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Why Currency Mismatches Matter

Earlier financial crises provide ample evidence of the role currency mismatches have played in them. Consider the Asian financial crisis of 1997–98. As shown in table 2.1, widely used indicators of aggregate, short-term currency mismatch (particularly, the ratio of short-term external debt to international reserves and, less consistently, the ratio of broad monetary liabilities, M2, to international reserves) suggest that the Asian-crisis countries had a relatively high and/or rising currency mismatch in the run-up to the 1997–98 crisis. After the crisis broke, these mismatches were sharply reduced. More disaggregated measures of currency mismatch by sector also tell a story of increasing vulnerability. In each of the Asian-crisis countries, the net foreign exchange exposure of banks significantly increased (table 2.2). As detailed in Alba et al. (1998), in Korea, Thailand, and the Philippines, foreign liabilities of nonbank financial intermediaries (for example, merchant banks and finance companies) also mushroomed. In Indonesia, corporations saw their short-term foreign liabilities expand rapidly;[1] according to Dale Gray (1999), for Indonesian firms listed on the stock market, the share of foreign liabilities that were unhedged against currency risk in December 1997 ranged from 65 percent in the consumer goods sector to over 95 percent in the agricultural, mining, real estate and construction, and financial sectors. When the currencies of the countries in the Association of Southeast Asian Nations (ASEAN) plunged during 1998, it resulted in huge and unprecedented declines in their economic

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1. Burnside, Eichenbaum, and Rebelo (1999) also document large currency mismatches (relative to GDP) for deposit money banks, other financial intermediaries, and nonfinancial firms in the run-up to the crises in Indonesia, Korea, Malaysia, the Philippines, and Thailand.

Table 2.1 Proxies for currency mismatches before the Asian crisis, 1995–99 (percent of foreign exchange reserves)

Country	Short-term external debt					M2				
	1995	1996	1997	1998	1999	1995	1996	1997	1998	1999
Indonesia	208	197	224	113	75	719	661	470	318	345
Korea	184	222	330	76	59	1,498	1,541	1,548	1,022	802
Malaysia	35	44	75	39	27	323	354	353	288	281
Thailand	124	125	152	88	45	371	391	358	457	383
Memorandum:										
Latin America	118	109	105	102	98	426	393	407	431	452

M2 = broad monetary liabilities

Sources: IMF's *International Financial Statistics*, national sources, and Bank for International Settlements.

growth rates. In contrast, a group of emerging economies in Latin America had smaller or less rapidly increasing currency mismatches or both on the eve of the Asian crisis;[2] some of these Latin American countries also suffered currency declines and growth slowdowns in 1998—but not nearly as pronounced as in East Asia. In analyzing the link between short-term, unhedged foreign currency–denominated debt and currency crises in 1997–98, Jason Furman and Joseph Stiglitz (1998) go so far as to conclude that "the ability of this variable, by itself, to predict the crises of 1997 is remarkable."

Consider next the Mexican peso crisis of 1994–95. In the run-up to that crisis, there was a large substitution of foreign currency–indexed tesobonos for domestic currency–denominated cetes. Indeed, between February and December 1994, the stock of tesobonos expanded tenfold (figure 2.1). By December 1994, the dollar value of Mexican public-sector debt exceeded the rapidly dwindling stock of international reserves by about $10 billion. Public-sector debt service relative to exports was also much higher in Mexico on the eve of the crisis than in almost all its neighbors (Brazil was the exception). Similarly, after rising rapidly over 1989–94, the dollar value of M2 had climbed to a level in December 1994 (just before the peso devaluation) that was almost five times higher than the maximum level of international reserves the country ever recorded (Calvo and Goldstein 1996). Between December 1993 and December 1994, the foreign currency–denominated liabilities of Mexican banks jumped from 89 billion pesos to 174 billion pesos. In addition, large and medium-sized Mexican com-

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2. The Financial Stability Forum's report on capital flows (Financial Stability Forum 2000) notes that between end-1990 and end-1996, the ratio of short-term external debt to international reserves rose from 125 to over 150 percent in East Asian and Pacific emerging economies, whereas it fell from over 140 to 85 percent in a group of Latin American and Caribbean countries.

