

---

## Appendix A

# Measuring Mismatches: Some Cautionary Notes

As in many areas of economics, there is a significant gap between theory and practice in the measurement of currency mismatches. This appendix outlines some methodological issues that arise in translating theoretical concepts into practical measures. It suggests how certain difficulties could be addressed.

The theoretical ideal is to measure how a change in the exchange rate will affect the present discounted value of an agent's income and expenditure flows over time. How should this present discounted value be measured? In the case of income from financial assets (or expenditure to service liabilities), an obvious approximation is the market value of the financial asset. Hence a first approximation to measuring an agent's vulnerability to currency mismatch would be to take the difference between foreign-currency liabilities and assets as a proportion of some measure of income. Such measures are indeed widely compiled.

The shortcoming is that no account is taken of the denomination of other types of income. In the example cited at the beginning of the book—the apartment in London financed by borrowing dollars—the currency of denomination of rental income (presumably pounds) needs to enter the picture. But calculating the present discounted value of such income flows is necessarily much more approximate (and subject to guesswork) than the value of financial assets—future income flows and their currency of denomination are not known with any degree of precision. One simple (but far from satisfactory) approximation is to assume that exports and imports are denominated in foreign currency and other items of expenditure in local currency. The next section considers some important issues of measurement, and the section following that outlines some statistical lacunae.

## Theory and Practice: Some Important Issues

### Currency of Denomination of Financial Assets and Liabilities: Importance of Maturity Profiles

Consider the simplest case of a firm whose income is derived only from financial assets and whose only expenditure is the service of debt—that is, a purely financial firm.<sup>1</sup> This is a useful abstraction because it can be applied to any financing structure, even that of a nonfinancial firm with “real” income and earnings. In the case of the financial firm, the structure of the balance sheet will determine the impact of exchange rate changes on income and expenditure flows. If the capital structure is “inverted,” borrowing costs will rise when the exchange rate falls. If it is “correlated,” borrowing costs may fall. An additional complication is whether the drop in the exchange rate leads to changes in interest rates (e.g., due to changes in domestic interest rates, a widening of credit spreads, and so on). A financial firm attempting to analyze its exposure to exchange rate changes will allow for such secondary effects. Table A.1, which summarizes such effects for the liability side of the balance sheets by looking at common forms of debt, is drawn from a recent book by a market practitioner (Pettis 2001).

In all but one case (fixed-rate, local-currency debt), borrowing costs rise after a depreciation of the exchange rate. A similar tabulation can be made for the asset side of the balance sheet, substituting “earnings” for “costs.” The future income and expenditure flows of an entity with identical asset and liability structures would be affected identically by a change in the exchange rate. Only in this limiting case could it be said that the entity has no currency mismatch. Once these restrictive assumptions are relaxed and some differences introduced between the nature of assets and liabilities, the identity of exchange rate impacts on income and expenditure breaks down. Given maturity differences, net income can change in response to an exchange rate change, even if foreign-currency assets and liabilities are equal. For instance, an entity with long-term peso assets but short-term peso liabilities will see its debt-service costs rise but its interest income unchanged after a sharp change in the exchange rate—on the assumption that domestic interest rates rise.

The implication of these considerations is that currency mismatches cannot be fully captured simply by comparing the currency of denomination of assets and liabilities. The maturity structure will also be relevant. Hence an entity that has an identical proportion of assets and liabilities in

---

1. In this case, the asset/liability and income/expenditure definitions of mismatch converge, on the assumption that the value of foreign-currency assets (liabilities) is just the present discounted value of all future foreign-currency income (expenditure).

**Table A.1 Impact of an exchange rate change on borrowing costs**  
(according to different debt structures)

Type of funding	Sharp fall of the exchange rate in a crisis	Widening of credit spreads
<b>Inverted</b>		
Short-term dollar debt	Costs ↑	Refinancing risk can become a major factor
Short-term peso debt	Costs ↑ if domestic interest rates rise in real terms	Refinancing risk for corporations; government can print money
Floating-rate peso debt	Costs ↑	Avoids refinancing risk
Long-term floating dollar debt	Costs ↑	Avoids refinancing risk
Long-term fixed dollar debt	Costs ↑	Avoids refinancing risk
<b>Correlated</b>		
Long-term fixed-rate peso debt	Costs ↓ in real terms	Avoids refinancing risk

Note: The term “peso debt” is used as a short-hand for debt denominated in local currency.

Source: Based partly on table 6.2 in Pettis (2001).

pesos could nevertheless find that its future income and spending streams (and thus its net present value) will be differently affected if maturity structures differ. However, the analysis of such impacts will depend on making assumptions about how other variables change when the exchange rate changes (e.g., do domestic interest rates rise or fall in real terms after an exchange rate collapse? Do credit spreads widen when the exchange rate falls? And so on).

An exchange rate collapse was indeed associated with a sharp subsequent rise in domestic interest rates in most recent crises in emerging markets. If a firm has long-term local-currency assets but short-term liabilities (on which interest rates rise), its net income will fall. For this reason, some analysts prefer to focus on the *liquidity* of foreign-currency assets and liabilities rather than on currency mismatches per se. Borrowers face liquidity risks (“balance sheet vulnerability”) if “actual or potential obligations on foreign currency exceed the amount of foreign currency that can be addressed on short notice.”<sup>2</sup> By focusing on foreign-currency assets that can be accessed “on short notice,” one might exclude, inter alia, from the currency-mismatch calculation foreign currency–denominated loans that are illiquid and foreign exchange reserves that the government has lent to offshore branches of commercial banks. Liquidity considerations also

2. Chang and Velasco (1999) call this “international illiquidity.”

highlight the (remaining) maturity structure of debt and of put options in debt contracts—not just on its original currency composition.

