in total factor productivity, which, in turn, could be explained by ‘soft factors’ or ‘social infrastructure’ like governance, rule of law, and respect for property rights” (p. 31). In short, no analysis of the path to reduced financial fragility and higher economic growth in emerging economies that concentrated exclusively on external sources of finance would be persuasive. Domestic financial markets in emerging economies should not be compared to some idealized version of cross-border capital flows but rather to their real-world counterparts—warts (sudden stops, cross-country contagions) and all.

An original sin measure of currency mismatch would leave out domestic bond markets. While much smaller relative to GDP than in

Table 3.5 Emerging-market financing, all sectors, 1997–2001
(billions of dollars)

Region	Domestic				International			
	Equities	Bonds	Bank loans	Total	Equities	Bonds	Bank loans	Total
Total emerging markets	158	2,367	907	3,432	80	303	214	598
Asia	112	342	883	1,337	63	113	96	272
Latin America	313	1,752	–1	1,784	12	172	103	288
Central Europe	13	273	25	311	6	18	15	38

Note: Emerging markets are Argentina, Brazil, Chile, China, Czech Republic, Hong Kong, Hungary, Korea, Malaysia, Mexico, Poland, Singapore, and Thailand.

Source: IMF (2003a, 78).

industrial countries, domestic bond markets in emerging markets are already anything but trivial. By end-2001, outstanding domestic debt securities in emerging markets amounted to over \$2 trillion—up from \$1 trillion in 1994. Likewise, the volume of emerging-market domestic debt that is tradable now exceeds by a wide margin that of tradable international debt—even though international bonds are still more liquid instruments. According to IMF (2003a) figures for the 1997–2001 period, public-sector domestic bond issuance by emerging economies was 13 times larger than international foreign-currency bond issues; international corporate bond issuance by emerging economies in 1997–2001 amounted to only about half of such bonds issued domestically; and the annual average value of international corporate bond issuance declined slightly between 1997–99 and 2000–01, whereas the corresponding average for domestic bond issuance rose tenfold. While emerging markets have traditionally been viewed as bank-dominated financial systems, local bond markets have now become the single largest source (in terms of flows) of domestic and international funding for emerging economies (table 3.5 covers both public- and private-sector financing). Clearly, by looking only at international bonds and cross-border bank loans, one would get a partial and misleading impression of both the key elements of emerging-market financing and of trends in these financing patterns.

While the maturity of financing in emerging economies remains much shorter than is available to industrial countries, the (original version of the) OSH went too far in claiming that emerging economies cannot borrow long-term (domestically) in their own currencies. Mihaljek, Scatigna, and Villar (2002) report that 37 percent of domestic-debt securities in Latin

America were short-term in 2000—down from 53 percent in 1995; the percentage of short-term debt for emerging economies in Asia and Central Europe is lower than in Latin America. Moreover, data collected by Salomon Smith Barney (2001) indicate that domestic currency-denominated bonds with maturities extending to 20 years currently exist in India, Malaysia, the Philippines, Poland, South Korea, and Thailand; if long maturity were defined as 10 years, then some domestic currency-denominated bonds in Argentina, Colombia, the Czech Republic, Hong Kong, Hungary, Mexico, and Singapore would also qualify. And in Chile—an emerging economy with original sin ratios close to one—the average maturity of inflation-indexed local currency-denominated corporate bonds now runs 15 to 20 years (up from 10 to 15 years in the first half of the 1990s), and the market for indexed local-currency bonds has tripled in size since 2000 (IMF 2003a). To be sure, some of these long-dated domestic-currency bonds in emerging economies are not as liquid as would be desirable, but this list belies the notion that it is simply impossible for emerging economies to borrow at long maturity from their own citizens unless they denominate this debt in one of the leading reserve currencies; equally important, as argued later, if emerging economies can improve their macroeconomic performance and institutions, they will be able to attract more longer-term finance.

In their latest papers (Eichengreen, Hausmann, and Panizza 2003e; Hausmann and Panizza 2003), Eichengreen, Hausmann, and Panizza construct a measure of “domestic” original sin to complement their external original sin measure; the earlier papers ignored almost completely the domestic bond markets. Domestic original sin is measured by the share of the domestic bond market accounted for by the sum of foreign currency-denominated instruments, short-term domestic currency-denominated fixed-rate debt, and domestic-currency debt indexed to the interest rate. The higher this measure of domestic original sin, the lower the share of long-term fixed-rate and long-term inflation-indexed debt denominated in domestic currency—and the assumed lower stage of “development” of the domestic debt market. Of the 22 emerging economies in their sample, 9 (Taiwan, India, South Africa, Slovak Republic, Thailand, Singapore, Hungary, Poland, and the Philippines) had domestic original sin ratios less than one-half. Perhaps more important, they find that there are *no* countries with poorly developed domestic bond markets that have been redeemed from external original sin—suggesting that domestic bond development is a necessary precondition for a country to borrow abroad in its own currency. Also of interest, seven emerging economies in their sample are free of domestic original sin but still suffer from external original sin—a result that Eichengreen, Hausmann, and Panizza interpret as suggesting that domestic bond market development is not a sufficient condition for a country’s being able to borrow abroad in its own currency. But since their bond market figures refer to a single year (1999), another

interpretation is that there is simply a time lag between domestic bond market development and the subsequent ability to borrow abroad in one's own currency.