Table 2.2 Borrowing by domestic banks from international banks, 1995–2002 (percent of domestic bank lending to the private sector)

Region/country	1995	1996	1997	1998	1999	2000	2001	2002
Latin America[a]	**21**	**25**	**21**	**18**	**18**	**18**	**17**	**25**
Argentina	20	24	22	20	22	22	22	67
Brazil	15	22	23	17	24	27	26	32
Chile	13	12	10	8	5	5	5	8
Colombia	15	16	17	16	12	8	10	11
Mexico	28	35	22	23	16	12	10	9
Peru	23	26	27	26	18	15	11	8
Venezuela	44	28	18	16	10	9	9	14
Asia, large economies[a]	**10**	**10**	**12**	**8**	**6**	**5**	**4**	**3**
China	8	8	8	6	4	3	3	2
India	9	9	10	9	6	5	5	5
Korea	25	30	45	21	16	13	10	10
Taiwan	5	5	5	5	4	3	3	4
Other Asia[a]	**27**	**26**	**34**	**27**	**35**	**36**	**30**	**20**
Indonesia	19	18	30	29	52	58	43	25
Malaysia	n.a.	17	24	19	17	15	14	13
Philippines	17	21	27	27	26	27	30	28
Thailand	46	44	50	27	18	17	14	10
Central Europe[a]	**18**	**18**	**20**	**23**	**22**	**19**	**17**	**17**
Czech Republic	12	13	17	15	16	15	17	22
Hungary	58	55	54	70	58	40	32	27
Poland	7	7	9	11	13	14	12	11
Russia	113	115	73	146	90	37	25	22
Israel	2	1	3	3	4	2	3	3
Turkey	28	29	29	33	39	40	35	24
South Africa	9	10	9	8	6	6	12	8

n.a. = not available

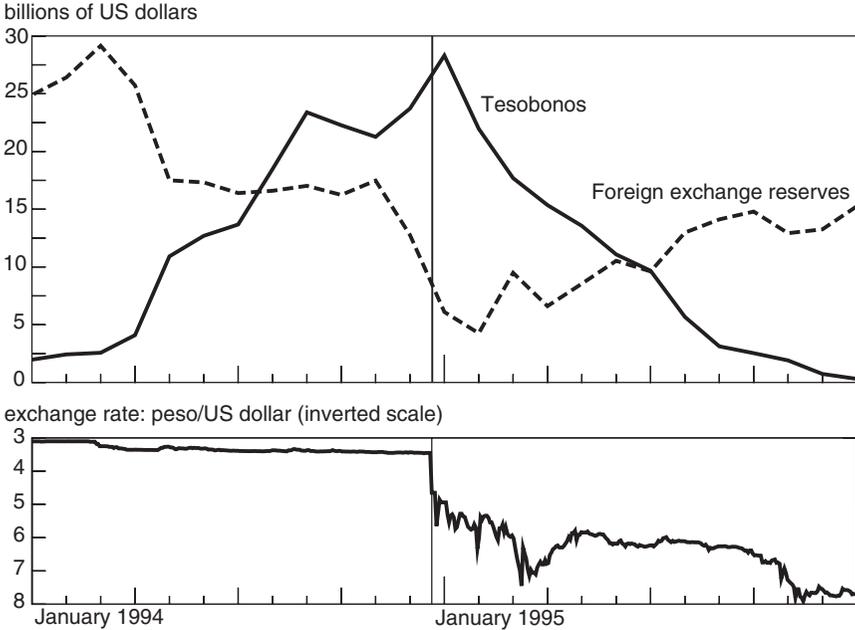a. Weighted average of countries shown, based on 1995 GDP and purchasing power parity (PPP) exchange rates.

Note: Cross-border foreign-currency lending by BIS reporting banks to domestic banks as a percent of loans outstanding of deposit money banks; outstanding year-end positions.

Sources: IMF's International Financial Statistics, national sources, and Bank for International Settlements.

panies were mismatched, as suggested by the comparison that roughly 10 percent of their sales revenues were denominated in foreign currency versus 60 percent of their financial liabilities (Goldstein and Turner 1996). In 1995, Mexico suffered a 7 percent fall in real GDP—its deepest recession in 50 years.