## **Currency of Denomination of Noninterest Income Flows**

The above analysis was couched in terms of a financial entity where income is derived only from financial assets and whose only expenditure is the service of debt. This focus is useful for comparing financial strategies. However, the analysis changes when borrowers have other income and expenditures because changes in exchange rate will also affect such income and expenditures, and this has obvious bearings on the meaning of currency mismatches.

For instance, a firm that is a net earner of foreign exchange will lose from an exchange rate appreciation. This possible loss can be hedged by creating a foreign exchange exposure on its financial balance sheet. Hence what may appear as a currency mismatch defined in terms of assets and liabilities may actually represent a hedge once account is taken of all the firm's activities. Some recent studies have attempted to analyze firms' decisions on the currency composition of debt in terms of their activities (see, for example, Keloharju and Niskanen 2001 and Martinez and Werner 2001).

Similar considerations apply to countries. Most taxes are denominated in local currency, which, *prima facie*, suggests that borrowing should be in local currency. However, the taxation of tradable output could change this prescription. For instance, foreign currency-denominated funding for countries with very open economies (high proportion of output tradable) will be more sustainable—indeed more desirable—than similar funding for countries with more closed economies. The implication of this is that any currency mismatch derived from balance sheet statistics should be considered in the context of the currency of denomination of noninterest income flows—a point further explored later.

The analysis is further complicated by the fact that financing strategies may involve deliberately taking (or avoiding) exchange rate positions to hedge not only direct and obvious exchange rate exposures but also exposures to associated risks. For example, a European company selling in the United States faces the risk that its goods would become less competitive if the dollar were to depreciate against the euro. It could hedge this by issuing debt denominated in dollars. Other examples could be constructed to incorporate hedges for changes in other variables (e.g., income, credit spreads) associated with exchange rate changes. The fact that changes in the exchange rate are normally associated with changes in other macroeconomic variables (income, exports, and so on) makes it more difficult to pin down the effect of a depreciation on a firm's income or on a country. It makes it harder to know how far an apparent currency mismatch represents a genuine vulnerability.

## Financial Institutions and Indirect Currency Mismatches

Defining a mismatch in terms of the sensitivity of net worth to changes in the exchange rate underlines the fact that a currency mismatch can occur from indirect as well as direct currency exposures. Consider, for example, the banking system's exposure to currency risk when its corporate customers have foreign currency-denominated liabilities but only local-currency earnings and limited foreign-currency assets. In such a situation, a large devaluation would increase the debt burden of such borrowers and make them a worse credit risk. The risk-adjusted present discounted value of loans to such borrowers would decline. While such loan deterioration might be formally classified as credit risk (for banks), there is little doubt that the causal factor is an exchange rate change imposed on mismatched currency positions among bank customers. Note that in this example, devaluation would adversely affect the net worth of the banking sector even if the banking system's direct asset/liability position was perfectly matched—that is, even if the foreign-currency share of bank deposits was identical to the foreign-currency share of bank loans.

## Balance Sheet Mismatches as a Proportion of Income

Calculating the ratio of some measure of the balance sheet (e.g., net foreign-currency position) to income has the problem that one is denominated in foreign currency and the other mainly in domestic currency. This means that the ratio will change as the exchange rate changes—even if nothing else (e.g., liabilities, income) changes. This truism has often been overlooked in assessing the vulnerability of borrowing countries. As noted earlier, many crises in emerging markets have been preceded by periods of capital inflow-driven real exchange rate appreciation, which drives up the value of nominal GDP relative to foreign-currency debts. With a grossly overvalued exchange rate, the foreign debt/GDP ratio is misleadingly low. Once the exchange rate collapses after a crisis, it rises sharply. There is no simple solution to this problem. One practical solution is to use some proxy for tradables in GDP (e.g., total exports or imports).

## Aggregation

The measures discussed in the book and summarized at the end of this appendix are typically *aggregate* measures of economywide mismatches. Such measures provide a useful diagnostic about how manageable mismatches in the country are likely to be. However, a small economywide mismatch need not imply that serious mismatches at the sectoral level are absent. The example offered by Dixon and Hayes (2000) illustrates why the offsetting of one sector's foreign-currency assets against another sector's

foreign-currency liabilities implicit in the aggregation process may not be feasible or desirable in practice. Suppose the corporate sector has a sizable excess of foreign currency–denominated liabilities over its liquid foreign-currency assets, but the public sector has large foreign-currency reserves and little foreign-currency liabilities. The economywide mismatch may therefore be minimal. But this does not mean that the sovereign would be willing to use its net reserves to guarantee the corporate sector’s net foreign-currency liability position—especially if the sovereign were worried about extending unduly the official safety net or maintaining a large enough reserve cushion to counter shocks in the currency markets. A large unexpected devaluation would thus leave the corporate sector in a vulnerable position—the small size of the economywide mismatch notwithstanding. Similarly, the household sector may have a positive net foreign-currency position (based on large holdings of foreign-currency assets abroad) at the same time that the sovereign is facing a large negative foreign-currency position. But if the sovereign is not able to induce households to repatriate some of those foreign-held assets and thereby increase its tax revenue (in foreign-currency terms), the sovereign may face a liquidity crisis despite the absence of an economywide currency mismatch.