Yet a fifth caveat about using original sin as a measure of aggregate currency mismatch is that the former concentrates on the "original" currency denomination of international bonds and cross-border bank loans; the original borrowers could use derivatives markets to limit their currency risk and/or transfer that risk to other parties (including foreigners). Consider a Polish nonfinancial corporation that issued an international bond denominated in US dollars but preferred to have its risk denominated in Polish zloties. It could use the swap, forward, or options market to switch or hedge its original exposure. In that case, the original currency composition of that corporate bond would not reveal much about the firm's currency mismatch. The IMF (2003a) reports, for example, that virtually all local companies in Brazil that have access to international financial markets raise funds denominated in US dollars but then use the local derivatives market to swap the international financial obligations into the local currency with an interest rate indexed to the overnight rate.

The early work on OSH did not take account of derivatives markets. In the later versions of the OSH, the authors (Eichengreen, Hausmann, and Panizza 2002) address the possibility that currency swaps could distort their measure of original sin. Their adjustment for this is to include all international bonds denominated in an emerging-market currency even if issued by countries other than the home country. They find that this makes little difference to their results since there are not enough local currency-denominated international bonds to sustain a large volume of currency swaps. But this procedure, while moving in the right direction, still suffers from several problems. Currency swaps are only one of many ways of hedging or transferring currency risk. In most of Latin America, for example, there is a greater reliance on forwards than on foreign exchange swaps, while the reverse holds for most of the Asian emerging economies; Eichengreen, Hausmann, and Panizza (2002) consider only currency swaps. Since foreigners also participate in local bond markets, domestic bonds denominated in local currency should also in principle be taken into account in gauging potential currency swap operations; and because (as argued earlier) the volume of domestic bonds outstanding far exceeds that of international bonds, there is no shortage of domestic-currency bonds for swap operations with foreigners.

What makes it difficult to assess the difference derivatives make for the correct measurement of currency risk is that still relatively little is known about who is on the other side of these transactions. Unlike Eichengreen and Hausmann (1999), we do not regard a redistribution of currency risk within an emerging economy as being of little significance, since a transfer of exposures from nontradable to tradable producers could (as argued earlier) generate a sizable reduction in currency

mismatch. Still, it would be illuminating to know how prominent foreigners are in these transactions. A recent IMF study (2003a, 66) reports that foreign-investor participation in local derivative exchanges is usually “fairly limited” but has been considerable in Mexico, Hungary, Poland, and the Czech Republic; that in some emerging economies like Singapore, Hong Kong, and South Africa, foreign dealers account for the bulk of turnover in over-the-counter derivatives markets; that “real-money accounts” (both dedicated and cross-over investors) hedge relatively little of their risk exposures in emerging economies while speculative money accounts (hedge funds and proprietary trading desks of commercial and investment banks) use derivatives markets freely for either hedging or speculative position-taking; and that the main sellers of protection in credit derivatives markets are internationally active banks. In our own discussions with market participants, there was a view that internationally active banks and real-money funds were likely to be on the other side of derivatives transactions when locals wanted to short the local currency.

How far derivatives alter the currency exposure implied by the original currency composition of international bonds and bank loans will not be known until there is better information on the identity of counterparties in hedging transactions—both within and across countries. But the wide array of hedging instruments and markets makes it a leap too far to assume that the original currency composition of international bonds and bank loans provides a reliable picture of who is ultimately bearing the currency risk.

Summary

A useful way to sum up this discussion about the original sin measure of currency mismatch is to ask under what set of conditions it would produce a good estimate. Three such conditions are apparent.

Condition number one is that domestic bond and bank flows would either have to be very small relative to international flows or if large, would need to have the same currency composition as international flows. It is clear that condition one is grossly violated. As seen earlier, domestic financial flows are large relative to international flows, and the local currency share of domestic finance is much larger than for international flows.

Condition number two is that the asset side of balance sheets (and the income side of net income statements) would have to be similar across countries and relatively constant over time. If that were the case, then information on liabilities alone would track pretty well both cross-country differences and changes over time in currency mismatch. But, as shown earlier, this condition too is far divorced from what is observed in practice.

Condition number three is that neither the distribution of currency risk within an economy nor the redistribution of currency risk interna-

tionally (via the use of derivatives) would matter much. If that were the case, then data on aggregate currency mismatch and the original currency composition of bond and bank flows would be sufficient for gauging currency risk. But as argued earlier, it does matter which entities and sectors within an economy bear the currency risk, and some emerging economies do have enough access to decent derivative and hedging instruments to potentially alter significantly the allocation of currency risk implied by the original currency composition of financial instruments.