The Asian and Mexican crises do not appear to be outliers in the experience of emerging economies more generally. A large empirical literature now examines the relative performance of various macroeconomic variables as "leading indicators" of currency and banking crises in emerging

Figure 2.1 The Mexican peso crisis, 1994–95

billions of US dollars

Tesobonos

Foreign exchange reserves

exchange rate: peso/US dollar (inverted scale)

January 1994   January 1995

Note: The vertical line marks December 22, 1994, the onset of the crisis.

Source: Banco de México.

economies over the past three decades.[3] While the out-of-sample per-
formance of these models is still a matter of some contention and while
currency mismatch variables do not always win the horse race, some of
the mismatch variables (such as the ratio of short-term external debt to

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3. See Berg et al. (1999), Edison (2000), Goldstein, Kaminsky, and Reinhart (2000), Hawkins
and Klau (2000), and Bell (2000) for a review of this literature. Wijnholds and Kapteyn (2001)
conclude from an examination of the experience of emerging economies in the 1990s that
"For most countries with a low level of R/STED (i.e., international reserves to adjusted
short-term external debt), a financial crisis ensued." Rodrik and Velasco (1999) find that
countries with a ratio of short-term external debt to reserves that was higher than unity
roughly tripled their probability of getting into a crisis. Mulder, Perrelli, and Rocha (2002,
15) conclude that the ratio of corporate and banking debt to exports is "especially signifi-
cant" in predicting the probability of currency crises in emerging economies, suggesting that
"crises are more likely if banks and corporations are more exposed to foreign financing in
relation to exports, likely on account of currency mismatches and the balance-sheet effects
caused by currency movements." According to the Bank of England's *Financial Stability
Review* (June 2000), there were sizable currency mismatches (i.e., net foreign currency–
denominated liabilities) in both Turkey (public and banking sectors) and Argentina (public
and nonbank private sectors) in 1999; both these countries subsequently underwent finan-
cial crises in 2000 and 2001.

international reserves, the ratio of bank and corporate debt to exports, and the ratio of M2 money balances to international reserves) typically rank high, particularly for the more recent financial crises (Sachs, Tornell, and Velasco 1996; Furman and Stiglitz 1998; Kaminsky and Reinhart 1999; Berg et al. 1999; Bussiere and Mulder 1999; and Hawkins and Klau 2000). In addition, some evidence suggests that exchange rate volatility by itself—without regard to information on currency mismatches—is not a good contemporaneous or leading indicator of financial difficulties/crises (Worrell and Leon 2001). Analyzing balance sheet exposures during the emerging-market financial crises of the 1990s, Allen et al. (2002, 17) conclude that "almost all recent crisis episodes were marked by currency mismatch exposures."[4]

Currency mismatches not only increase the chance of getting into a financial crisis but also seem to increase the cost—especially the output cost—of getting out of one. A set of "third-generation" crisis models show how liability dollarization can interact with a large depreciation to produce a dramatic decline in the private sector's net worth and creditworthiness, a fall in spending and output, and a financial crisis.[5] If one seeks an explanation for the finding of Guillermo Calvo and Carmen Reinhart (2001) that devaluations in developing countries have been contractionary, it is difficult to find a more plausible candidate than currency mismatches. Focusing on currency crises of the 1990s, Cavallo et al. (2001) find that output contractions were larger in countries with both heavy foreign-currency debt burdens and large devaluations.[6]

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4. Allen et al. (2002) note that currency mismatch risk on the part of the government was important in Mexico, Brazil, Turkey, Argentina, and Russia; that currency mismatches by the banking system were large in Korea, Thailand, Indonesia, Turkey, Russia, and Brazil; and that large currency mismatches in the nonfinancial private sector (corporations and households) were large in Korea, Thailand, Indonesia, Turkey, Argentina, and Brazil.

5. See, for example, Chang and Velasco (1999) and Krugman (1999). "First-generation" crises models highlighted the incompatibility between macroeconomic policies and international reserves needed to sustain a fixed exchange rate, while "second-generation" models emphasized how speculators could push the costs of holding on to a fixed exchange rate beyond the costs of reneging on the exchange rate commitment, generating a "self-fulfilling" attack.