## **Contingent Liabilities**

Potential foreign-currency liabilities can wreak as much havoc as actual liabilities. When an emerging economy is defending an explicit exchange rate target, the authorities have to stand ready to convert into foreign exchange (at a fixed price) a whole set of domestic-currency liabilities.<sup>3</sup> When market participants come to the view that serious overvaluation makes devaluation inevitable, the set of potential foreign-currency liabilities of the government can expand rapidly, as residents begin to convert a wider set of domestic-currency liabilities (including time deposits and government bonds) into foreign exchange. Moreover, if an attempt were made to clear capital flight by offering foreign currency–denominated deposits in local banks, the stock of foreign-currency liabilities would expand further. In such a situation, the precrisis stock of foreign currency–denominated liabilities would not be a good guide either to the potential

---

3. Similarly, a crisis characterized by a sudden stop in capital inflows to emerging economies would render imprudent a reserve-adequacy guideline based on the assumption that capital inflows would continue at the actual pace of recent years. Indeed, it is with such contingencies in mind that some officials have recommended a more conservative reserve management guideline for emerging economies that would permit external debt to be serviced on time even if the borrowing country were cut off from new external borrowing for a year. See Calvo and Goldstein (1996).

foreign currency–denominated liabilities or to the size of the potential currency mismatch.<sup>4</sup> It should be recognized further that the onset of financial distress could cause lenders or borrowers to alter the form and currency composition of lending. For example, foreign lenders may refuse to supply local currency–denominated finance once they sense a heightened risk of devaluation. And recent events in Argentina demonstrated that borrowers in dire circumstances may unilaterally redefine the currency composition of existing financial contracts, if the systemic consequences of a large existing currency mismatch cum devaluation are regarded as too costly.

## Some Statistical Lacunae

In theory, the obvious starting point for measuring currency mismatches for a country as a whole is to examine the national balance sheet of assets and liabilities. In practice, however, few countries attempt to produce comprehensive data on their external balance sheet position, distinguishing between foreign currency–denominated assets and domestic currency–denominated assets. Chapter 4 cited the example of Thailand (table 4.2). Such estimates, however, are typically incomplete.

Table A.2 reports on a BIS survey of central banks on data published by most of the major emerging-market countries. This shows that the coverage of government data is fairly comprehensive and regarded as reliable, although in some cases the data on individual state-owned enterprises' balance sheets are not aggregated into an overall figure. In some cases, the treatment of government debt issue with exchange rate–linked coupons or principal is unclear (it should be reported as foreign-currency debt). Another complication is that the currency of denomination of some financial instruments changes in response to a given event (e.g., becoming dollar-denominated if the exchange rate falls by more than  $x$  percent).

The data on banks' balance sheets are generally regarded as good. Such data are summarized in table 7.2. These data show that there is nothing irreversible about a high dollar (or foreign currency) denomination of banks' balance sheets: Chile, Indonesia, and Mexico have experienced substantial reductions in the degree of dollarization after crises. There are some major gaps for financial institutions other than banks.

The main sectors for which data are generally unavailable and/or of low quality are the corporate sector, and, even more so, the household sector (in some cases household data are not separately distinguished from the corporate sector). Some countries rely on data collected from foreign lenders (including the BIS) or samples of large companies' annual reports for data on the corporate sector's external debt.

---

4. See discussion of the so-called Greenspan and Guidotti rules in chapter 4.

Table A.2 Survey on data published by major emerging-market economies (percent)

	Central government	Central bank	Other government	State-owned enterprises	Banks	Other financial intermediaries	Companies	Households
<b>External debt</b>								
Domestic currency	83	89	67	50	78	44	67	22
Foreign currency	83	89	67	44	83	39	67	17
Of which: Short-term	67	78	67	28	67	33	50	n.a.
<b>Domestic debt</b>								
Domestic currency	100	78	50	28	72	44	67	17
Foreign currency	83	83	61	39	56	44	39	22
<b>Liquid foreign-currency assets</b>	61	78	61	28	56	39	17	11
<b>Credit lines in foreign currency</b>	50	28	61	6	33	22	11	n.a.

n.a. = not available.

Note: Eighteen economies surveyed. Includes cases where debt is prohibited.

Source: Hawkins and Turner (2000).

One particular lacuna in the statistics on external positions is (unregistered) resident holdings of foreign securities or bank accounts held abroad, which tend to be significant in countries with a history of expropriation or high inflation. In some instances, the same local business entity (typically small firms, including family-owned firms) will have dollar-denominated liabilities onshore and dollar-denominated assets offshore. In such a case, the statistics will overstate the effective degree of currency mismatch to which the firm is exposed. But it is unclear whether the existence of dollar assets held abroad provides any comfort for a local bank that has lent dollars to such a firm. The improved viability of a company due to assets held abroad—often secretly—that cannot be touched inevitably limits the degree of comfort afforded to local bank creditors. In the aftermath of several recent banking crisis in the emerging markets, attempts by local banks or publicly financed asset management corporations to recover such assets from solvent borrowers (i.e., solvent when account is taken of the assets secreted abroad) who have defaulted on local loans have not been encouraging.

Moreover, entities with dollar liabilities will often not be the ones that hold the dollar assets. From the point of view of credit risks as assessed by the bank, the mismatch would be best measured by the net liability positions of debtors—with no account taken of the residents with large creditor positions. From the point of view of the macroeconomic wealth effect of devaluation, however, some account should be taken of resident holdings of foreign-currency assets abroad, even if such assets continue to be held largely offshore.

The gaps and the lack of uniformity in data compiled by major debtor countries can to some extent be compensated by the use of data compiled from creditor sources.<sup>5</sup> The most comprehensive data that explicitly measure currency denomination are probably those on international banking flows, which are drawn from the reports to creditor banks and published by the BIS, and on international bond issuance. One big advantage of such data is that they distinguish flows and stocks according to the currency of denomination. The other advantages are their objectivity (debtors do not attempt to massage the figures) and availability for all countries. These data can be summarized in many different ways: detailed tabulations for all emerging-market countries can be found in tables A.3 and A.4. Such data at least provide a convenient starting point—and hopefully can prompt national authorities to cross-check and improve their own statistics.

---

5. Von Kleist (2002) provides one useful comparison.

**Table A.3 Ratio of M2 to foreign exchange reserves, 1990–2002**

Region/country	1990	1995	1996	1997	1998	1999	2000	2001	2002
<b>Latin America<sup>a</sup></b>	<b>5.5</b>	<b>4.1</b>	<b>3.8</b>	<b>3.9</b>	<b>4.2</b>	<b>4.3</b>	<b>4.4</b>	<b>4.3</b>	<b>3.4</b>
Argentina	3.3	3.8	3.5	3.5	3.5	3.4	3.7	5.0	2.5
Brazil	5.9	3.7	3.1	4.2	5.0	4.4	4.5	3.9	3.0
Chile	1.1	1.5	1.7	1.7	2.0	2.1	2.1	2.0	1.9
Colombia	1.5	2.0	2.1	2.4	2.9	2.8	2.4	2.3	2.0
Mexico	10.6	7.5	7.4	6.1	5.7	7.2	7.3	7.0	6.1
Peru	2.4	1.3	1.2	1.5	1.7	2.0	2.0	2.0	2.0
Venezuela	1.6	2.1	1.0	1.2	1.5	1.5	1.6	2.5	1.7
<b>Asia, large economies<sup>a</sup></b>	<b>35.2</b>	<b>9.7</b>	<b>9.1</b>	<b>8.4</b>	<b>8.3</b>	<b>8.4</b>	<b>8.3</b>	<b>7.5</b>	<b>6.6</b>
China	9.8	9.9	8.7	7.9	8.8	9.5	9.9	8.9	7.9
Hong Kong	6.3	5.3	5.1	3.9	4.5	4.5	4.4	4.1	4.0
India	111.6	8.5	8.8	7.7	7.6	7.3	6.7	6.1	4.9
Korea	14.0	15.0	15.4	15.5	10.2	8.0	5.8	5.7	6.1
Taiwan	3.3	5.4	6.0	5.5	5.6	5.3	5.4	4.6	3.6
<b>Other Asia<sup>a</sup></b>	<b>6.6</b>	<b>5.4</b>	<b>5.0</b>	<b>4.2</b>	<b>3.6</b>	<b>3.4</b>	<b>3.0</b>	<b>3.1</b>	<b>3.1</b>
Indonesia	6.1	7.2	6.6	4.7	3.2	3.5	2.8	3.0	3.2
Malaysia	3.0	3.2	3.5	3.5	2.9	2.8	3.2	3.2	2.9
Philippines	15.2	6.0	4.7	5.3	4.6	3.6	3.2	3.1	3.4
Singapore	1.5	1.3	1.3	1.2	1.3	1.4	1.2	1.3	1.3
Thailand	4.6	3.7	3.9	3.6	4.6	3.8	3.7	3.7	3.3
<b>Central Europe<sup>a</sup></b>	<b>21.4</b>	<b>2.5</b>	<b>2.7</b>	<b>2.7</b>	<b>2.6</b>	<b>2.4</b>	<b>2.6</b>	<b>3.1</b>	<b>2.9</b>
Czech Republic	62.9	2.7	3.2	3.6	3.4	3.0	3.0	3.2	2.4
Hungary	13.3	1.5	1.9	2.2	2.2	1.9	1.9	2.4	3.5
Poland	4.1	2.8	2.6	2.4	2.3	2.4	2.6	3.3	3.0
Russia	37.2	3.3	4.6	4.9	2.8	3.1	1.7	1.6	1.5
Israel	5.8	8.0	6.9	4.1	3.7	4.3	4.7	4.7	4.6
Turkey	5.3	3.3	3.0	2.8	3.3	3.2	3.8	3.9	3.0
Saudi Arabia	n.a.	n.a.	5.4	5.4	5.9	5.2	4.7	6.0	6.1
South Africa	51.9	23.9	64.6	14.5	15.7	11.7	10.5	7.6	12.3
<i>Memorandum:</i>									
Australia	9.6	17.9	17.0	12.9	15.8	12.4	12.9	14.0	15.3
Sweden	6.2	4.8	6.5	10.8	8.4	8.1	7.4	7.6	7.9
Switzerland	6.2	8.5	7.4	7.3	7.4	7.3	7.4	7.7	8.2