6. Several recent empirical studies reinforce this conclusion. Disyatat (2001) shows that there was a much closer association between exchange rate depreciation and increases in banks' ratios of foreign liabilities to total assets in the Asian-crisis countries than in the exchange rate mechanism (ERM)–crisis countries; output declines in the former were much larger than in the latter. Using firm-level data from Thailand, Rodriguez (2002) reports that firms with larger fractions of their liabilities denominated in foreign currency were forced to cut investment more after a devaluation. Gupta, Mishra, and Sahay (2001), looking at currency crises among a large sample of developing countries over a long period (1970–98), report that output contractions are significantly related to some currency mismatch or debt variables (short-term debt to reserves) but not to others (change in the external long-term debt). Bleakley and Cowan (2002) show that when mainly exporting firms take on foreign

In cases when a large currency mismatch in the banking sector cum a large devaluation is not associated with a large output decline, it is usually because either the banking sector is small relative to the size of the economy or the mismatch has been "socialized" by moving it from the balance sheet of the private sector to that of the public sector (or both). John Hawkins and Philip Turner (1999) show that bank credit to the private sector relative to GDP tends to be much smaller in Latin America than in emerging Asia (table 2.3). Contrary to the Asian crisis, the private sector in Brazil was reasonably hedged before the huge decline in the real in 1999. This is because the Brazilian government, in an effort to demonstrate its commitment to the then pegged exchange rate and to meet the increasing demand for dollars, sold both foreign currency outright and a large amount of dollar-indexed bonds to the private sector. By so doing, the public sector suffered both large reserve losses and heavy fiscal costs (when the devaluation of the real came in January 1999), but economic growth (roughly 1 percent in 1999) was better shielded than in Asia where the private-sector currency mismatch was not addressed (before the crisis) and where it subsequently produced a wave of private-sector insolvencies.[7]

A second cause for concern is that sizable currency mismatches can undermine the effectiveness of monetary policy during a crisis. Consider the monetary-policy options of a country facing a decline in external demand resulting from an international recession. The orthodox prescription would be to lower interest rates, thus directly stimulating domestic demand, and to allow the exchange rate to fall, thus helping to insulate the local economy from the external recession. During the Asian crisis, Australia was able to follow just such an approach. Specifically, the Reserve Bank of Australia could lower interest rates and allow the Australian dollar to depreciate to cushion the effects of a slowdown in its two most important export markets (Japan and Korea). As a result, the Australian economy grew by over 5 percent in 1998.

But when a currency crisis hits an economy with substantial unhedged foreign currency–denominated debt and many highly leveraged firms, the road for monetary policy is not easy. If domestic interest rates are lowered (or even kept constant), there is a real threat that the currency could go into free fall, bringing with it widespread bank failures and cor-

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currency–denominated debt, devaluation is expansionary (because the negative effect on net worth is more than compensated for by the positive effect on earnings and profits generated by improved competitiveness). Gupta, Mishra, and Sahay (2001) confirm that far from all currency crashes in developing countries are contractionary. They examine a sample of 195 crisis episodes in 91 developing countries over 1970–98 and find that about 40 percent of currency crises were expansionary; the corresponding figure for larger emerging economies was 30 percent.

7. Bevilaqua and Garcia (2000) report that the share of dollar-indexed bonds in Brazil's public debt increased from 7 percent in 1995–96 to 15 percent at end-1997 to 21 percent by end-1998.