M2 = broad money liabilities

n.a. = not available

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

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

**Table A.4 Domestic debt securities outstanding, 1994–2002**  
(billions of dollars)

	1994	1995	1996	1997	1998	1999	2000	2001	2002
<b>Latin America<sup>a</sup></b>	<b>270</b>	<b>314</b>	<b>395</b>	<b>467</b>	<b>519</b>	<b>447</b>	<b>483</b>	<b>508</b>	<b>386</b>
Argentina	30	26	29	34	40	43	47	37	18
Brazil	173	231	297	344	391	294	298	312	212
Chile	25	29	32	37	34	33	35	35	35
Colombia	4	5	7	8	10	12	15	18	18
Mexico	37	22	24	38	38	57	74	88	88
Peru	1	1	1	2	2	3	4	4	4
Venezuela	n.a.	n.a.	5	4	4	5	10	14	11
China	66	93	119	162	228	293	355	419	480
India	64	71	81	75	86	102	114	130	156
Korea	185	227	239	130	240	265	269	293	381
Taiwan	68	76	100	101	124	126	123	124	141
Hong Kong	17	24	34	41	40	43	43	44	45
Singapore	20	23	25	24	29	36	43	51	55
<b>Other Asia<sup>a</sup></b>	<b>94</b>	<b>105</b>	<b>118</b>	<b>85</b>	<b>109</b>	<b>121</b>	<b>126</b>	<b>141</b>	<b>152</b>
Malaysia	54	62	73	57	62	66	75	83	83
Philippines	26	26	28	18	21	22	20	22	22
Thailand	14	16	17	10	24	32	31	36	47
<b>Central Europe<sup>a</sup></b>	<b>40</b>	<b>49</b>	<b>53</b>	<b>51</b>	<b>67</b>	<b>69</b>	<b>72</b>	<b>90</b>	<b>129</b>
Czech Republic	7	12	12	12	22	25	23	26	43
Hungary	12	12	15	14	16	17	17	20	31
Poland	21	25	26	25	29	27	32	44	55
Russia	3	17	43	65	8	9	8	5	7
Israel	86	94	103	103	99	102	103	101	106
Turkey	16	21	27	30	38	43	55	85	92
South Africa	97	98	79	80	69	69	58	39	53
<b>Total<sup>a</sup></b>	<b>1,029</b>	<b>1,215</b>	<b>1,416</b>	<b>1,416</b>	<b>1,654</b>	<b>1,724</b>	<b>1,851</b>	<b>2,030</b>	<b>2,184</b>
<i>Memorandum:</i>									
Australia	181	176	198	170	168	206	172	170	207
Sweden	228	271	281	241	250	238	197	160	207

n.a. = not available

a. Sum of the countries shown.

Note: Data are by country of issuer, outstanding year-end positions.

Sources: Central banks, IMF's *International Financial Statistics*, and the Bank for International Settlements.



---

## Appendix B

# Evolution of the Original Sin Hypothesis

The original sin hypothesis (OSH) is most closely associated with the work of Barry Eichengreen, Ricardo Hausmann, and Ugo Panizza, in various combinations—that is, Eichengreen and Hausmann (1999, 2003a–c); Eichengreen, Hausmann, and Panizza (2002, 2003a–e); and Hausmann and Panizza (2002, 2003). OSH was first defined as a situation “in which the domestic currency cannot be used to borrow abroad or to borrow long term, even domestically” (Eichengreen and Hausmann 1999, 330).

The first version of the OSH stressed the incompleteness of financial markets as the main culprit of financial fragility; for example, Eichengreen and Hausmann (1999, 330) argued that currency mismatches exist not because banks and firms in emerging economies lack the prudence to hedge their exposures but rather because they are *unable* (emphasis added) to do so (since foreigners are unwilling to take the other side of a hedge contract). The OSH authors regarded the causes of original sin as an open question. They seemed to reject the proposition that original sin was mainly due to a borrower’s history of inflation and currency depreciation, since their measure of original sin suggested that it was present in more than a few emerging economies without a recent history of high inflation. They leaned instead toward an explanation that emphasizes incomplete information and sovereign risk; more specifically, they suggested that foreign investors were reluctant to invest in domestic currency-denominated assets (of the borrower) because they could not tell which borrowers would manipulate the currency to minimize debt payments. To explain relatively low levels of original sin in a few nonreserve-currency countries (e.g., Australia), Eichengreen and Hausmann (1999) speculated that because these countries developed their domestic finan-

cial markets first (i.e., before relying on external borrowing), they created a political constituency that opposed opportunistic depreciation (thereby easing the concerns of foreign investors).

Whatever its causes, the original interpretation of OSH saw just two ways out of the original sin trap. One was to eliminate the exchange rate by dollarizing (or the euro equivalent). This would dissolve currency mismatches since income streams would then be denominated in the same currency unit as liabilities. But there was a worry that if dollarization proceeded before other risks to financial stability were eliminated, the attendant removal of lender-of-last-resort facilities and the loss of independent monetary policy could prove hazardous. The other way out of original sin would be to embark on an effort to build deep and liquid domestic markets in long-term domestic currency-denominated securities. But this route to redemption was regarded both as taking too long and as being increasingly difficult to achieve in a world of liberalized financial markets and floating exchange rates.

The mark II version of the OSH, as best captured in Eichengreen, Hausmann, and Panizza (2002) included some notable changes. To begin with, the domestic element in OSH was discarded. Original sin was then defined simply as a situation in which “most countries cannot borrow abroad in their own currencies” (Eichengreen, Hausmann, and Panizza 2002, 1). As in the original version of the OSH, original sin was again measured by the shares of cross-border bank loans and international bonds that were denominated in domestic currency. The authors showed that aside from the issuers of the five major currencies (that is, the United States, euro area, Japan, the United Kingdom, and Switzerland), the phenomenon of original sin was both widespread and persistent over time. Outliers (i.e., nonreserve-currency countries with relatively low levels of original sin, such as Poland, New Zealand, South Africa, and the Czech Republic) were regarded as not challenging the basic OSH because over 80 percent of their debt issued in local currency was accounted for by nonresidents, especially the international financial institutions (IFIs) such as the World Bank.

Notably, the mark II version of the OSH made no attempt to distinguish original sin from aggregate currency mismatch; indeed, quite the contrary. In explaining the “pain of original sin,” Eichengreen, Hausmann, and Panizza (2002, 10) argued that “countries with original sin that have net foreign debt will have a currency mismatch on their national balance sheets.” This tight link between original sin and aggregate currency mismatch allowed them to argue that movements in exchange rates would generate wealth effects that would limit the effectiveness of monetary policy, that central banks would be less willing to let exchange rates move and would be less able to avert liquidity crises, and that dollar-denominated debts and the associated volatility of domestic interest rates would heighten the uncertainty associated with public debt service—thereby

lowering credit ratings. In their empirical work, Eichengreen, Hausmann, and Panizza (2002) ran a series of regressions that tested the pain of original sin—usually regressing various outcome variables (e.g., real output volatility, international capital flow volatility, country credit ratings) on various measures of original sin. Underlining the assumed equivalence between original sin and aggregate currency mismatch, the sector headings for these regression results carried labels like “Currency mismatches and exchange rate volatility” (p. 11) and “Currency mismatches and output and capital-flow volatility” (p. 14)—even though the variable that actually appears in these regressions is original sin. Likewise, throughout the text, original sin and aggregate currency mismatch were used interchangeably; for example, in summarizing their empirical findings, Eichengreen, Hausmann, and Panizza (2002, 16) stated: “In sum, we find statistically significant and economically important effects of original sin on exchange rate and GDP volatility and on country credit ratings. Currency mismatches clearly create serious problems for the countries saddled with them, and as we showed in Section 2 above, these problems are pervasive.”

The mark II explanation for original sin rested on transactions costs and network externalities. Building on their empirical finding that the only robust determinant of original sin was country size, Eichengreen, Hausmann, and Panizza (2002) argued that in a world of transactions costs, the optimal portfolio would have a finite number of currencies, and that the benefits of further diversification from adding new currencies would fall faster than the costs. Most strikingly, Eichengreen, Hausmann, and Panizza (2002) maintained (again supported by their regression results) that original sin was *not* related to weaknesses of national macroeconomic policies or institutions. This comes across most clearly in the concluding paragraph (p. 42) of their paper:

The evidence is strong that original sin is not going to go away anytime soon as a result of the standard recipe of macroeconomic prudence and institution building. Neither cross-country nor time-series evidence supports the view that efforts to strengthen policies and institutions will suffice to ameliorate the problem over the horizon relevant for practical policy decisions.

Eichengreen, Hausmann, and Panizza (2002) proposed an *international* initiative to solve the problem because they saw original sin as being generated primarily by international transactions costs and network externalities; the dollarization option has apparently been discarded. They recommended that a basket index of emerging-market currencies be developed, that both the IFIs and the G-10 countries issue debt denominated in the index (so as to transform the structure of the global portfolio in favor of emerging-market currencies), and that swaps be encouraged between the IFIs and G-10 countries on the one hand and the individual countries in the index on the other. Once a liquid market in this index of

emerging-market currencies had developed, the IFIs and G-10 countries could scale back their role. Again, the concluding sentence of Eichengreen, Hausmann, and Panizza (2002, 42) highlights the low importance accorded to good domestic policies:

The *only* practical way for a large group of countries representing over 90 percent of the population and the GDP of the developing world to escape original sin is an international initiative to develop an EM index and a market in claims denominated in it (emphasis added).

The mark III version of the OSH appears in the 2003 papers of Eichengreen and Hausmann (2003), Eichengreen, Hausmann, and Panizza (2003a–e), and Hausmann and Panizza (2003). In some of the papers written between August and November of 2003 (Eichengreen and Hausmann 2003b, 2003c and Eichengreen, Hausmann, and Panizza 2003d, 2003e), the authors respond explicitly to criticisms of their earlier work by Goldstein and Turner (2003), Reinhart, Rogoff, and Savastano (2003b), and Burger and Warnock (2002). As suggested in chapter 1, the mark III version of the OSH modifies significantly the arguments put forward in the two earlier versions of the OSH. Three modifications merit explicit mention.

First, Eichengreen, Hausmann, and Panizza and Hausmann and Panizza jettison the mark II practice of looking only at the “international” dimension of original sin. In a footnote, Eichengreen, Hausmann, and Panizza (2003e) explain that they had focused on the international aspect of original sin because that problem seemed particularly intractable. More significantly, they acknowledge that a growing number of countries are showing an ability to develop domestic bond markets.<sup>1</sup> In recognition of that reality, they define domestic original sin as the “inability to borrow domestically long-term at fixed rates in local currency” (Hausmann and Panizza 2003, 963). Although they do not have data either on domestic bank loans, or on private domestic bonds, or on nontraded, domestic government bonds, they are able to classify (traded) domestic government bonds by maturity, currency, and coupon (fixed and indexed rates).<sup>2</sup> They find that only Argentina, among the 21 emerging economies included in their sample, has as much as half its domestic public debt denominated in foreign currency—thereby supporting our finding in chapter 3 that the foreign-currency composition of domestic bonds is very different from

---

1. This seems a switch in view. In Eichengreen and Hausmann (1999), the authors concluded that building a demand for long-term, domestic currency-denominated securities may be even harder in today’s world of liberalized financial markets and floating exchange rates. In Eichengreen, Hausmann, and Panizza (2002), they question what governments in emerging economies can do to promote the development of a large constituency of domestic bondholders and are skeptical about any approach that would require banks, pension funds, and the social security system to hold long-term, domestic currency-denominated, fixed-rate debt.