Table 2.3   Domestic bank credit to the private sector
               (percent of GDP)

Region/country	1990	1995	2002
Latin America[a]	**24.6**	**28.5**	**22.8**
Argentina	15.5	19.7	15.1
Brazil	31.1	30.8	29.3
Chile	46.1	48.1	65.7
Colombia	15.6	18.1	20.1
Mexico	22.3	36.6	10.4
Peru	8.1	15.8	22.6
Venezuela	16.6	8.7	10.2
Asia, large economies[a]	**70.6**	**73.0**	**107.5**
China	88.8	88.3	139.7
Hong Kong	129.4	141.8	144.9
India	25.2	22.8	32.6
Korea	48.5	50.7	92.3
Taiwan	100.4	146.8	125.5
Other Asia[a]	**53.0**	**70.0**	**57.3**
Indonesia	46.9	53.5	22.3
Malaysia	69.4	83.6	106.7
Philippines	20.5	39.3	38.8
Singapore	90.8	100.6	108.6
Thailand	68.5	103.9	95.5
Central Europe[a]	**42.1**	**31.8**	**32.2**
Czech Republic	76.1[b]	66.4	31.7
Hungary	46.6	22.6	34.0
Poland	23.9[c]	18.2	31.7
Russia	11.7[b]	8.5	17.7
Israel	57.9	68.2	97.8
Turkey	15.5	17.5	14.0
Saudi Arabia	16.7	22.7	29.2
South Africa	58.1	57.8	64.0
Memorandum:			
Australia	76.9	78.8	107.3
Sweden	136.5	105.1	122.3
Switzerland	167.9	168.4	158.9

a. Weighted average of countries shown, based on 1995 GDP and PPP
   exchange rates.
b. 1993 figure.
c. 1991 figure.

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

porate bankruptcies. If interest rates are increased sharply to support the domestic currency, the financing burdens of firms will be exacerbated, and aggregate demand will be reduced at a time when the economy is likely to be headed toward a recession. In such circumstances, neither monetary policy option—keeping interest rates low and letting the exchange rate fall or defending the exchange rate with very high interest rates—can avoid a fall in net worth so severe as to cause widespread

bankruptcies.[8] Monetary policy becomes severely constrained, as several Asian countries with massive currency mismatches discovered during the Asian crisis.

Anne Krueger (2000), now the IMF's first deputy managing director, has argued that until a way is found to prevent the buildup of large currency mismatches in the financial systems of developing countries, the IMF will find its crisis management role difficult and complex. In addition, she apparently regarded the currency mismatch problem as sufficiently worrisome to propose two bold measures for discouraging such mismatches, namely, either making foreign-currency obligations incurred by domestic entities within emerging economies unenforceable in their domestic courts or passing and then enforcing legislation in G-7 countries that would require their financial institutions to accept liabilities abroad only if they were denominated in emerging-market currencies.

Yet a third concern about currency mismatches is that they will severely handicap the operation of floating rate currency regimes in developing countries. Calvo and Reinhart (2000) have shown in their empirical work that developing countries that declare they are following a floating rate regime do not "float" in the same way as industrial-country floaters. More specifically, emerging economies engage in more exchange market intervention and more interest rate action to manage their exchange rates (Calvo and Reinhart 2000). According to Hausmann, Panizza, and Stein (2000), this "fear of floating" appears to be related more to a heavy reliance on foreign currencies in their foreign borrowing than to high "pass-through" of exchange rate changes into domestic prices. The point is that once developing countries have allowed large currency mismatches to accumulate, they will be very reluctant to countenance a large depreciation—lest they drive many of their banks or firms into insolvency.

To the extent that developing-country floaters do not really float in practice, they give up the significant benefits of greater monetary policy independence and better cushioning against external real shocks. In addition, a strong fear of floating would also compromise the effectiveness of inflation targeting in emerging economies since such a targeting regime requires that low inflation (not the exchange rate) be the dominant nominal anchor. If no progress were made in reducing currency mismatches, the fear of floating could over time lead many emerging economies to conclude that they have little choice but to deal with mismatches by taking the radical step of "dollarizing" their economies. But as one of us has argued elsewhere (Goldstein 2002), dollarization does not offer a viable policy instrument to deal with domestic recession when monetary policy is made abroad, when external debt fragilities preclude countercyclical

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8. See the model outlined in Jeanne and Zettelmeyer (2002).

pump priming, and when the domestic economy lacks the flexibility to correct a real exchange rate overvaluation on its own. In short, lack of attention to currency mismatching would continue to hamper the operation of floating rate regimes in emerging economies and could lead eventually to currency regime choices that would not be helpful for the overall economic performance of these economies.