2. Hausmann and Panizza (2003) note that domestic private debt instruments are important in Singapore, Korea, Taiwan, and Thailand.

that for international bonds. Hausmann and Panizza (2003) also report that for about half the countries in their sample, the sum of domestic-currency, fixed-rate bonds and domestic-currency, inflation-indexed bonds accounts for half or more of domestic public debt. Similarly, in 9 of the 21 countries, long-term, fixed-rate, domestic-currency bonds represented half or more of the total.<sup>3</sup> These figures would seem to support our argument in chapter 3 that domestic bond markets in emerging economies are already quite important.

When Hausmann and Panizza (2003) compute correlations between measures of domestic and international original sin, they find that the correlations are positive but are not strong and are rarely statistically significant. Perhaps more interesting, when they look at countries with original sin ratios of 0.75 or higher, they report that no country with high domestic original sin has low international original sin—a result they themselves interpret as suggesting that convincing one’s residents to lend in local currency at long maturities seems to be a necessary condition to convince foreigners to do the same. At the same time, they find that seven countries had low domestic original sin but relatively high international original sin, implying that dominant use of the local currency in domestic financial markets is not a sufficient condition for dominant use internationally. Hausmann and Panizza (2003) discount the possibility that the escape from international sin merely lags the escape from domestic original sin by arguing that the country composition of international original sin is similar between the international bond market of the mid-19th century and that of more recent years.

A second major modification in the mark III version of the OSH concerns the distinction between aggregate currency mismatch and (international) original sin. As argued earlier, we found that all the OSH papers written up until the latter part of August 2003 essentially used the two terms interchangeably and suggested strongly that (international) original sin implied an aggregate currency mismatch for the vast majority of developing countries. In the (latest) mark III version, Eichengreen, Hausmann, and Panizza (2003e) and Eichengreen and Hausmann (2003) reject our interpretation of their earlier work. For the first time, they now state explicitly that the two concepts are *not* the same and argue that those working on original sin are trying to measure something different from currency mismatch. In particular, Eichengreen, Hausmann, and Panizza (2003e, 16) now maintain that one consequence of original sin is the tendency for afflicted countries to accumulate international reserves as a way of protecting themselves from the potentially destabilizing financial consequences; as such, “where an aggregate mismatch is one possible conse-

---

3. Hausmann and Panizza (2003) choose instead to highlight the finding that only 5 of the 21 countries had a share of long-term, fixed-rate, domestic-currency bonds that was 75 percent or higher.

quence of original sin, it is not a necessary one.” In addition, instead of asserting (as they did earlier) that an aggregate currency mismatch will occur when there is a net debt to foreigners, they now argue (as in Goldstein and Turner 2003) that an aggregate mismatch exists when there is net debt to foreigners *denominated in foreign currency*;<sup>4</sup> this modification is necessary to reflect the fact (noted in chapter 3) that some significant portion of debt owed to foreigners is not denominated in foreign currency (i.e., net debtor status is based on a country’s net international investment position, which is not necessarily equivalent to its net currency mismatch).

While we believe there are many reasons (not just reserve accumulation) why aggregate currency mismatch may differ from (international) original sin, we welcome and agree with the mark III distinction; indeed, this distinction formed much of our earlier criticism of the OSH in Goldstein and Turner (2003).

In addition to clarifying the distinction between aggregate currency mismatch and (international) original sin, the mark III version of the OSH includes some new empirical material on the impact of original sin versus that of aggregate currency mismatch. Because the Goldstein-Turner (2003) measure of aggregate effective currency mismatch (AECM) was available for only 22 emerging economies and because Eichengreen, Hausmann, and Panizza (2003e) wanted a larger sample, they decided to replace our measure with their own mismatch variable that combines information on reserves, international debt, exports, and original sin. As Eichengreen, Hausmann, and Panizza (2003e) acknowledge (in a footnote), their mismatch variable does not capture either net international assets or the currency composition of total debt; as such, it differs nontrivially from our measure, although Eichengreen, Hausmann, and Panizza (2003e) report that the correlation between the two measures (for countries for which both series are available) was reasonably high (0.8). Eichengreen, Hausmann, and Panizza (2003e) conduct a set of regression exercises where both original sin and aggregate currency mismatch are included (simultaneously) as explanatory variables. In brief, they find that original sin is significantly related to exchange rate flexibility whereas mismatch is not, that neither original sin nor mismatch is significantly correlated with the volatility of growth or capital flows, and that both original sin and mismatch are significantly correlated with country credit ratings.

Eichengreen, Hausmann, and Panizza (2003e) regard these results as supporting their view that original sin has important consequences for financial fragility even if it doesn’t measure aggregate currency mismatch. We, in contrast, regard these new empirical results as having lim-

---

4. As late as August 2003, Eichengreen, Hausmann, and Panizza (2003c, 15) were still arguing: “Our point is that an aggregate mismatch is unavoidable when a country suffers from original sin and there is a *net* foreign debt” (emphasis added).

ited value in assessing the usefulness of our AECM measure and as lending little support to the OSH. As noted in chapter 3, we see the AECM as a useful shorthand stress test of the impact of currency mismatches on the real economy, contingent on a large exchange rate change taking place. The regressions reported in Eichengreen, Hausmann, and Panizza (2003e) have at best only a weak link with such stress tests. As Eichengreen, Hausmann, and Panizza (2003e) argue themselves, whereas original sin and debt intolerance seek to explain the same phenomenon—namely, the volatility of emerging-market economies and the difficulty that these countries have in servicing and repaying their debts, currency mismatching is concerned instead with the “consequences” of these problems. For these reasons, comparisons of original sin with measures of currency mismatch in volatility regressions don’t shed much light on the distinctions between them. In addition, the Eichengreen, Hausmann, and Panizza (2003e) measure of aggregate mismatch leaves out some key components found in our measure (AECM). As for the OSH itself, we read the regression results in Eichengreen, Hausmann, and Panizza (2003e) as suggesting that the effect of original sin on the volatility of real output and of capital flows is quite sensitive to the inclusion of other (currency composition) variables, and that original sin is hardly unique (among currency composition variables) in affecting country credit ratings.

Yet a noteworthy third modification found in the mark III version of the OSH is that the importance of national policies and institutions has been upgraded, while the necessity of an international initiative (to escape from original sin) has been downgraded somewhat.

The earlier versions of the OSH conveyed the impression (at least to us and many others) that national policies and institutions had little impact on (international) original sin and on aggregate currency mismatch relative to international factors. In contrast, the mark III version seems to accord the former at least equal, if not greater, status. Specifically, in Eichengreen, Hausmann, and Panizza (2003e, 5), the authors state that “the intermediate position is that domestic policies and institutions are important for the ability of countries to borrow abroad in their own currencies but so are factors largely beyond the control of the individual country;” they then go on to indicate that this “intermediate position” is a fair summary of their view on the origins of original sin. Similarly, in Eichengreen and Hausmann (2003b, 6), the authors characterize their position as suggesting that original sin, and hence the susceptibility to exchange rate–related balance sheet effects, reflects “not just weaknesses of their own policies and institutions but also something about the structure of the international financial system.” And in Eichengreen and Hausmann (2003c, 3), the authors explain that “we have no quibble with arguments for robust institutions that guarantee the rule of law, strengthen property rights, and encourage responsible fiscal, monetary, and financial policies. We would certainly encourage countries to develop long-term fixed rate domestic debt markets in

local currency, in nominal terms where possible and in inflation-indexed terms where not." Note that in their most recent empirical work, Eichengreen, Hausmann, and Panizza (2003d) still fail to find any evidence that international original sin is significantly associated with domestic policies and institutions—rendering somewhat mysterious their statement that good policies are necessary but not sufficient for escaping from original sin. But they do find that monetary policy credibility and exchange rate flexibility, alongside other factors, are significantly related to domestic original sin.

Similar recent changes are evident in the discussion of their international initiative (the new EM index). Whereas Eichengreen, Hausmann, and Panizza (2002) described their proposed EM index as "the only practical way" to escape from original sin, Eichengreen and Hausmann argue in their October 2003 paper (2003c, 3) that in addition to better domestic policies and institutions, "an international initiative *may* be required" (emphasis added). In the latter paper, Eichengreen and Hausmann also characterize their proposal as one of several instruments (including GDP- and commodity-linked bonds) aimed at increased international risk sharing and at helping complete incomplete financial markets.

To sum up, the OSH hypothesis has undergone a series of changes since its debut in the 1999 paper of Eichengreen and Hausmann. In the mark I and II versions, the OSH was very bold in its claims about the link between original sin and aggregate currency mismatch, about the importance of international financial markets relative to domestic ones, about the lack of differentiation among emerging economies in their capacity to cope with currency mismatches, about the role of international network externalities and transactions costs relative to domestic policies and institutions in causing original sin, and about the necessity of an international initiative to escape from original sin. In the mark III version of the OSH, these bold claims seem (at least to us) to have been scaled back significantly—moving the OSH closer both to the mainstream view of financial fragility in emerging economies and to the view expressed in this book about the desirability of a (largely) domestic agenda for dealing with the currency mismatch problem.

To be clear, we are not critical of the authors of the OSH for having modified over time their view on original sin and on aggregate currency mismatch in light of further research and critical comment. After all, that is how economic science progresses. Also, much has been learned from the ongoing debate on the OSH, including the contribution that the OSH has made to a better understanding of what determines the currency composition of international bonds and cross-border bank loans. We do not want to be seen as suggesting that domestic policies and institutions are the only thing (rather than the main thing) that matters for the currency mismatch problem, or that emerging economies would not find life easier if more of them could borrow abroad in their own currency, or that it does

not take time before the progress in developing a healthy domestic-currency local bond market spills over into international claims, or that some financial innovations would not be helpful in improving emerging economies' ability to pay in the face of large shocks; indeed, on the last point, we have argued that there would be merit in further exploring the use of GDP-indexed bonds. Where we parted company with the mark I and II versions of OSH was on how best to define and measure aggregate currency mismatch, on differentiation among emerging economies in their ability to cope with currency mismatches, and on how much weight to give the "domestic" versus "international" elements of currency mismatch. The mark III version of the OSH reduces but by no means eliminates this disagreement.

